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VIT Vidyalankar Institute of Technology

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VIT

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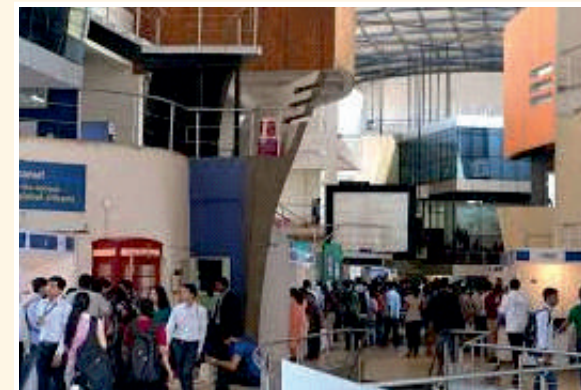
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Vidyalankar Institute of Technology is an Engineering Degree and Management College, approved by AICTE and affiliated to the University of Mumbai. Incepted in 1999 and awarded an 'A' Grade by the Govt. of Maharashtra, the Institute generates quality engineers and managers with solid academic records and offers excellent placement opportunities. Biomedical and Electronics Department are accredited by National Board of Accreditation.

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Foreword

Dear Readers,

It is said that "Research is to see what everybody else has seen, and to think what nobody else has thought."Vidyalankar Institute of Technology through its technical journal titled **'Applied Engineering and Technologies' aims to** facilitate a forum to encourage research among participants and enables them to enrich their corpus of knowledge .It is a proud moment indeed for all of us at the Institute to present the forth issue of the technical journal. Being a part of an engineering and management institute, it is imperative for us to share our ideas with others to increase the visibility of our technological research findings and in turn to learn more about the advancements in our disciplines. Vidyalankar Institute of Technology has always encouraged its faculty and students to not just excel in the dissemination of current knowledge, but to also reach out to newer horizons and explore technology in a broader context.

The theme of the journal focuses on applications in the areas of Electronics, Electrical, Communication and Bio-Medical Engineering and Educational Technology.

This year the issue includes 17papers and 18 articles which have been reviewed by eminent editorial team comprising highly experienced faculty. Further the papers have been checked for content originality on IEEE cross check web portal. This will ensure that good quality reviewed research papers are included.

The target readers are research students, undergraduate and postgraduate students and practicing upcoming professionals from industry and academia. This will further serve to facilitate their interaction and intellectual exchange of ideas with academia, industry and research personnel and help them to chisel and hone their talents to become better professionals.

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Decoupling Control for Multivariable Control System

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ABSTRACT

Multi-input multi-output control systems occur very frequently in practice and constitute difficult control problems for the operating personnel. For designing a controller for these systems, input-output pairs must be established. If the choice of input-output pair is difficult to perform, it is possible to insert a pre-compensator that makes the system diagonally dominant. In this paper, a two-input-two-output process is presented and various decoupling control techniques such as simplified, ideal and inverted decoupling are studied and compared. Simulation results are given to illustrate these generalized decoupling methodologies.

Keywords : Ideal Decoupling, Simplified Decoupling, Inverted Decoupling.

I. Introduction

Multi-input multi-output control systems occur very frequently in practice and constitute difficult control problems for the operating personnel. A suitable operating practice is to find pairs of the input-output variables where the corresponding manipulated variable has the maximum effect on the output variable and to design simple controllers for each pair [1]. In this phase of control design, techniques of loop selection are used. However, if the choice of input-output pair is difficult to perform, it is possible to insert a pre-compensator that makes the system diagonally dominant. Pursuing this idea further, some way of compensation can be sought that makes the compensated closed-loop system totally diagonal. This is called **Decoupling**. In this case each output variable is influenced only by one manipulated variable and the problem of multivariable control is then reduced to a series of single variable control problems that are more easily solved. The choice of a decoupling method is a relatively complex task since all techniques have their advantages and limitations. Simplified decoupling is most popular method. Its main advantage is that it is simple. Ideal decoupling, which is rarely used in practice, greatly facilitates the tuning of the controller transfer matrix. Inverted decoupling, which is also rarely implemented, presents at the same time the main advantage of both the simplified and ideal decoupling methods [2]. Simplified and inverted decoupling methods are also described by Seborg et al. [3]. Shinskey [4], Luyben [5] and Waller [6], have concluded that inverted decoupling is appropriate to take into account the saturation of manipulated variables, however it is more sensitive to modelling errors.

In this paper, we present a two-input-two-output process and compare various decoupling control techniques such as simplified, ideal and inverted decoupling are studied and compared. Simulation results are given to illustrate these generalized decoupling methodologies. The rest of the paper is arranged as follows: Section II describes hardware for the Multivariable control system proposed. Section III explains about decoupling control. Section IV gives explanation about system modelling. Section V describes different methods for decoupling.

II. Hardware Description

The multivariable control system comprises of a plate of size 7.5cm x7.5cm, made up of Tin. The objective is to control the temperatures in different regions of this plate. These heater coils are made up of Nichrome wire of 0.7mm diameter wound with 20 equally spaced helical turns into a coil. A computer fan is used to cool the plate from below for equal temperature distribution. A temperature transducer is stuck beneath the tin plate to measure the temperature. Plate is heated using 4 heater coils that are mounted as shown in fig1.
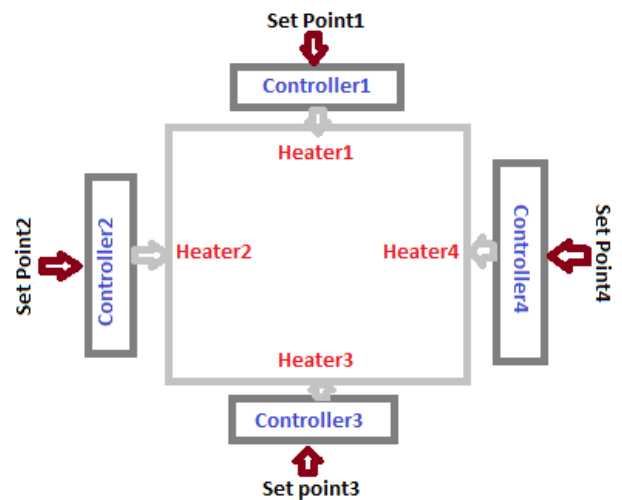
Fig.1: Schematic of the Process

III. Decoupling Control

Multi-input multi-output control systems occur very frequently in practice and constitute difficult control problems for the operating personnel. A suitable operating practice is to find pairs of the input-output variables where the corresponding manipulated variable has the maximum effect on the output variable and to design simple controllers for each pair. In this phase of control design, techniques of loop selection are used. If the choice of input-output pair is difficult to perform, it is possible to insert a precompensator that makes the system diagonally

dominant. Pursuing this idea further, a some way of compensation can be sought that makes the compensated closed-loop system totally diagonal. This is called Decoupling. The term decoupling means diagonal coupling i.e each input/output is independent. When certain input/outputs are grouped together various decoupling regimes can be obtained [7].In this case each output variable is influenced only by one manipulated variable and the problem of multivariable control is then reduced to a series of single variable control problems that are more easily solved. The choice of a decoupling method is a relatively complex task since all techniques have their advantages and limitations.

IV. System Modelling

In order to develop a controller for multiloop control system we must have a model of the system that describes the behavior of the system in response to changes in any of the inputs. To know the mathematical model of any system, we have to perform step test for the system. A model helps to explain a system and to study the effects of different components, and to make predictions about behavior. We obtain mathematical model of the system using system identification toolbox in MATLAB 2013.To know the mathematical model of any system, we perform step test for that system and use system identification toolbox to obtain the transfer function models. We use the data from step test results to obtain transfer function model using system identification toolbox in MATLAB. The transfer function matrix obtained is as follows:

$$G = \begin{bmatrix} \dfrac{0.06489e^{-6.825}}{33.839s+1} & \dfrac{0.03052e^{-30}}{31.022s+1} & \dfrac{0.032064e^{-21.001}}{46.257s+1} & \dfrac{0.071766e^{-5}}{46.024s+1} \\ \dfrac{0.090032e^{-5.533}}{47.527s+1} & \dfrac{0.11944e^{-5.01}}{55.58s+1} & \dfrac{0.051343e^{-1.001}}{56.051s+1} & \dfrac{0.049982e^{-14.011}}{50.47s+1} \\ \dfrac{0.047669e^{-1}}{67.305s+1} & \dfrac{0.066044e^{-14.958}}{34.42s+1} & \dfrac{0.1178e^{-2.157}}{31.563s+1} & \dfrac{0.055626e^{-1}}{52.525s+1} \\ \dfrac{0.038259e^{-1}}{46.834s+1} & \dfrac{0.033102e^{-30}}{36.929s+1} & \dfrac{0.025e^{-16}}{30s+1} & \dfrac{0.090711e^{-9.023}}{36.228s+1} \\ \dfrac{0.079823e^{-15.628}}{35.248s+1} & \dfrac{0.080116e^{-23.088}}{43.696s+1} & \dfrac{0.07597e^{-1}}{40.09s+1} & \dfrac{0.085697e^{-1}}{48.54s+1} \end{bmatrix}$$

V. Decoupling Methods

The term decoupling means diagonal coupling i.e each input/output is independent. Ideal, simplified, and inverted decoupling are some of the widely used classic methods for industrial process controls. Decoupling of a two input-two output (TITO) process P(s) requires the design of a transfer matrix D(s), such that P(s) ×D(s) is a diagonal transfer matrix T(s):

$$D(s) = \begin{bmatrix} D_{11}(s) & D_{12}(s) \\ D_{21}(s) & D_{22}(s) \end{bmatrix} \quad \dots (1)$$

$$P(s) = \begin{bmatrix} P_{11}(s) & P_{12}(s) \\ P_{21}(s) & P_{22}(s) \end{bmatrix} \quad \dots (2)$$

$$T(s) = P(s) \times D(s) = \begin{bmatrix} T_{11}(s) & 0 \\ 0 & T_{22}(s) \end{bmatrix} \quad \dots (3)$$

Decoupling control system for a TITO process is shown in fig.2. The variables r_1 and r_2 are the set points, c_1 and c_2 are the controller outputs, u_1 and u_2 are the manipulated variables and y_1 and y_2 are the process outputs.
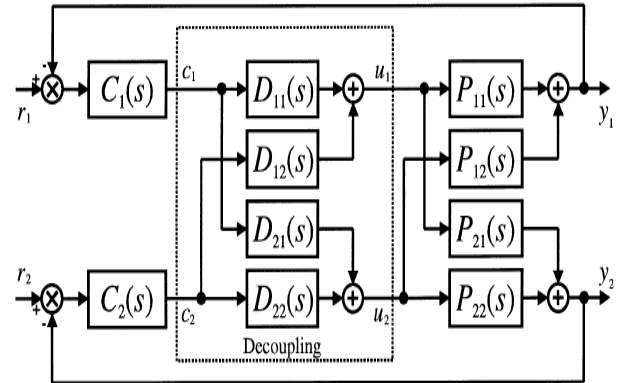
Fig.2: Decoupling Control of a TITO process

The controller transfer matrix is diagonal and is defined as follows:

$$C(s) = \begin{bmatrix} C_1(s) & 0 \\ 0 & C_2(s) \end{bmatrix} \quad \dots (4)$$

From Eq.3, we get

$$D(s) = P(s)^{-1}T(s)$$

$$= \frac{1}{P_{11}(s)P_{22}(s)-P_{12}(s)P_{21}(s)} \begin{bmatrix} P_{22}(s)T_{11}(s) & -P_{12}(s)T_{22}(s) \\ -P_{21}(s)T_{11}(s) & P_{11}(s)T_{22}(s) \end{bmatrix} \quad \dots (5)$$

The elements $P_{11}(s)$, $P_{12}(s)$, $P_{21}(s)$ and $P_{22}(s)$ of Eq.5, which represent the transfer functions of the process, are supposed to be known. The only unknown elements are $T_{11}(s)$ and $T_{22}(s)$. They represent the desired dynamics of the decoupled system.

5.1. Ideal decoupling

In ideal decoupling, the decoupled process is expected to have a diagonal transfer function matrix in the form below:

$$T(s) = P(s) \times D(s) = \begin{bmatrix} P_{11}(s) & 0 \\ 0 & P_{22}(s) \end{bmatrix} \quad \text{---- (6)}$$

An illustration of the system connection with an ideal decoupler is shown in Fig.3.
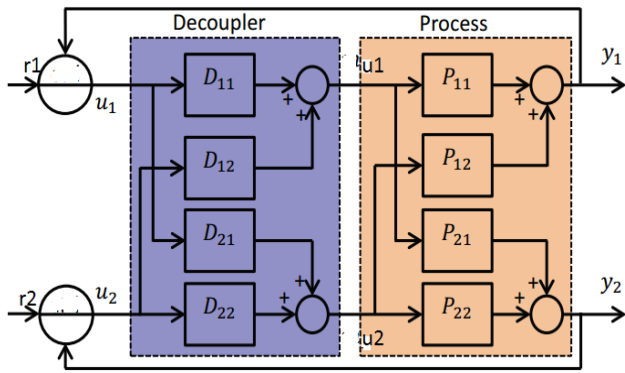
Fig.3: Ideal Decoupling

Based on the decoupling requirement in equation (6), four equations can be established:

$$P_{11}(s)D_{11}(s) + P_{12}(s)D_{21}(s) = P_{11}(s)$$

$$P_{11}(s)D_{12}(s) + P_{12}(s)D_{22}(s) = 0$$

$$P_{21}(s)D_{11}(s) + P_{22}(s)D_{21}(s) = P_{22}(s)$$

$$P_{21}(s)D_{12}(s) + P_{22}(s)D_{22}(s) = 0$$

The decoupler elements are then obtained by the solution of above equations:

$$D_{11}(s) = \frac{P_{11}(s)P_{22}(s)}{P_{11}(s)P_{22}(s) - P_{12}(s)P_{21}(s)}$$

$$D_{12}(s) = \frac{-P_{12}(s)P_{22}(s)}{P_{11}(s)P_{22}(s) - P_{12}(s)P_{21}(s)}$$

$$D_{21}(s) = \frac{-P_{11}(s)P_{21}(s)}{P_{11}(s)P_{22}(s) - P_{12}(s)P_{21}(s)}$$

$$D_{22}(s) = \frac{P_{11}(s)P_{22}(s)}{P_{11}(s)P_{22}(s) - P_{12}(s)P_{21}(s)}$$

A first decoupling control design consists in selecting the transfer functions $T_{11}(s)$ and $T_{22}(s)$. The decoupling transfer matrix $D(s)$ is then deduced from Eq.5. The diagonal controller elements $C_1(s)$ and $C_2(s)$ are independently and respectively tuned based on $T_{11}(s)$ and $T_{22}(s)$. A logical choice for $T(s)$ is $T_{11}(s) = P_{11}(s)$ and $T_{22}(s) = P_{22}(s)$. With this choice, the same controller tuning can be kept even if one loop is set in manual mode. However, this technique, called "ideal decoupling", often leads to complicated $D(s)$ expressions, which can be difficult to realize.

5.2 Simplified Decoupling

Compared with the ideal decoupling, the simplified decoupling has less stringent requirements on the diagonal elements of the process. In other words, it does not emphasize much on what the primary loops become after decoupling. Instead, it assigns fewer tasks to the decoupler by setting the diagonal elements to be 1, as shown in Fig.4,
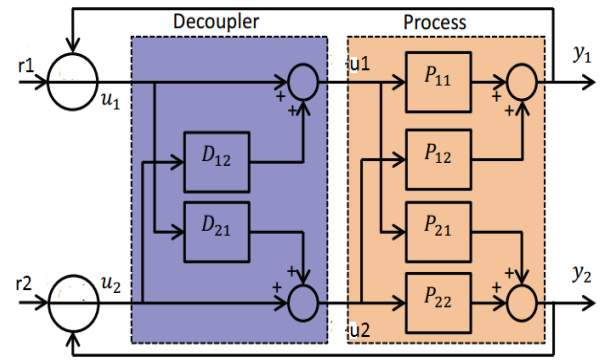
Fig.4: Simplified Decoupling

Selection Process for simplified decoupler is as follows:

$$D(s) = \begin{bmatrix} 1 & D_{12}(s) \\ D_{21}(s) & 1 \end{bmatrix} \qquad \dots (7)$$

Thus, the following two equations are used to satisfy the decoupling condition, i.e. to make the process behave diagonal.

$$P_{11}(s)D_{12}(s) + P_{12}(s)D_{22}(s) = 0$$

$$P_{21}(s)D_{12}(s) + P_{22}(s)D_{22(s)} = 0$$

When these equations are solved, we get

$$D_{12}(s) = -\frac{P_{12}(s)}{P_{11}(s)} \text{ and } D_{21}(s) = -\frac{P_{21}(s)}{P_{22}(s)}$$

$$D(s) = \begin{bmatrix} 1 & \dfrac{-P_{12}(s)}{P_{11}(s)} \\ \dfrac{-P_{21}(s)}{P_{22}(s)} & 1 \end{bmatrix} \qquad \dots (8)$$

The resulting transfer matrix $T(s)$ is then:

$$T(s) = \begin{bmatrix} P_{11}(s) - \dfrac{P_{12}(s)P_{21}(s)}{P_{22}(s)} & 0 \\ 0 & P_{22}(s) - \dfrac{P_{12}(s)P_{21}(s)}{P_{11}(s)} \end{bmatrix} \qquad \dots(9)$$

This choice makes the realization of the decoupler easy, but the diagonal transfer matrix $T(s)$ obtained is complex since its elements are the sum of transfer functions. Controller tuning can therefore be difficult. Therefore we approximate each sum by a simpler transfer function to facilitate controller tuning [2].

5.3 Inverted Decoupling

To avoid the realization problems of ideal decoupling while keeping its advantages, an interesting method found, consists in modifying the decoupling structure of fig.4. According to this figure and Eq.5, when $T_{11}(s) = P_{11}(s)$ and $T_{22}(s) = P_{22}(s)$, the manipulated variables are:

$$u_1(s) = c_1(s)\left[\frac{P_{11}(s)P_{22}(s)}{P_{11}(s)P_{22}(s) - P_{12}(s)P_{21}(s)}\right] - c_2(s)\left[\frac{P_{12}(s)P_{22}(s)}{P_{11}(s)P_{22}(s) - P_{12}(s)P_{21}(s)}\right]$$

$$\dots (10)$$

$$u_2(s) = -c_1(s)\left[\frac{P_{21}(s)P_{11}(s)}{P_{11}(s)P_{22}(s) - P_{12}(s)P_{21}(s)}\right] + c_2(s)\left[\frac{P_{11}(s)P_{22}(s)}{P_{11}(s)P_{22}(s) - P_{12}(s)P_{21}(s)}\right]$$

$$\dots (11)$$

It can easily be demonstrated that these equations can be simplified as follows:

$$u_1(s) = c_1(s) - u_2(s)\left[\frac{P_{12}(s)}{P_{11}(s)}\right] \qquad \ldots (12)$$

$$u_2(s) = c_2(s) - u_1(s)\left[\frac{P_{21}(s)}{P_{22}(s)}\right] \qquad \ldots (13)$$
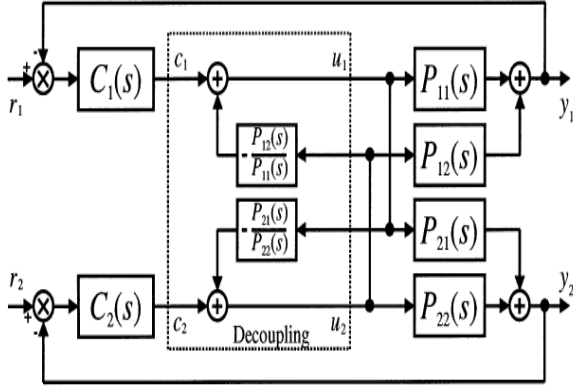
Fig.5: Inverted Decoupling

Fig.5 shows a control system with the decoupling structure defined by Eq.11 and Eq.12. It should be noted that the transfer functions of the decoupler are the same as the ones used with simplified decoupling. Therefore, inverted decoupling offers at the same time, the ease of realization of the simplified decoupling elements and the more appropriate diagonal transfer matrix(s) of the ideal decoupling.

VI. Simulation Results

6.1 Decoupling Control Results

Various simulations have been performed to evaluate the efficacy of decoupling control techniques described in section IV. All simulations are implemented on MATLAB 2013A.We have designed system in MATLAB simulink and have designed a subsystem using mathematical model obtained in section IV.

6.2 Multiloop Control without Decoupler

Multiloop PI control system without decoupler is shown in Fig.6. The procedure to obtain results as follows:

1. Process is in the steady state with 31 and 35 degree Celsius for temperature1 and temperature5 respectively.

2. Temperature1 set point is changed to 33 degree Celsius after 2500 samples.Temperatures1 increases to track set point change. In this time temperature5 should not change but because of loop interaction temperature5 also changes. We can see effect of loop interaction in between 4000 to 8000 sample range.
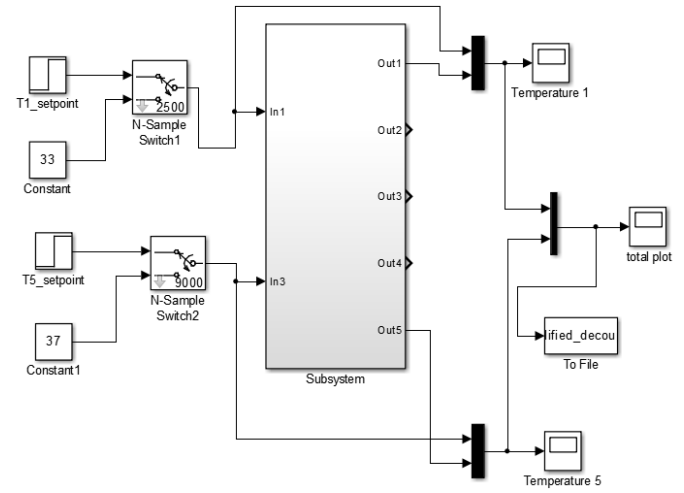
Fig.6: Multiloop Controller without Decoupler

$$\begin{bmatrix} T(1) \\ T(5) \end{bmatrix} = \begin{bmatrix} \dfrac{0.06489e^{-6.825}}{33.839s+1} & \dfrac{0.032064e^{-21.001}}{46.257s+1} \\ \dfrac{0.079823e^{-15.628}}{35.248s+1} & \dfrac{0.07597e^{-1}}{40.09s+1} \end{bmatrix} \times \begin{bmatrix} u(1) \\ u(3) \end{bmatrix}$$

$$\ldots(14)$$
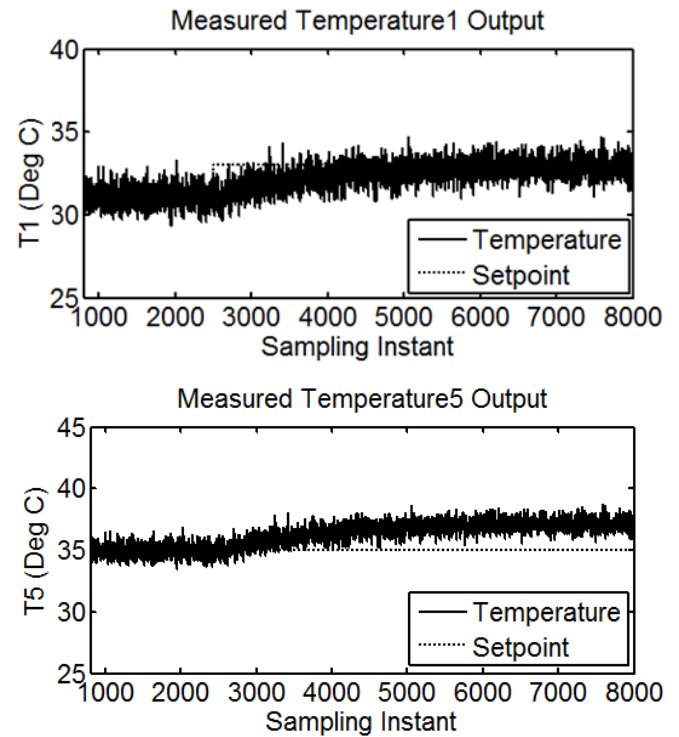
Fig.7:Multiloop Control without Decoupling

6.3 Steady State Decoupling Control

In order to control Temperature 1 and 5 independent of each other, we implement steady state decoupling control. The decoupling transfer functions are given in Eq.14. These equations gives negative exponential values i.e. Past values and these values are required in future mathematical calculations. If we take other combinations then these equations gives positive exponential values that we can't predict. We control inputs to heaters 1 and heater3 and observe outputs 1 and 5. The transfer function we already obtained section IV.

(4)

$$\begin{bmatrix} P_{11}(s) & P_{12}(s) \\ P_{21}(s) & P_{22}(s) \end{bmatrix} = \begin{bmatrix} \dfrac{0.06489e^{-6.825}}{33.839s+1} & \dfrac{0.032064e^{-21.001}}{46.257s+1} \\ \dfrac{0.079823e^{-15.628}}{35.248s+1} & \dfrac{0.07597e^{-1}}{40.09s+1} \end{bmatrix}$$

$$\dots (15)$$

$P_{11}(s)$ = Change in temperature 1due to heater 1
$P_{12}(s)$ = Change in temperature 1due to heater 3
$P_{21}(s)$ = Change in temperature 5 due to heater 1
$P_{22}(s)$ = Change in temperature 5 due to heater 3

Decoupler gain matrix is as follows:

$$D_{21} = \frac{-K_{21}}{K_{22}} = -1.05071 \qquad \dots (16)$$

$$D_{12} = \frac{-K_{12}}{K_{11}} = -0.494128 \qquad \dots (17)$$

$$D(s) = \begin{bmatrix} 1 & -0.494128 \\ -1.05071 & 1 \end{bmatrix} \qquad \dots (18)$$

Fig.8: Steady State Decoupling

In this simulation, Heater1 and Heater3 are used to control temperature T1 and T5. From the fig.8, we can observe that when temperature 1 changes, temperature 5 are in stable state.

6.4 Dynamic Decoupling Control

6.4.1 Simplified Decoupling : We made simplified decoupling Simulink model and we got following results

$$D_{21}(s) = -\frac{P_{21}(s)}{P_{22}(s)} = -1.05\frac{40.09s+1}{35.248s+1}e^{-14.628}$$

$$\dots (19)$$

$$D_{12}(s) = -\frac{P_{12}(s)}{P_{11}(s)} = -0.4931\frac{33.839s+1}{46.257s+1}e^{-14.175}$$

$$\dots (20)$$

Decoupler gain matrix is as follows:

$$D(s) = \begin{bmatrix} 1 & \dfrac{-P_{12}(s)}{P_{11}(s)} \\ \dfrac{-P_{21}(s)}{P_{22}(s)} & 1 \end{bmatrix} \qquad \dots (21)$$
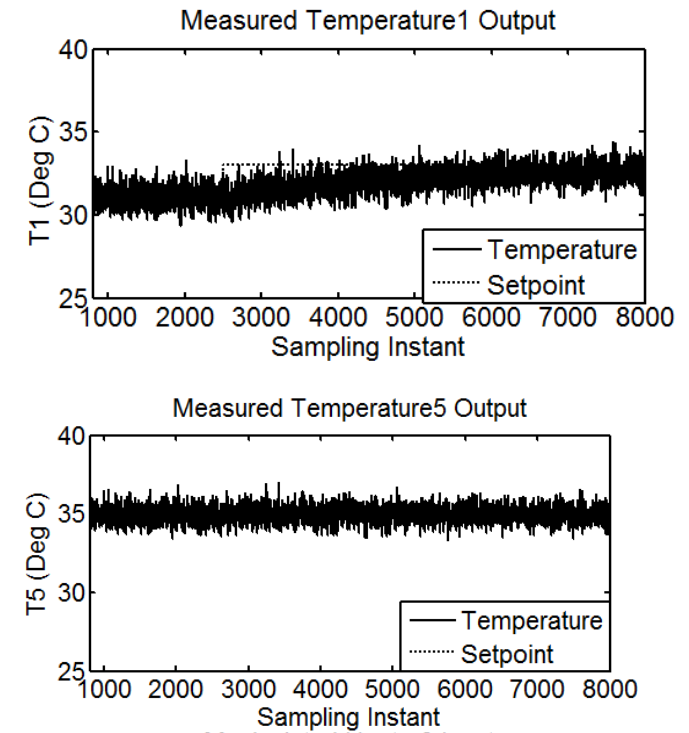
Fig.9: Simplified Decoupling

In this simulation, Heater1 and Heater3 are used to control temperature T1 and T5. From the fig.9, we can observe that when temperature 1 changes, temperature 5 are at stable state. The effect of loop interaction cancels due to decoupler matrix.

6.4.2 Ideal Decoupling: The decoupling transfer matrix D(s) is then deduced from Eq.6. The diagonal controller elements $C_1(s)$ and $C_2(s)$ are independently and respectively tuned based on $T_{11}(s)$ and $T_{22}(s)$. A logical choice for T(s) is $T_{11}(s) = P_{11}(s)$ and $T_{22}(s) = P_{22}(s)$.

$$T(s) = \begin{bmatrix} T_{11} & 0 \\ 0 & T_{22} \end{bmatrix}$$

$$D(s) = inv(P)*T(s)$$

We have simulate inverted decoupling according to Fig.3 and got following results:

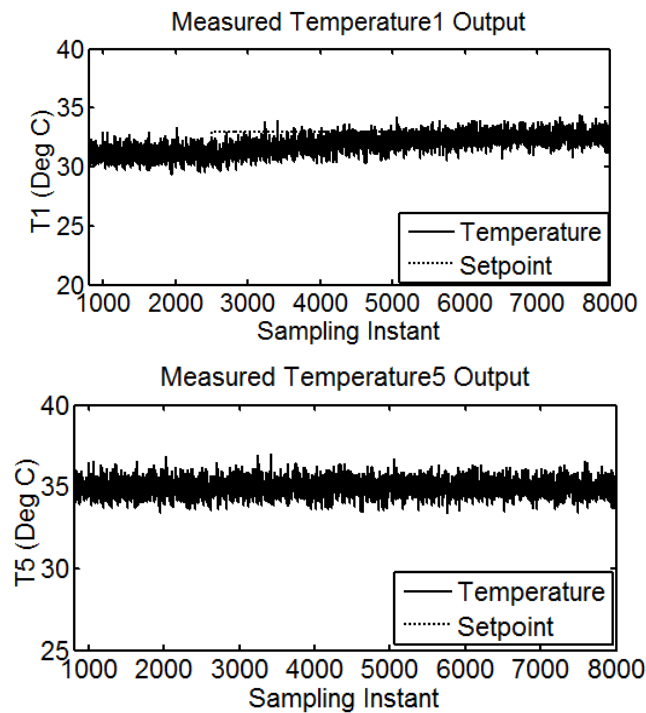Measured Temperature1 Output

Measured Temperature5 Output
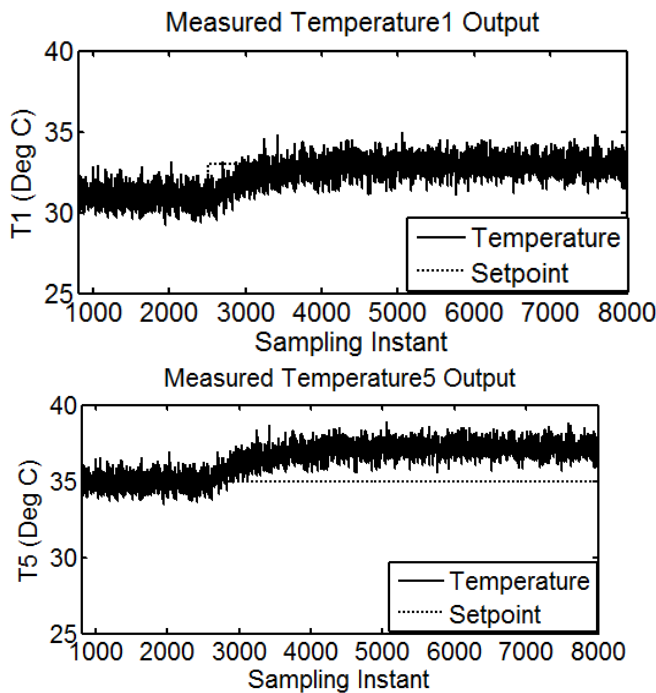
Fig.10: Ideal Decoupling

In this simulation, Heater1 and Heater3 are used to control temperature T1 and T5. From the fig.10, we can observe that when temperature 1 changes, temperature 5 also change. The effect of loop interaction visible here.

6.4.3 Inverted Decoupling: Inverted decoupling matrix already calculated in Eq.22 and we have simulate inverted decoupling according to Fig.5 and got following results:

Measured Temperature1 Output

Measured Temperature5 Output
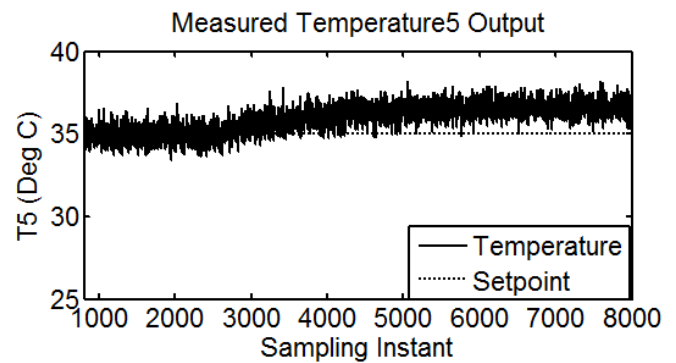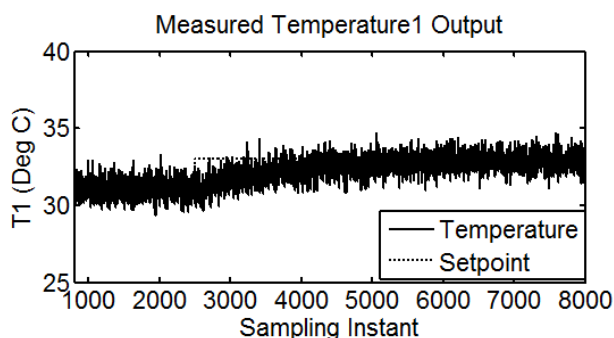
Fig.11: Inverted Decoupling Control Results

In this simulation, Heater1 and Heater3 are used to control temperature T1 and T5. From the Fig.11, we can observe that when temperature 1 changes, temperature 5 also change. The effect of loop interaction visible here.

VII. Conclusion

Experiments are carried out for set point tracking performance of the controller.

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Performance Evaluation of Improved AODV Protocol with Cross layer Functionality for Mobile Ad Hoc Networks

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ABSTRACT

The purpose of this paper is to work on cross layer design and study the impact of transport layer protocol; Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) on quality of service parameters of ad hoc network using Improved Ad hoc On Demand Distance Vector Routing(I-AODV) protocol. We have modified AODV protocol on physical and data link layer and named it as IAODV. This I-AODV, combines the effect of modifications in expanded ring search, wait time and time to live; and allows node participation only above a set energy level while establishing a route. At transport layer, selection of TCP or UDP protocol will help in optimizing the performance of overall ad hoc network. The simulation result indicates that UDP performs better for the specified optimized values of I-AODV . Our results show that the improved protocol I-AODV offers lower Energy consumption to the extent of 24 %, End to End Delay is reduced by about 28% and PDR is improved above 88%. By deploying UDP protocol for transport layer using Constant Bit Rate (CBR) traffic further improves the performance of end to end delay, retransmissions and overhead by minimum 30%. The performance of energy and packet delivery ratio remains unaffected.

I. Introduction

Unlike traditional networks mobile ad hoc networks (MANETs) are infrastructure less networks. The main focus of a protocol deployed in MANETS is to achieve reliability by finding the most reliable and robust route from source to destination and maintain the same for longer duration.

In case of wireless Ad hoc networks like MANETS, the nodes have limited energy levels and they are mobile. It is necessary to find out reliable route with consideration of more than one attribute like energy consumption and end to end delay to offer comprehensive solution in line with traditional networks. It is increasingly important today that the protocol deployed should be able to ensure minimum "end to end delay" and higher network life time, thus guarantee QoS. Developing a protocol considering all above aspects is done at the network layer. Also the conventional layered protocol architecture does not provide optimal performance for ad hoc networks. If optimization is done at all layers of protocol stack, then optimal network performance can be achieved. While developing a protocol if physical, data link, transport layer is also considered, then that becomes a cross layer problem. Dealing with cross layer problem, considering more than one layer for optimization and improving two

attributes simultaneously is still an open issue for research in MANETs and our attempt is to take a positive step in that direction.

In this paper we are analyzing the effect of transport layer protocols TCP and UDP on IAODV. IAODV is developed considering physical and data link layer. UDP shows improvement in QoS parameters, namely End to End delay, retransmissions and overhead as compared to TCP.

In section 2, we have explained IAODV, TCP and UDP. Section 3 gives the details of the simulation scenario and the parameters considered as the metric for simulation. Extensive simulation is done in section 4. Finally section 5 summarizes the paper, section 6 draws conclusion and 7 mentions the future scope.

2. Protocols

2.1. Improved AODV

2.1.1 **Reduction in Energy Consumption** QoS improved AODV protocol considers energy as one of the metrics for finding the route [8]. Route requests are sent to the neighboring nodes. If the energy of the node is above the threshold, then the node accepts the route request. Otherwise it will drop the RREQ. Thus all the nodes participating in the route for data transmission will have enough energy for transmission. It is assumed that if the energy of the node goes below threshold while transmission, the node will generate RRER and follow the normal AODV procedure for route repairing.

In mobile communication, if the destination is not within the range of source then intermediate nodes play important role for setting up the route between source and destination. In order to form shortest path between source and destination, some nodes act as routers. After a short period of time, the energy resources of those nodes get depleted, which leads to node failure and thus consecutively leads to link failure. Due to this, either local repair is initiated or the fresh route rediscovery is initiated. Thus a better choice of route is one where packet gets routed through path which contains node that has enough energy. To achieve this we have applied a threshold Energy (TE) to check nodes remaining energy. The node then decides whether to take part in communication or not. The threshold energy of a node is defined as the ratio of its remaining energy to initial energy. Hence value of threshold energy will have a range between 0 and 1.

The decision about acting as a router is taken by every node depending on its threshold energy. So there is no need to pass its value of TE to neighbors through any of the control messages. In existing AODV protocol, whenever a node receives a RREQ message it is processed without considering its energy. In I-AODV, when a source node initiates a RREQ message, the neighboring nodes first check their TE. If its TE is greater than some threshold then only it processes the RREQ message. Due to this node saves its energy in processing RREQ too. This modification puts a limit on who should participate in forming a route from source to destination. If a node participates in formation of route then it is assumed that it has sufficient energy to work for that data session as a router. Due to consideration of TE at local level, network lifetime increases and also number of broken links decreases. This is explained below, Threshold Energy (TE) is calculated by using equation (1) for every node when it receives route request packet.

Threshold Energy of node n is given by-

$$TE = RE/IE \qquad \dots (1)$$

Remaining energy of node is calculated as given in equation 2

$$RE = \text{Initial Energy} - \text{Consumed Energy} \qquad \dots (2)$$

2.1.2. Reducing End to End Delay. In order to reduce end to end delay and improve other quality of service parameters, the I-AODV protocol uses following mechanisms:

1. A faster ad hoc routing mechanism for finding the path between source and destination.
2. Decrease in the wait time during the route reply back-off
3. Modifying the predefined time to live (TTL) threshold

2.1.3.   Algorithm for I-AODV Route Discovery

1. Modify the Time to live (TTL=1) threshold(9), ERS (increment by 3)and the Wait Time.
2. Source node initiates the RREQ on demand.
3. **if** Neighbouring nodes in radius (TTL value) of ring search of source receives the RREQ message
4. **then** update route to source of RREQ
5. check
6. **if** the node is the intended destination
7. **then** send RREP to source.
8. **Else**
9. Calculate TE of node.
10. check
11. **if** TE > threshold.
12. **then** act as a router and broadcasts the RREQ message to nodes in its range.
13. **Else** simply discard the RREQ packet.
14. RREP is received by source S then normal operation like AODV is done.

2.2. Transmission Control Protocol (TCP)

TCP is connection oriented protocol. It is suited for applications which require high reliability and no critical time constraint. The header size is 20 bytes. The data transmission speed is low. TCP requires 3 packets to set up a connection before sending any user data.

The biggest problem with TCP where multiple sources are used is its congestion control algorithm. It treats packet loss as a sign of bandwidth limitation and automatically controls the rate of data transfer. This increases the latency on 3G or Wi-Fi networks.

2.3. User Datagram Protocol (UDP)

UDP is a connectionless protocol. It is suitable for applications that need fast and efficient transmission. It is faster than TCP. The header size is 8 bytes.

3. Simulation Environment

We have conducted simulation in NS-2.34. UDP is compared with TCP for I-AODV. We have observed the effect of variation in speed on energy consumption, PDR, overhead, Throughput, Delay, link breaks and Retransmissions. The simulation parameters considered are mentioned below in table 1.

Table 1. Simulation Parameters

Parameter	Value
Channel type	Channel/Wireless channel
MAC Layer Protocol	802.11
Area (m*m)	500*500
Simulation duration	100s
Pause Time	1 s
Maximum speed	5m/s
Mobility model	Random way point
Number of nodes	30
Traffic type	Constant bit rate CBR
Payload Data	512 bytes/packet
Packet Rate	50 packet/s
Protocol	IAODV

4. Simulation Results and discussion

In this section, we present the results comparing TCP and UDP.

4.1. Energy Consumption

The remaining energy of overall network is measured.
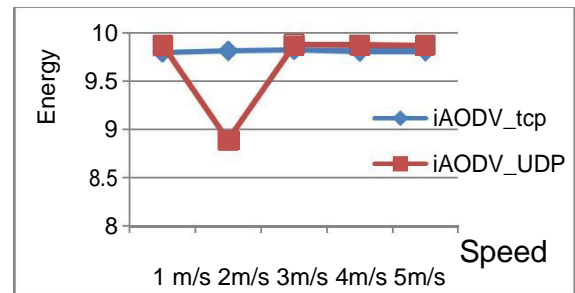
Figure 1. Energy Consumption as function of speed.

The procedure for TCP is fixed. Increase in speed has no effect on functioning of the protocol. Hence energy consumption is also stable. Even for UDP the performance on energy parameters is stable. We do not observe impact of change in transport layer protocol on energy consumption. The benefits obtained with IAODV remains unaltered.

4.2. Packet Delivery Ratio

PDR shows how packets are delivered successfully from source to destination.
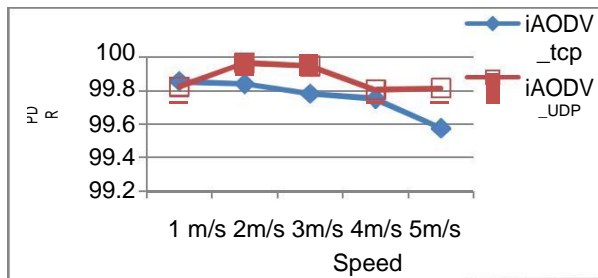
Figure 2. Packet Delivery Ratio as function of speed.

Change in transport layer protocol has shown negligible impact on PDR. The data transmission in UDP is faster compared to TCP. The header size is small, 8 bytes . Thus even if packets are droped, the information lost is less.

4.3. Overhead

TCP requires three packets to set up a connection before sending any user data. also three way handshaking is done to establish a connection. Hence the overhead required is more in TCP.
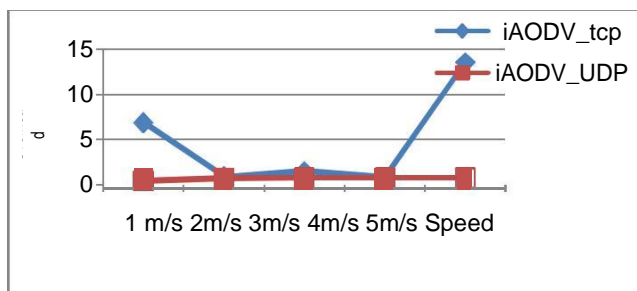
Figure 3. Overhead as function of speed.

4.4. Throughput

The data transmission in TCP is reliable. It takes care of congestion control. Hence the throughput in TCP is more. However, the reduction of through put performance for UDP does not affect the network performance of Adhoc netowrk.
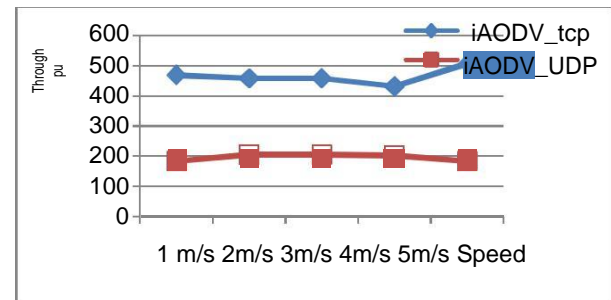
Figure 4. Throughput as function of speed

4.5. Linkbreak

The number of linkbreaks are constant irrespective of speed in UDP. In TCP, as the speed increases the number of linkbreaks also increase due to frequent change in topology.
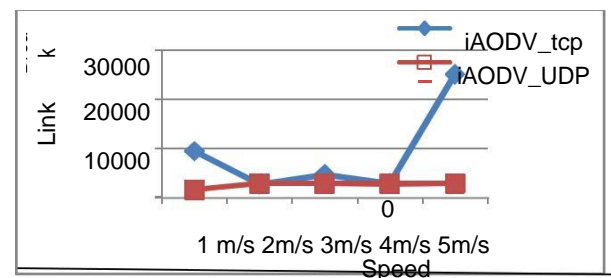
Figure 5. Linkbreak as function of speed.

4.6. Retransmission

Since the number of link break is more in TCP, the retransmissions are also more. With increase in the speed the retransmission is fairly constant. The increase in TCP is due to its way of implementation of the protocol.
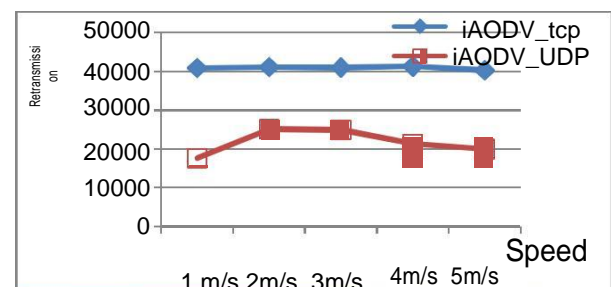
Figure 6. Retransmission as function of speed.

4.7. End-To-End Delay

The time required to establish a link in TCP is more due to its handshaking mechanism. As the speed increases the rate of collision also increase. UDP does not take care of flow control in case of congestion. The packets dropped are lost. Hence delay in receiving data packets at higher speeds.
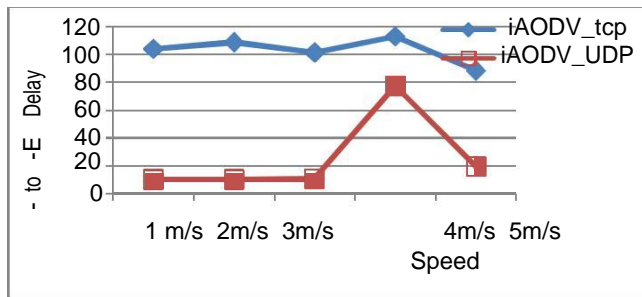
Figure 7. End to End Delay as function of speed

5. Summary

The percentage increase is compared in the table 2.

Table 2. Percentage Improvement

Parameters	Percentage Improvement
Energy Consumption	Performance unaffected
PDR	Performance unaffected
Overhead	Improved by 30%+
Link break	Improved by 30%+
Re Transmission	Improved by 30%+
Delay	Improved by 30%+

6. Conclusion

UDP uses connectionless communication set up. UDP does not need to establish a connection before sending data. Communication consists of only data segments. It does not consist of acknowledgement, flow control and sequence. Hence overhead and delay is low. Number of link breaks , retransmissions is also less. Due to which PDR is high. Therefore IAODV with UDP can be used for video or audio streaming where loss of data is acceptable and time is not a constraint.

7. Future Scope

Instead of running the IAODV protocol on simulation platform, trail should be taken on real time scenario to see the actual effect of cross layer designing.

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Wireless SCADA With Low Cost Automation

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ABSTRACT

SCADA (Supervisory Control and Data Acquisition) is a type of industrial control system. In typical industrial automation applications, PLCs are used to communicate between the plant and SCADA. In this paper we are using a low cost microcontroller to understand the various control techniques and capabilities of SCADA and implement them in real time. A simple temperature control scheme is developed using ATMEGA2560 microcontroller and industry standard SCADA software Vijeo Citect v7.2. We make use of MODBUS ASCII protocol which is an industry standard communication protocol to set up a temperature control system which collects real time temperature data, processes the data and performs the desired control action. We have implemented Wireless communication of Microcontroller and SCADA using Zigbee Module. Major contribution of the paper is in developing MODBUS library for communication between microcontroller and SCADA and implementing control algorithms such as ON/OFF and proportional controller on data obtained in real time. Thus this paper presents a low cost automation scheme which can be easily extended for more complicated control schemes including wireless control. The project has been developed as first step towards a project on pipeline leakage detection scheme using wireless sensor nodes.

Keywords : SCADA, Atmega2560, MODBUS, ZigBee

I. Introduction

The automation phenomenon has grown rapidly in the last century, influencing every aspect of our lives. SCADA (Supervisory Control and Data Acquisition) is a type of industrial control system (ICS). Industrial control systems are computer controlled systems that monitor and control industrial processes that exist in the physical world. SCADA systems historically distinguish themselves from other Industrial Control systems by being large scale processes that can include multiple sites, and large distances. These processes include industrial, infrastructure, and facility-based processes, chemical and pharmaceutical, power generation and distribution, Nuclear reactors etc. Such industries require tools to analyze and control various processes such as flow, pressure, temperature etc.

In Large water supply systems, pipeline leakages are the main source of contamination and loss. In order to ensure and monitor quality and quantity of water supply, a large sensor network will be required to get the data of flow and pressure at various locations in the pipelines. This data will then be analyzed to detect leakages. PLC based SCADA are most commonly used for this purpose. As PLCs are very costly, at the development stage an idea of using low cost microcontrollers has been put up. we have created our own system for monitoring data in real time and use it for implementing control.

The main objective of this paper is to understand the basic working of the industry standard SCADA software and develop a wireless interface between a microcontroller and SCADA to form a low cost system. The various capabilities of SCADA are verified using a standalone control system on Vijeo Citect v7.2. To demonstrate supervisory control, we have selected a temperature control system and the interface protocol selected is MODBUS ASCII. For wireless communication ZigBee modules are used.

The MODBUS protocol supports master-slave control which is very essential in supervisory control from SCADA that acts as Master to Microcontroller which acts as slave. The microcontroller chosen is Atmega2560 which is an 8 bit AVR microcontroller having high performance and low power. The Atmega2560 board has provision for analog and digital I/O ports. The system comprises of temperature as analog input to Vijeo Citect v7.2 through temperature sensor. For a particular temperature range appropriate control is done by Atmega2560 board which drives a DC Fan. The block diagram of proposed system is shown in figure (1).

I. Literature Review

Supervisory Control and Data Acquisition (SCADA) systems are critically important to the procedure of modernization of contemporary power systems, industries etc. A SCADA system involves the integrated technologies of computer, communication, electric devices etc. Electric utilities are expected to choose the communication media best suited for the characteristics of distribution facilities. The communications systems provide the physical medium for transferring, controlling and acquisition of data within SCADA from remote locations. Currently, it is generally recognized that wired communications will serve as the best solution to this problem. Obviously, compared with wired communications, wireless communication presents a number of security and reliability concerns for SCADA system but wireless communications become an attractive option as communication network. In SCADA system the communication system plays a key role and to meet objective of the SCADA system, as a result, various communication media have been applied. In [1], authors are presenting concept about SCADA system using IEEE 802.22 standard where detail design of system, analysis of feasibility and benefits over wired and other wireless systems and scopes to enhance the performance are also

described. ZIGBEE falls in the category of wireless domain like GSM and RF technology. ZIGBEE provides the wireless communication. It means ZIGBEE only reduces the cost and maintenance of the wires used for connections else all the process will be same such as ZIGBEE will provide a particular bit on/off status to the other side due to which same message or data we can get on the other side as wire provides. Thus ZIGBEE replaces the connecting wires and provides a wireless communication. ATMEGA2560 microcontroller is used instead of PLC to understand the various control techniques and capabilities of SCADA software Vijeo Citect v7.2. and implement them in real time. They have studied MODBUS ASCII protocol which is industry standard communication protocol to set up a temperature system which collects real time data, processes it and performs the desired control action. Major contribution was in developing MODBUS library for communication between microcontroller and SCADA and implementing control algorithms on data obtained in real time [2].This paper motivated us to develop a wireless system.Wire based system has also raised numerous problems: the difficulties in locating the particular area affected by the industrial parameter, the complexity in operation of the system, the maintenance issue and so on. They have used cables and bulky equipment which require large amount of space, high degree of the maintenance and are easily detoriated by moisture and excessive heat. Additionally, the Data acquisition and control techniques used. The control of the temperature of a room containing chemicals and toxic gases the existing research has failed to provide a flexible solution for controlling such conditions by connection oriented systems. The control of sensitive industrial parameters by using SCADA-based wireless technology has gained significant industry and academic attention lately for the usability benefits and convenience that it offers users [3].

Pipelines are used to carry the fluid from one place to another place which can be inflammable, hazardous fluids as a result SCADA system was introduced. But traditional SCADA which use wirings are hindrance because of the risk involved. For e.g., wires may catch fire, also accessing remote locations, and flexibility is an issue. So they have used wireless SCADA system aided with ZIGBEE technology to implementing pipelining security. To sense the movement and status (pressure, temp, speed of flow) of the liquid or gas mounted different sensors on the pipe. These are the analog signals which are Output of ADC is given to 89S51 microcontroller. Controlling is done by SCADA system which is powered by VB 6.0. Communication between plant and control room is done by ZIGBEE transmitter and receiver module working at 2.4 GHz [4].

In [5], a low cost microcontroller based SCADA system for monitoring & accessing the performance of remotely situated device by acquiring and controlling the physical parameters such as temperature on a real time basis. Using SCADA software like Lab VIEW along with a low cost microcontroller based data acquisition hardware as DAQ card. The real state monitoring of physical parameters (temperature, solar radiation, humidity, pressure etc.) can be remotely acquired and saved into database files like MS Excel, MS Access etc and can be communicated with other PC situated at remote location.

III. Hardware & Software Components

A. Atmega 2560

The Atmega2560 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the Atmega2560 achieves throughputs approaching 1 MIPS (Millions Instructions Per Second) per MHz allowing the system designer to optimize power consumption versus processing speed [6].

The architecture is more code efficient than conventional CISC microcontrollers. By combining an 8-bit RISC CPU with In-System Self- Programmable Flash on a monolithic chip, the Atmel Atmega2560 is a powerful microcontroller that provides a highly flexible and cost effective solution to many embedded control applications. It has 256K Bytes of In-System Self-Programmable Flash Memory.The ATMEGA2560 Development Board has standardized 20 pin socket for the ZigBee wireless module along with the 3.3V supply for the module. You can connect TXD and RXD pins of the ZigBee module to the any RXD, TXD pins of the microcontroller. It is also possible to connect FT232 USB to serial converter to ZigBee module directly and use it as ZigBee USB wireless module.
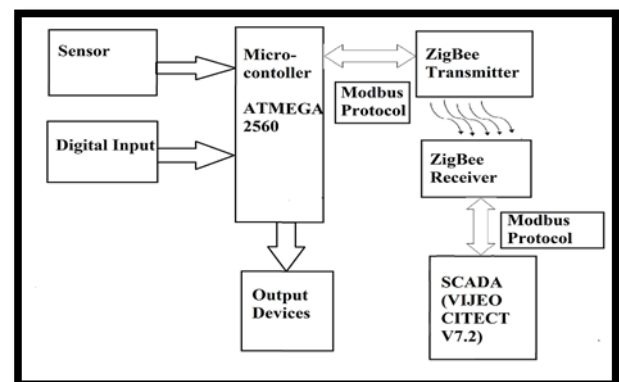
Figure 1: Block Diagram Of The Proposed system

B. ZigBee Module

Wireless networks can be created using a variety of RF protocols.Some protocols are proprietary to individual vendors, and others are industry standards. ZigBee protocol is the industry standard for data transmission, and it is built on 802.15.4 protocol.AsZigBee is an industry standard protocol,it has three main nodes,Co-ordinator,router and end device.Along with this it has two addressing modes,they are,64 bitIEEE address mode and 16 bit Network address mode. ZigBee Transmission occurs in two ways Broadcast mode and the Unicast Mode.To configure ZigBee modules for communication a dedicated software *X-CTU* is used in which setting of the parameters like *Channel ID,PAN ID,Destination Address High,Destination Address Low and Baud rate.* [7]

C. MODBUS Protocol

Modbus protocol supports Master-Slave Technique which is widely used in many control processes such as SCADA systems [8]. This protocol defines a message structure that controllers will recognize and use, regardless of the type of networks over which they communicate. It describes the process a controller uses to request access to another

device, how it will respond to requests from the other devices, and how errors will be detected and reported. It establishes a common format for the layout and contents of message fields [9].

During communications on a Modbus network, the protocol determines how each controller will know its device address, recognize a message addressed to it, determine the kind of action to be taken, and extract any data or other information contained in the message. If a reply is required, the controller will construct the reply message and send it using Modbus protocol [8].
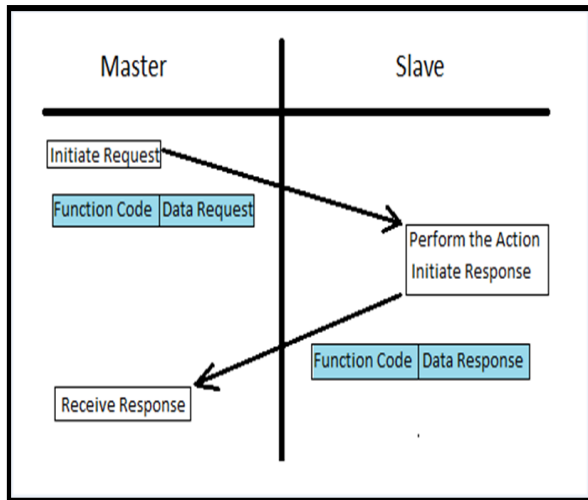
Figure 2 : MODBUS communication concept

1. *Transactions on Modbus Network*

Controllers communicate using a master–slave technique, in which only one device (the master) can initiate transactions (called queries).The other devices (the slaves) respond by supplying the requested data to the master, or by taking the action requested in the query. Typical master devices include host processors and programming panels. Typical slaves include programmable controllers.

The master can address individual slaves, or can initiate a broadcast message to all slaves. Slaves return a message (called a response) to queries that are addressed to them individually
(Refer Figure 3).Responses are not returned to broadcast queries from the master. The Modbus protocol establishes the format for the master's query and slave response
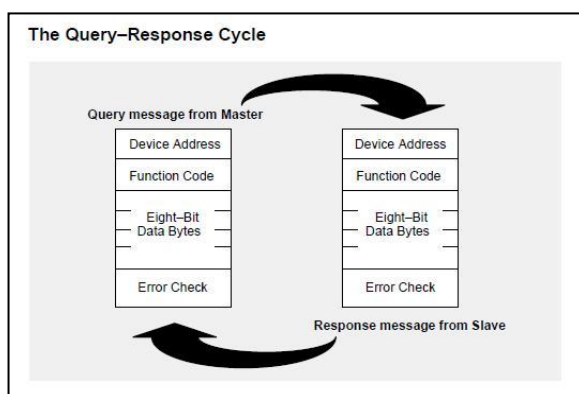
Fig. 3. Query-Response cycle in MODBUS network

2. *Memory*

MODBUS protocol contains mainly two types of functions A) Data and control functions B) Diagnostic functions. In all, there are 24 data & control functions and 17 diagnostic functions.

Memory considerations are important while programming a microcontroller. The microcontroller Atmega 2560 has program memory of 256 kb which is comparatively large. The actual memory required for our system was 8456 bytes i.e. only 3.2% of total memory available in microcontroller. Thus, more functions can be added to the program as per requirement of application, without worrying about memory constraints.

D. *SCADA software (VijeoCitect v7.2)*

Vijeo Citect v7.2 is used for operating and monitoring components [10]. It is the new Process Automation system of Schneider Electric. With its powerful visualization capabilities and operational features, it delivers actionable insight faster, enabling operators to respond quickly to process disturbances and thereby increase their effectiveness.

The graphics, controls, configuration data and programming associated with a Vijeo Citect v7.2 installation is configured and implemented through projects. A project acts as a digital representation of production facility, allowing the entire system to be monitored and controlled in real-time.

Vijeo Citect v7.2 is made up of a several configuration tools and a runtime section [10]. Vijeo Citect v7.2's architecture can be divided into three distinct area of functionality:

➢ Configuration

➢ Runtime

➢ Drivers

Configuration involves the tasks necessary to prepare and build a project, while runtime is the implementation of a project in a live production environment. Drivers enable communication with devices via a number of communication protocols. The driver defines the specific project settings necessary for Vijeo Citect v7.2 to communicate with a particular device.

Vijeo Citect v7.2 can communicate with an array of I/O Devices, including PLCs, loop controllers, and distributed control systems (DCS). Drivers enable communication with devices via a number of communication protocols (including Ethernet, TCP/IP, and Serial). This includes information about:

➢ Boards

➢ Ports

➢ Devices

➢ Tag addressing

The components which can be incorporated in a project are logically divided across the following categories:

➢ Graphics components
➢ Tags
➢ Alarms
➢ System components
➢ Communications components
➢ I/O Server components
➢ Cicode / CitectVBA

Using above components of Vijeo Citect v7.2, a simple system can be built which can be used to demonstrate the interfacing between SCADA and microcontroller system & the automation which can be achieved through it. We have developed such a system using all the above components whose graphic layout is shown below in Figure 4.
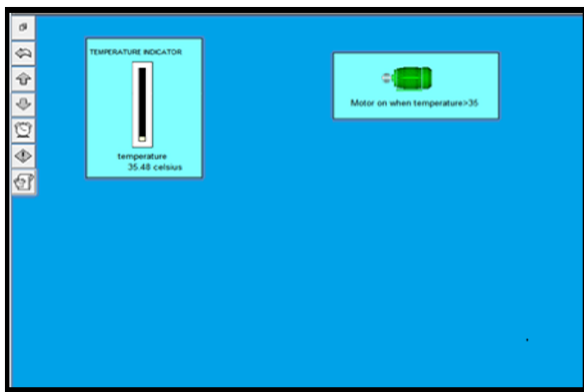
Figure 4: Run Time Data in VijeoCitect v7.2

E. Peripheral

The peripherals of the system consist of all the devices which are interfaced on the hardware boards. We have 3 boards as follows:

1. ATMEGA 2560 Board
2. Peripheral Board
3. Power Supply Board

The Atmega2560 board consists of microcontroller. It contains IC'S that enable communication such as MAX232 which is dual driver/receiver for serial communication and FT232 for USB communication along with a Zigbee Module for Wireless Communication. It also includes 6 pin ISP connector for programming via AVRISP mkII.

Peripheral board contains many hardware components that can be used for digital input, digital output, analog input, analog output. It contains switches, relays, LED"s, an LCD display, Buzzer etc. It also contains IC"s such as-

1) High Current Driver ULN2003 (Relay driver).

2) DAC 0808 (8-Bit D/A Converter) is an 8-bit monolithic digital to analog converter.

3) Analog inputs such as potentiometer. sensor data can be given to ATMEGA 2560 through analog connector. The sensor data must be properly buffered before giving it to the controller. Hence, Quad OP-AMP LM324N is used in the system.

Power supply board includes various components such as transformers, voltage driver ICs etc. that deliver power to various hardware components of the project. Figure 5 shows the Actual Hardware Setup
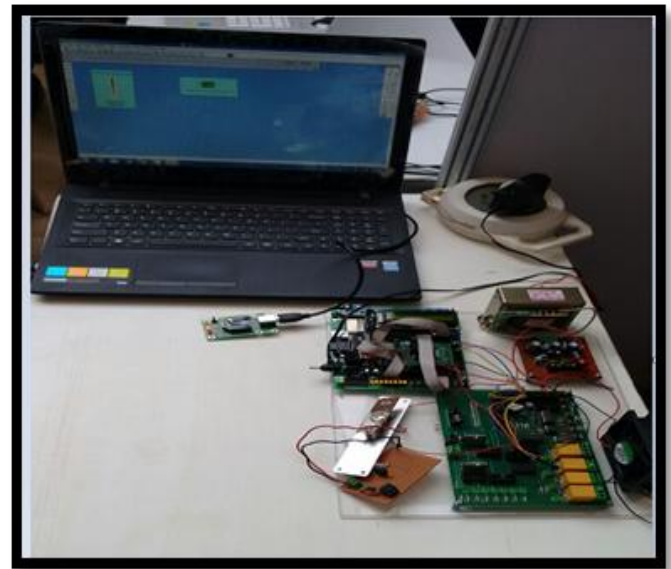
Figure 5: Actual Hardware Setup

IV. Microcontroller Programming

The ATmega2560AVR is supported with a full suite of program and system. The programming is done on AVR Studio which is an integrated development platform (IDP) created by Atmel[6], for developing and debugging Atmel AVR microcontroller based applications.

The microcontroller is programmed so that it receives the MODBUS query frame, defragments it into its components (function code, address etc.), performs the necessary actions, then it forms a response frame to the corresponding MODBUS query. It then notifies the SCADA software about the action taken by sending this response frame. All these actions must be performed in an orderly manner and within a short interval of time. Inherent speed of processing of microcontroller (Up to 16 MIPS Throughput at 16 MHz) ensures that. Also, we have used hardware interrupt & timer interrupt mechanism to ensure faster processing and real-time data acquisition from peripheral devices.

A simple algorithm is followed to make programming easier.

Algorithm

1. Initialize all the Ports, Registers & Counters which are being used.
2. Wait for a character to be received on receive buffer of UART, generate an interrupt upon reception.Inside ISR of UART, Copy the received characters into an array. Also calculate slave id, function code etc.
3. Convert the received ASCII array into a HEX array for processing.

4. Calculate LRC of the received Query.Compare the calculated LRC with the received Query's LRC. If it does not match with received LRC, do nothing and proceed to next step.
5. Otherwise do all the processing for the MODBUS function code received. Create an array of ASCII characters formed after collecting appropriate data from peripheral.
6. Depending upon whether the temperature is less than or greater than the reference value, controller will turn On or turn Off the Fan.

V. Communication Between Scada And Microcontroller

As we are familiar with the algorithm to program the microcontroller it is important to understand how the communication between SCADA software & microcontroller takes place. To establish communication, SCADA software will send a handshaking signal to microcontroller in MODBUS ASCII format.

Communication starts when microcontroller responds to this signal. The query format for the handshaking signal is shown in Table 1. Microcontroller should echo back the received frame as response.

Once handshaking is achieved, further communication takes place. According to the system developed on SCADA, further queries will be sent whose format will be similar to the one given above. The microcontroller should respond to these queries in MODBUS ASCII format.

The MODBUS functions used in this paper are listed in Table 2 and Table 3.

Code	Name
01	Read Input Status
04	Read Input Registers

Table 1: Data and Control Functions

The MODBUS functions used in this paper are listed in Table 2 and Table 3.

START	ADDRESS Slave ID	FUNCTION Code	DATA				LRC CHECK
			Starting Address		No. of Points		
			Hi	Low	Hi	Low	
:	01	02	00	00	00	10	ED

Table 2: Read Input Status Query for Handshaking Signal

START	ADDRESS Slave ID	FUNCTION Code	DATA				LRC CHECK
			Starting Address		No. of Points		
			Hi	Low	Hi	Low	
:	01	04	00	00	00	04	FA

Table 3: Read Input Register Query for Temperature Data

VI. Results

All monitoring and controlling actions in the system are governed by SCADA software and microcontroller respectively. SCADA software continuously communicates with microcontroller via MODBUS protocol in the wireless manner.

The SCADA software Vijeo Citect V7.2 has powerful features llike plotting run time data on a graph. Figure 5 shows graphical representation of real time changes taking place in temperature. Initially, the temperature is constant. A temperature disturbance is introduced by turning on external heat source, due to which temperature starts rising. It shows the results for about 15 minutes.The pen1(Black color) waveform shows the temperature data.A limit on temperature is set at 35 degree celcius, above which controller starts taking corrective action.
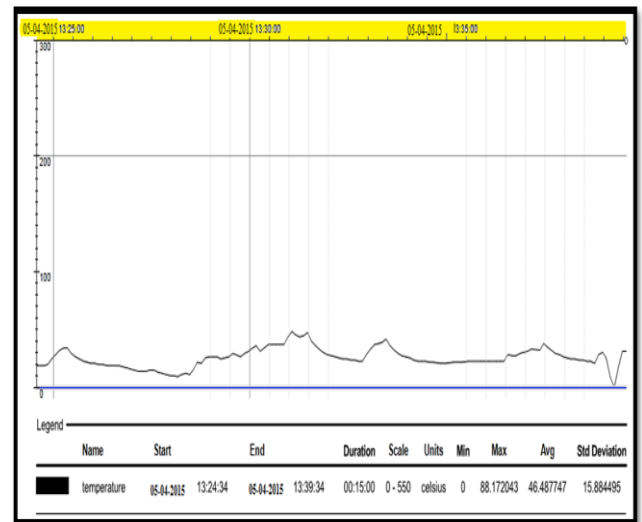
Fig. 6. Real Time Temperature Data on Vijeo Citect V7.2

VII. Conclusion

This paper presents a microcontroller based wireless low cost automation system using Industry standard SCADA software(Vijeo Citect v7.2) and microcontroller (Atmega2560). To facilitate communication between the two, we have used MODBUS protocol, which is industry standard protocol. For wireless communication zigBee modules are used. To demonstrate the functions of the system a temperature control system has been set up. This system senses the real time temperature data, compares it with the set point and takes a corrective action based on ON/OFF or proportional control law to achieve the desired set point. Results obtained reveal that the microcontroller

has been successfully programmed to receive a Modbus frame, process it, and give an appropriate response. We have managed to reply to a Modbus query in a proper format using microcontroller.

The microcontroller used in this project, Atmega2560 is one of the most powerful microcontrollers around. Thus, we have successfully integrated microcontroller, SCADA, ZigBee and MODBUS protocol to build a general purpose system which can be easily modified to suit our needs.

VII. Future Scope

The system presented in this paper integrates microcontroller based control system with industry standard SCADA. Scalability is the biggest advantage of the system described in this paper. However, To verify the feasibility of the idea at development stage a general purpose system which supports limited number of analog and digital I/Os has been built up. This can be easily extended to a variety of analog and digital inputs. By making minor changes in hardware & software we can easily expand the I/O capability which could satisfy the requirement of a small plant.

Real time temperature control is implemented with simple control laws as ON/OFF and proportional control. This can be further extended to more complex control including multivariable control.

In the current system, MODBUS library is built with certain data and control MODBUS functions for limited number of I/O‟ s provided in the hardware (Refer Table I). This can be easily extended to include Diagnostic functions to implement entire MODBUS protocol. Depending on application, more functions can be easily incorporated in the system by programming the microcontroller to understand the function specific query & to give its appropriate response. Also, using powerful SCADA software provides an inherent flexibility as it is built to handle large scale data & processes.

The interfacing between microcontroller and SCADA is done wirelessly .It can be extended for variety of applications in process and control industries. The future extension plan for the project is to develop a Wireless SCADA system which could be used to monitor leakages in water pipelines.

VIII. Acknowledgment

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Firing Angle Control of Dual Converter using DSPIC 30F 6012A for Speed Control of DC Motor

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ABSTRACT

The speed control of DC motor is very crucial in application where high precision is required. To implement complex control algorithm to control the speed of motor requires precise control, we need to use a controller that has high accuracy and linearity. In this paper we show the relationship between firing angle of converters (positive group and negative group) of dual converter and the speed achieved by the motor. Firing angle is generated to trigger thyristor using processor DSPIC 30F 6012A.PID control algorithm has been used to control motor speed. Relationship between firing angle and speed of motor was found to be linear in nature in both the cases, i.e., for positive converter group and negative converter group.

Keywords : DSPIC 30F 6012A, dual converter, speed control, dc motor, non-circulating current

1. Introduction

The electric drive system is used in many industrial applications, robotics and home appliances because of their low cost, less complex control structure and wide range of speed and torque which requires high performance, reliability, and variable speed due to its ease of controllability. The speed control of DC motor is very crucial in application where precision and protection are of essence. Purpose of a motor speed controller is to take a signal representing the required speed and to drive a motor at that speed under different load conditions

DC motors are widely used in industry. There are many methods of speed control of dc motor drive namely field weakening, voltage control, current control and torque methods [1]. In DC motor control, Armature voltage control method is widely used in industry to control the speed of DC motor. [2]

Mainly traditional DC drives are used in operation for speed control with forward and reverse operation. The reversal of current and speed through the dc motor is provided by dual converter [3].

2. Dual Converter and Control:

A single-phase converter operates only in two quadrants and can provide unidirectional torque with reversible rotation. To reverse speed and torque both voltage as well as current should be reversed. This can be achieved with reversing switch along with full converter thyristor switches (separate triggering circuits required). A dual converter provides the easiest way to speed reversal of a dc motor Figure 1 shows the Equivalent Circuit of Dual Converter.[4]
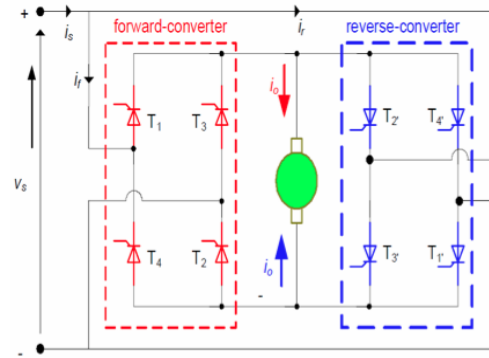
Fig 1: Circuit diagram of Dual converter

Dual converter consists of two fully controlled converter (one positive group converter and other negative group converter) connected back-to-back .One converter acts as a rectifier and other converter acts as inverter. In Dual Converter both the voltage and current can be reversed at dc terminal. There are two operating modes, Non-circulating current control and Circulating current control. In this work we have used the Non Circulating Current Mode. In this mode of operation, Only one converter is operated at a time. When converter 1 is ON, $0 < \alpha_1 < 90^0$, V_d is positive and I_d is positive. Voltage across converter 1 is given by [5].

$$V_1 = \frac{v_m}{\pi}(\cos\alpha_1 - \cos\beta_1)$$

where α_1 *is firing angle* and β_1 is conduction angle of a thyristor. When converter 2 is ON, $0 < \alpha_2 < 90^0$, V_d is negative and I_d is negative. Voltage across converter 2 is given by

$$V_1 = \frac{v_m}{\pi}(\cos\alpha_2 - \cos\beta_2)$$

where, α_2 *is firing angle* and β_2 is conduction angle. The DC motor speed reversal is achieved as follows, For Forward Motoring operation, Converter1works as a rectifier, while pulses to converter 2 are removed. For Braking and speed reversal, Converter 1 is first operated as inverter and when Armature current reduces to zero, 2-10 msec delay is provided to ensure turn off of thyristors in converter, Firing pulses withdrawn and transferred to converter 2. Initially firing angle for converter 2 is high. It is adjusted to brake the motor at maximum allowable current from initial speed to zero speed. Then motor is accelerated to desired speed in reverse direction.

3. Block Diagram

Block Diagram of the control scheme is shown in Figure 2. When we enter the speed using key pad , Initially dsp will give pulses to run motor at 25 rpm, when motor reaches speed of 25 rpm again dsp will generate firing pulses to increase motor speed to 50 rpm i.e. speed of motor will be increased in the steps of 25 rpm and so on ,and within seconds motor will start running at its set speed.

Speed of motor is sensed by optical sensor, which gives an output voltage of +5v when light is blocked, and about 0.5v when light is allowed to pass through the transparent part of the disc. Optical encoder gives series of pulses with a frequency proportional to the motor speed. The frequency of the output waveform is given by,[6]

This frequency is converted into voltage using frequency to voltage converter. This output of optical sensor is subtracted from the set point to produce error. The error is used in PID algorithm to generate the controller output. This digital output is then converted to analog using digital to analog converter and that analog value after amplification is given to ramp generation circuit, output of ramp generation circuit is saw tooth wave which when given to 555 timer in monostable mode produces series of pulses. A pulse transformer is used to give these pulses to trigger the SCR. The frequency of triggering pulses will change according to increase or decrease in error voltage. If the error is positive that means speed is more than the set speed, then the processer will reduce the digital value which was given to DAC by 25. This causes reduction in DAC output and if error voltage is negative that means speed of motor is less than set speed, in this case DSP will increase the digital value by 25, which increases the DAC output.
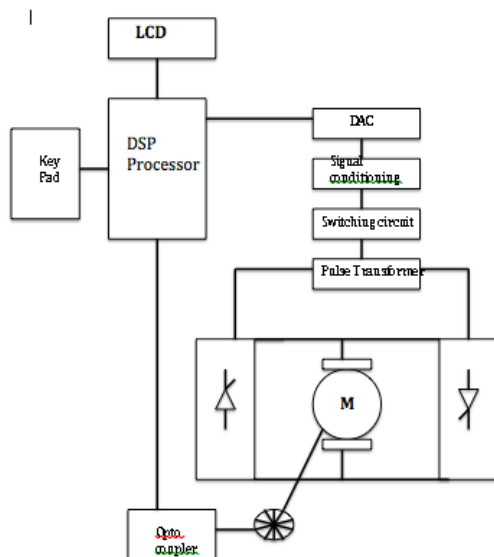
Fig 2 : Block Diagram

In this method output is increased by proportional amount to try and restore the speed. However as the motor speed recovers, the error reduces and motor speed is maintained. In this closed loop system Speed of motor

is controlled using a PID controller implemented using DSP processor in this work.

Fig 3: Implemented Circuit Diagram

4 DSP (DSPIC 30F 6012A)

DSP processor (DSPIC 30F 6012A) is used which consists of 40 bit wide accumulator with CPU speed 30 MIPS, it is 16 bit fixed processor this means it does not directly deals with real no, but uses modified form of integers for all calculations ,44 K byte flash memory for executing user code ,Inter integrated circuit (I^2C) to provide complete hardware support for both slave and master modes and it also allows bidirectional transfer between these two. Universal Asynchronous Receiver transmitter module (UART) for full duplex transmission, Controller area network (CAN) module is a serial interface useful for communicating with other microcontroller device, A to D converter allows conversion of an analog input to 12 bit digital no .

5. Flow chart of control scheme
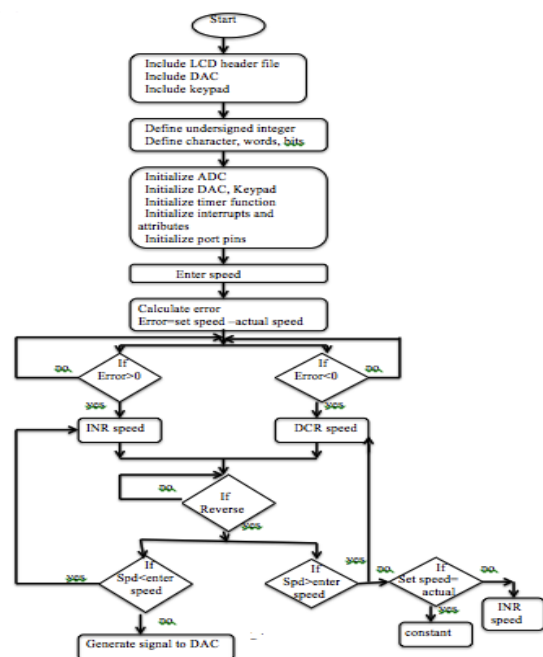
Fig 4: Flow Chart

5. RESULTS AND CONCLUSION

Experiments were carried out for different speed settings, to find the relationship between voltage and speed and also to observe the effect on firing angle. Then data collection was done at each speed of dc motor

Theoretical formula for firing angle calculation is given below.

V =Vm/π (cosα – cos β) where
V_m=peak voltage of voltage supply of thyristor
α = firing angle of thyristor
β = conduction angle of thyristor
firing angle value was estimated by using waveform fig 8

Sr no	Positive converter			Negative converter		
	Speed (rpm)	Voltage(v)	Firing angle (degrees) estimated	Speed (rpm)	Voltage(v)	Firing angle (degrees) estimated
1	100	2.25	90	100	-2.30	70
2	200	3.10	75	200	-3.00	65
3	300	5.11	60	300	-4.90	60
4	400	7.90	55	400	-6.00	50
5	500	9.1	40	500	-8.1	40
6	600	9.7	30	600	-9.2	30
7	700	10.2	30	700	-10.2	25

Table 1: relationship of firing angle and speed of motor

We measured the firing angle generated by DSP at different speed and observed that change in voltage was linear ,then we plotted the graph (graph 1 and graph 2)and found linear relationship between speed and firing angle for both positive and negative group of converters.
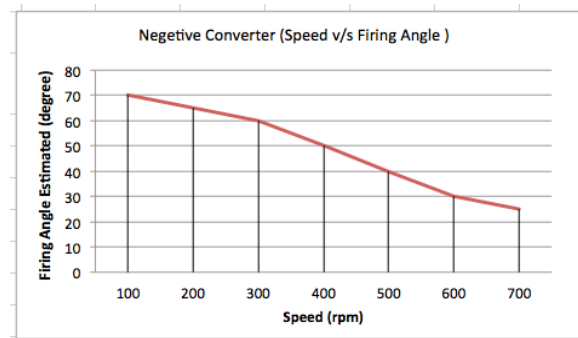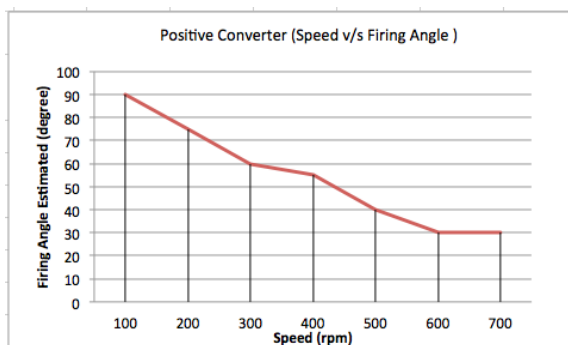
Graph: showing relationship between speed and firing angle generated by DSP

6.2 DC motor speed control Waveforms
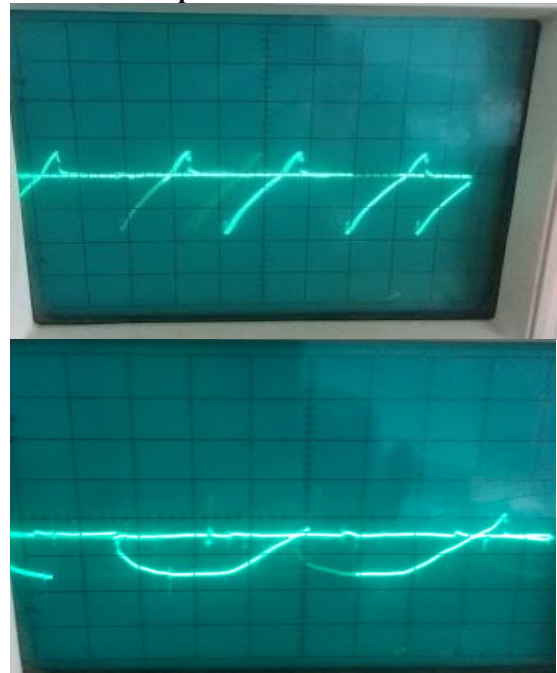
(a) Motor speed 200rpm

(b) Motor speed 700rpm

Fig 5 (a & b)- Load voltage waveform observed at negative converter
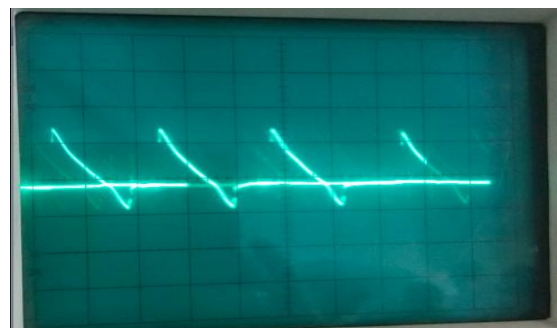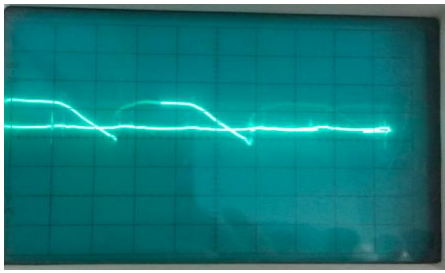
(a)Motor speed 200rpm
(b)Motor speed 700rpm
Fig 6(a & b) :Load voltage waveform observed at positive converter

(a)(scr1&3conducting) (b)(SCR 2&4conducting)
in positive half cycle
in negative half cycle
Fig 7 (a & b): triggering pulses generated by DSP and observed across for SCR (1 & 3 which was conducting in positive half cycle) and SCR (2 & 4 which was conducting in negative half cycle) when motor was running at a speed of 200rpm
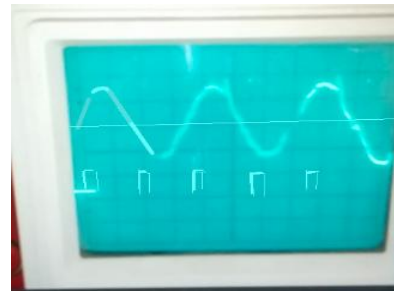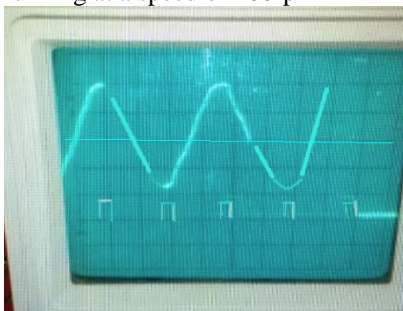
(a) motor speed 200rpm((α = 90 deg)
(b) motor speed 700 rpm(α = 30 deg)
 Fig 8: Waveform showing supply voltage and triggering pulses**.** waveforms in fig 8 shows the synchronization of supply voltage and triggering pulses and we can see that at low speed firing angle is high (table 2) and at high speed firing angle is less (table 2) and this is to maintain the dc voltage across the load.

6.3 FUTURE SCOPE:

 In this project we are using optical encoder to sense the speed of DC motor. In future we can connect current sensor in cascade with motor which can sense even very small change in current and will be able to control speed of motor more precisely. Current sensors can increase stability of the system also.

6.4 CONCLUSION The speed control of DC Motor was achieved successfully, Motor was rotated in both the directions .The DSP 30f 6012a was programmed to achieve firing pulses to trigger SCR in dual converter .Performance was fast at low speed also because of DSP processor. Speed of dc motor was observed to be constant at and below the reference speed. Relationship between motor speed and firing pulses generated by DSP was also found to be Linear.

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SMS Based Wireless Access Device With Enhanced Security

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ABSTRACT

This paper proposes and implements a low cost security system device using GPS and GPRS. The system reads the current position of the user using GPS and the address is sent via the GSM network. A mobile application is developed using J2ME. The current available software products in the market like VithU[1], only sends the messages to the respective numbers. But in the worst case scenario, it is not possible to open that application and send messages. This application is not feasible in the worst case scenario.

In our proposed system we are providing the new features like connecting hardware belt with software which tracks the location using GPS[2]-[4]. This system sends the messages to the nearest police station and predefined numbers by pressing the single key placed on the hardware belt.

Index Terms : GPS, Microcontroller, Bluetooth Modem

I. INTRODUCTION

Now a days there are number of facilities which provides a security for individuals, but on our research we concluded that these are not enough secure applications. The rate of women rape, child kidnapping in many countries are increasing at a higher rate [5]. Self-defense and self-protection are an important priority for individuals. The objective of this system is to provide more security to an individual using single key placed on hardware. Global Positioning System (GPS) is a 24-hour world-wide service. It provides accurate, three-dimensional information of the location as well as precision velocities and timing services. The service is free of cost to everybody. Google Map is used for mapping the location. Using this feature we track the user's current location and send the fetched information to the predefined numbers using GSM service. GSM/GPRS is one of the best possible communication media for the present and the future.

II. SYSTEM OVERVIEW

User starts the mobile software and enter a predefined password to start the device .The mobile will start sending ping command to microcontroller after starting Bluetooth and wait for response. The microcontroller will response to each ping query to ensure the connectivity between Bluetooth modem and mobile. The microcontroller also keeps on monitoring the mobile's Bluetooth for its continuity and also monitors the key. When key is pressed, the signal sends to the mobile and mobile will fetch the current GPS location and will send this information to the predefined numbers using SMS method.

III. PROCESS FLOW DESCRIPTION

- Initialization sequence algorithm:

1. Start the mobile software and enter a predefined username and password to start the device.
2. The mobile will start and it will start sending ping command to microcontroller using Bluetooth and wait for response of the mobile device to start communication.
3. The microcontroller will response to each ping query to ensure the connectivity between Bluetooth modem and mobile.
4. The microcontroller also keeps on monitoring the mobile Bluetooth for its connectivity and also monitores the key.
5. When the key is pressed, the signal sends to the mobile. and mobile will fetch the current GPS location and will send this information to the predefined numbers using SMS .

- Operational sequence algorithm:

1. If user press the key then goto step 4 else monitor the key press.
2. If user's belt loop is disconnected then goto step 4
3. If bluetooth connection get disconnected then goto step 4 else monitor the bluetooth.
4. GPS will fetch the current location of user. Using Longitude and Latitude, create SMS Packet including address and send it to the predefined numbers [6].

IV. HARDWARE SPECIFICATION

The single board module designed here consists of the microcontroller, Bluetooth modem, Battery, Key. The block diagram of the system is as shown in the Figure 1.

The 20 pin 8051 Microcontroller [7] used has high performance & low power consumption device. Logic functions allows microcontroller to mimic sophisticated electronics circuits. Microcontroller program will help to make decision and perform functions based on situations and events. The RN-42 Bluetooth modem has Low power sleep mode, perfect for short range (its range is about 10 to 100 meter).It can be used for fast data communication with the mobile device. 8051 microcontroller and Bluetooth modem require power supply 5V and 3.3V respectively. This hardware device is placed on a belt with a conducting loop.

Start

Initialize all system variables

Inialize all components

Monitor the mobile Bluetooth

Monitor the key press

If trigger — No
If Belt disconnected — No
If BT disconnected — No

Yes

Send command to the mobile via Bluetooth

Create SMS packet

Add GPS location

Send SMS to predefined numbers

Stop
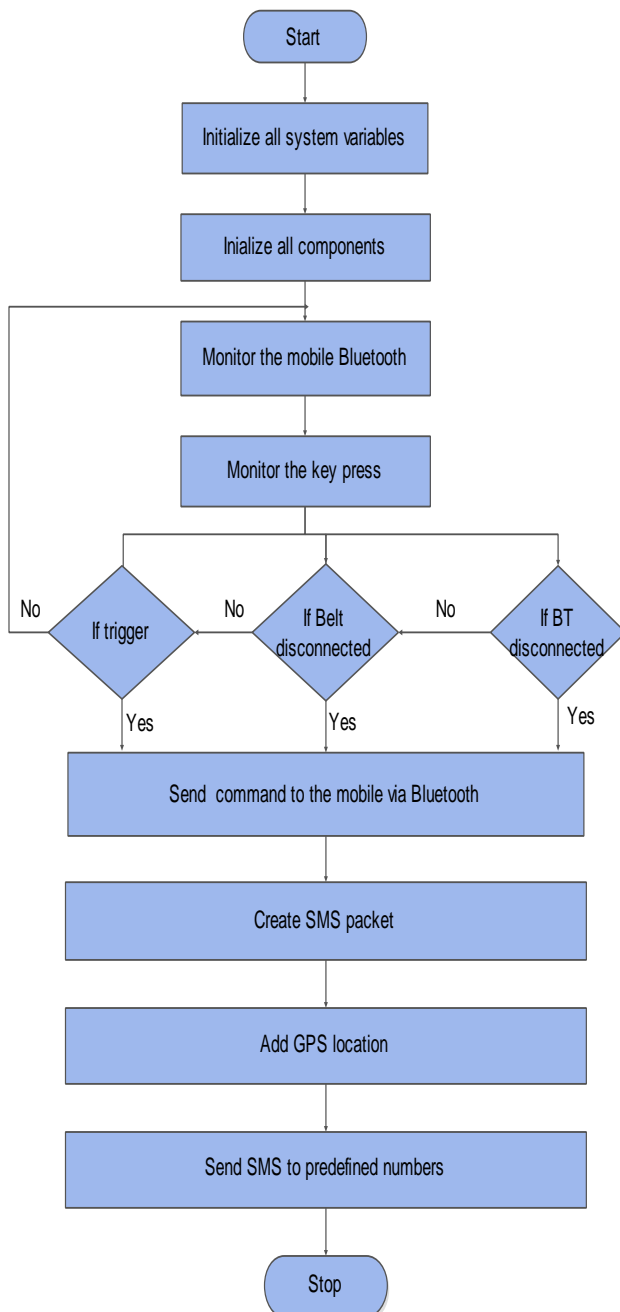
Fig.1. System Flow Diagram
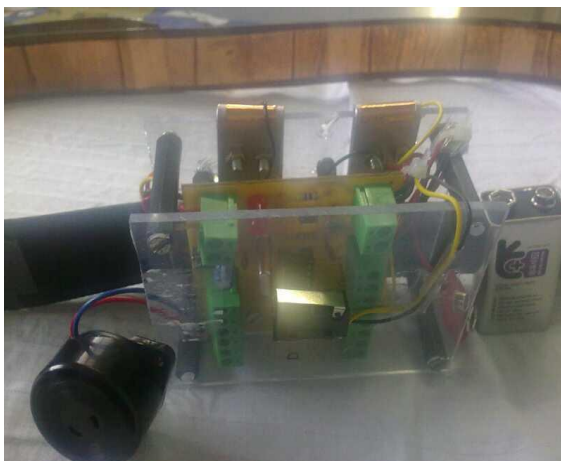
Fig. 2. Image of the circuit

When user wants to unlock the belt on its own, he/she has to enter the password which is set by the user. To start the device, enter the predefined password on the mobile software. The microcontroller keeps on monitoring the mobile bluetooth for its connectivity and also monitors the key.

V. SOFTWARE SPECIFICATION

A mobile application is developed using J2ME. Java Platform, Micro Edition, or Java ME, is a Java platform designed for embedded systems (mobile devices are one kind of such systems). Target devices range from industrial controls to mobile phones (especially feature phones) and set-top boxes. Java ME was formerly known as Java 2 Platform, Micro Edition (J2ME).

Java ME devices implement a profile. The most common of these are the Mobile Information Device Profile aimed at mobile devices, such as cell phones, and the Personal Profile aimed at consumer products and embedded devices like set-top boxes and PDAs. Profiles are subsets of configurations, of which there are currently two: the Connected Limited Device Configuration (CLDC) and the Connected Device Configuration (CDC) [8].

The Connected Limited Device Configuration (CLDC) contains a strict subset of the Java-class libraries, and is the minimum amount needed for a Java virtual machine to operate. CLDC is basically used for classifying myriad devices into a fixed configuration.

A configuration provides the most basic set of libraries and virtual-machine features that must be present in each implementation of a J2ME environment. When coupled with one or more profiles, the Connected Limited Device Configuration gives developers a solid Java platform for creating applications for consumer and embedded devices. The configuration is designed for devices with 160KB to 512KB total memory, which has a minimum of 160KB of ROM and 32KB of RAM available for the Java platform.

Designed for mobile phones, the Mobile Information Device Profile includes a GUI, and a data storage API, and MIDP 2.0 includes a basic 2D gaming API. Applications written for this profile are called MIDlets. Almost all new cell phones come with a MIDP implementation, and it is now the de facto standard for downloadable cell phone games. However, many cell phones can run only those MIDlets that have been approved by the carrier [9]

In our mobile to start the application user has to enter predefined password. The application will start and it will start sending ping command to microcontroller using Bluetooth and wait for response of the mobile device to start communication.
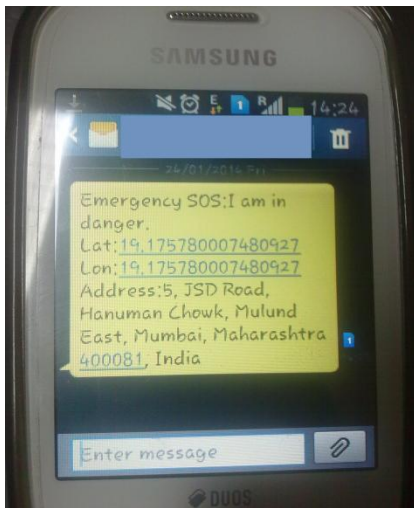
Fig 3.Example of received SMS

The microcontroller will response to each ping query to ensure the connectivity between Bluetooth modem and mobile. The microcontroller also keeps on monitoring the mobile bluetooth for its connectivity and also monitores the key. When the key is pressed, the signal sends to the mobile. and mobile will fetch the current GPS location and will send this information to the predefined numbers using SMS. The received message will be looked like shown in above fig 3.

The interface of our application is look like a following. The Connect BT button is use for connecting the Bluetooth modem with the mobile Bluetooth. There are some predefined mobile number on which we want to send alert message. By pressing the SOS button also, the message will be sent to the predefined numbers. To activate and deactivate the application or the whole system user has to enter a predefined password and can activate or deactivate the application. After activating the application the GPS will fetch the current LOG and LAT of that area and according to that the address will be fetched.
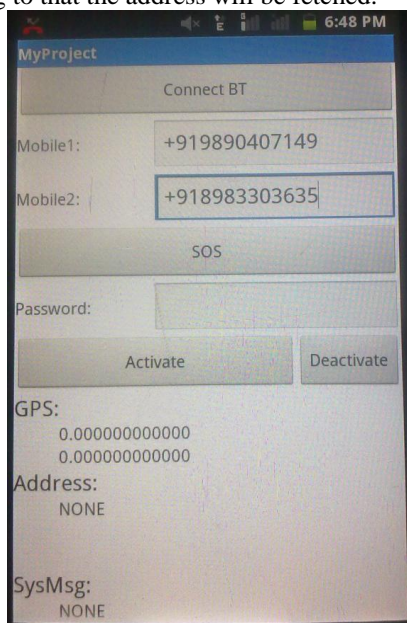
Fig.4. Interface of mobile application

VI. CONCLUSION

Till date, technology was used for the ease of humans. But being the need of the hour, now it's time for using it for the sake of safety also. The idea of protection belt is just an example of that. This is a perfect device which will prevent every individual from becoming a victim of any kind of assault.

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Performance Evaluation of Wireless Sensor Networks using a Generic Markov based Re-Routing Technique

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ABSTRACT

Establishing a route from the source to the destination is a challenging aspect in the design of wireless sensor networks (WSN). Re-routing is the process of selecting the best alternate route after the failure of the existing route. Minimal packet loss is expected during the process of re-routing in the resource constrained environment of WSNs. This paper proposes a generic re-routing technique, with a guaranteed improvement in the packet delivery ratio and latency of the route. The proposed re-routing technique is validated using a discrete time Markov chain. Regression analysis is employed to estimate the quantitative effect of the number of nodes between the source and the destination and the improved packet delivery ratio on the average energy consumption of the network. The paper presents analytical and simulation results showing the benefits of implementing the proposed re-routing technique and discusses the consequent improvement in the performance of the network.

1. Introduction

The process of routing establishes the path between the source and the destination. Most of the existing energy efficient routing protocols forward the packets through the minimum energy cost based optimal route to the destination to minimize energy consumption [1, 2, 3, 4]. One of the major reasons for route break-up is depletion of node energy. The death of a node in a routing path breaks the link and the connection between the source and the destination is severed [5,6]. This necessitates re-routing to complete the data transmission task. Therefore a routing protocol must be able to dynamically update the status of its links and re-configure itself in order to maintain strong connectivity to support communication among the nodes. A survey of a number of routing protocols [7,8,9,10,11] has shown that re-routing is initiated only after the termination of an existing link between the nodes in a route.

It is observed that when a link breaks, some packets may be dropped and hence loss of information occurs. Re-transmission of data on discovery of a new route leads to an increase in the energy consumption. It is of utmost importance to carry out the re-routing procedure ensuring that energy efficiency is maintained and packet loss is minimized. Although the node battery energy has been previously exploited in routing protocols, there is a need to explore its efficient usage in re-routing techniques [12, 13, 14,15].

We have made an attempt to discern the relationship between the average network energy consumption, packet delivery ratio and the number of nodes between the source and the destination using regression analysis. Existing work based on regression analysis primarily focuses on routing reliability and path loss estimation [16,17]. The paper is organized as follows. Section 2 introduces the Markov based re-routing technique. Section 3 validates the proposed Markov re-routing technique. Section 4 focuses on the regression analysis carried out to justify the correctness of the proposed technique. Finally section 5 concludes and discusses future scope of work.

2. The Markov Re-Routing Technique

2.1. The Re-routing Principle

We propose a Markov based re-routing technique based on node battery energy to reduce the packet loss during the process of re-routing and hence enable for successful dynamic re-routing. As the technique proposed is generic, it can be implemented for any routing protocol to improve its performance metrics.

The node battery capacity is defined at three levels as Full capacity (E_{Full}), Threshold 1 (E_{T1}) and Threshold 2 (E_{T2}) (Figure 1). Threshold 1 (E_{T1}) defines the percentage residual energy level below which a node is unable to transmit or receive packets. It can be said that a node is dead when the residual energy falls below threshold 1. Threshold 2 (E_{T2}) defines the percentage residual energy level at which a node can perform a pre-defined number of transmissions and receptions before reaching threshold 1.
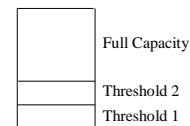
Figure1 : Node Battery Energy Levels

We define two new terms.

Re-routing time T_R: The time required by the previous node in a route to execute the re-routing process and establish a new route to the destination node.

Critical energy E_C: The energy required by a node to successfully execute packet transmission and reception till a new route is discovered and established.

$$E_C = E_{T2} - E_{T1}$$
$$= E_{TX} * \text{Number of packets transmitted}$$
$$+ E_{RX} * \text{Number of packets received.}$$

$$...(1)$$

Where,

E_{TX} is the transmit energy of a node

E_{RX} is the receive energy of a node

During the re-routing process, node continues to transmit the packets present in its buffer. The critical energy E_C is used for these packet transmissions. At the same time, a delay is given to the packets present in the previous node buffer. This delay is intentionally introduced to prevent packets being dropped due to impending route breakage or non-availability of route. The delay should be greater than the re-routing time T_R to avoid packet loss. Packets queue up in the previous node buffer for the given delay and will be forwarded through the newly discovered route.

The proposed modified routing protocol is executed in two stages.

Stage I: Node battery energy monitoring
I. Define node battery energy threshold levels.
II. Real time monitoring of node battery energy.
III. Comparing node battery energy with pre-defined threshold levels.
Iς. Informing the node battery status to the neighboring nodes in the route.

Stage II: Dynamic re-routing
On verifying impending battery failure status, initiate re-routing procedure.

- Discovery of new route to destination by the previous node in the route.
- Simultaneous successful completion of the existing packets transmission by the soon-to-die node.
- Forwarding of incoming packets through the newly discovered route.

The proposed re-routing technique being generic in nature, it can be incorporated in any existing routing protocol. New route discovery process is executed as per the existing routing protocols.

2.2. Mathematical Modeling

We have represented the path between the source node and the destination node as an N-element discrete time Markov chain (DTMC). A DTMC is a Markov process $X = \{X_n, n \geq 0\}$ having a countable number of states S_i. A Markov chain is specified in terms of its state probabilities $P(X_{n+1} = j \mid X_n = i)$ for all i, j Є S and $n \geq 0$. Let every node in the path from the source node to the destination node represent a state of the DTMC. We assume that the property of interest is over states satisfying the Markov property, and that every node of the WSN is independent and identical.

We have defined the WSN as a 2-tuple system (S,K), s Є S, k Є K. Let s Є S = {0,1} denote a binary value that indicates whether the system follows the initial path or the re-routed path from source to destination. Let s=1 represent the initial path and s=0 represent the re-routed path. Let k Є K = {0, 1, 2, …, N} denote the number of active nodes in a route. Let (1, N) be the source node and

(1, 0) be the destination node. Then (1, N-1) to (1, 1) represents the N-1 intermediate relay nodes. Nodes (0, N-1) to (0, 1) represent the nodes in the re-routed path. The Markov model can be extended to represent a multi-path system. However for simplicity of implementation we have restricted ourselves to one re-routed path. Let an active node make a transition to a dead state (D) when the residual energy of the node battery falls below threshold 1. The destination node state (1, 0) and the dead state (D) are absorbing states. An absorbing state is a state from which there is zero probability of exiting. Hence a routing system can be said to be analogous to an absorbing Markov system that contains at least one absorbing state, and is such that it is possible to get from each non absorbing state to some absorbing state in one or more steps. We use the stationarity assumption that the "State transition probabilities are independent of the actual time at which transitions take place".

Let P be the probability of successful transmission of a packet to an intermediate node in the path from source to destination. By virtue of the analogy between a routing system and a DTMC, the transition probability from state N to state N-1 can then be said to be $e^{(-P)}$. We define the *re-routing factor* c.

$$c = c_b * c_n \quad ……..(2) \text{ where}$$

c : Probability that the active node gets discharged below the threshold level and is replaced by a neighboring active node during the process of re-routing.
c_b : Probability of accurately detecting the node battery threshold levels
c_n : Probability of active nodes as neighbors
The state transition diagram representing the routing process is depicted in Figure 2. Since re-routing is initiated after a node in the path is dead, the probability of selecting an alternative path will be $[1-e^{(-P(1-c))}]$. We are interested in studying the effect of re-routing on packet delivery. Hence let a node in the newly discovered path forward the packet to the next node in the path with the same initial probability $e^{(-P)}$. Thus a node in the initial path will transition to the D-state with a probability $Q = e^{(-P(1-c))-\exp(-P)}$. A node in the newly discovered path will transition to the D-state with a probability $[1-e^{(-P)}]$.
In the proposed Markov re-routing technique using the node battery energy monitoring technique, re-routing is initiated prior to the failure of a node in the route from source to destination. Hence the probability of selecting an alternative path is $[1- e^{(-Pc)}]$. In this case a node in the initial path will transition to the D-state with a probability $Q' = [e^{(-Pc)} - e^{(-P)}]$.
The transition probability matrix Q is constructed for both the routing and re-routing processes. Each non-zero block corresponds to the transition probability among states. A Markov chain that has 'r' absorbing states and 't' transition states can be expressed in the canonical form.

$$\begin{bmatrix} Q & P\frac{R}{I} \\ 0 & I \end{bmatrix} \quad ….(3)$$

where matrix [Q] represents the transition probabilities between the transient states. Matrix [R] represents the transition probabilities from the non-absorbing states to the absorbing states [18]. The initial path from source node to destination node contains N+1 nodes and the re-routed path contains N-1 nodes. Hence the transition probability matrix [Q] is a (2N-1) x (2N-1) matrix.

The computation of absorbing state probabilities requires the determination of the fundamental matrix N $= [I-Q]^{-1}$. The product of fundamental matrix N and the absorbing matrix R gives the probability of eventually moving from each non-absorbing state to each absorbing state. Multiplying any vector of the initial non-absorbing state probabilities by NR gives the vector of probabilities for the process to eventually reach each of the absorbing states. The absorbing probability from state (1,N) to state (1,0) can be correlated to the probability of packets reaching the destination node from source node.

Figure 2. State Transition Diagram for Re-Routing Process

3. Validation Of the Markov based Re-Routing Technique

3.1. Mathematical Validation

The probability of being absorbed in state (1,0) has been calculated using Matlab for a varying hop count between the source node and the destination node. We have assumed the probability P of successful transmission of a packet to an intermediate node as 0.7 and the re-routing factor c is also assumed to be equal to 0.7 [19]. It is assumed that 1000 packets are transmitted by the source node in a burst. IEEE 802.15.4 protocol is considered for wireless communication. The source and destination are considered to be separated by 100 m. Packet delivery ratio (PDR) is calculated for both existing routing techniques and the proposed re-routing technique. The increase in packets reaching from source node to destination node (PDR) on implementing the proposed Markov based re-routing technique for varying hop count (N) is depicted in Figure 3.
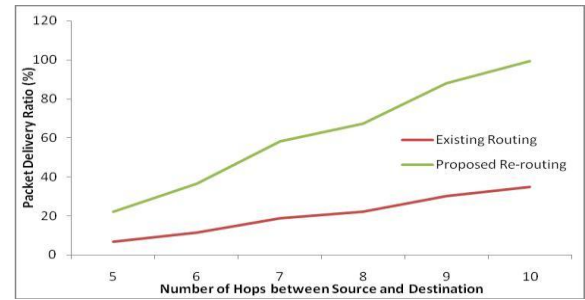
Figure 3. Packet Delivery Ratio

Results show an appreciable improvement in the absorption probability when re-routing is initiated prior to the failure of a node in the path from source to destination. Percentage increase in packets reaching from source node to destination node on implementation of proposed re-routing technique is significant. This supports our proposition that initiation of re-routing prior to node failure, based on node battery energy monitoring appreciably increases the number of packets delivered to the destination node.
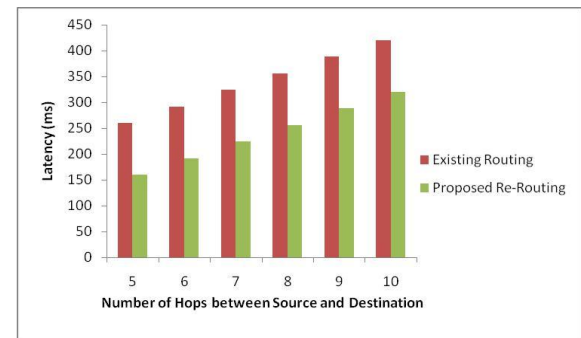
Figure 4. Latency

4. Regression Analysis of the Markov based Re-routing Technique

Regression analysis is a statistical tool for the investigation of relationships between variables. Regression analysis generates an equation to describe the statistical relationship between one or more predictor variables and response variables. The functional equation is of the form

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots + \epsilon \quad …..(4)$$

Y is the dependent variable and X_i (i = 1 to n) are the independent explanatory variables. β_i (i=1 to n) represents the regression coefficients. They represent the strength and type of relationship the independent variables have with the dependent variable. β_0 is the regression intercept. It represents the expected value for the dependent variable if all the independent variables are zero. ϵ, the random error term, represents the unexplained portion in the regression equation. Based on the data obtained from simulation incorporating the re-routing technique, a multiple regression model is formulated. A functional relationship between average network energy consumption (E), packet delivery ratio

(P) and the number of nodes (N) between the source and the destination is predicted. However parameters influencing the network performance that are not accounted for like non-linear node battery discharge, node power consumption during idle and sleep states and signal processing etc are accounted for by the regression intercept.

The proposed Markov based re-routing technique is applied to adhoc on-demand distance vector (AODV) protocol, hence renamed as battery monitored AODV (BM-AODV).

Analysis of variation and regression analysis statistics obtained after incorporating the Markov based re-routing technique in BM-AODV routing protocol is depicted in Table 1.

Table 1. Regression Analysis Statistics and ANOVA

	BM-AODV
R Square	0.8487
Standard Error	0.5275
Significance F	0.0588
Functional Relation	E = 19.5 − 0.033 N − 0.14 P

The coefficient of regression R^2 obtained on implementing the proposed Markov re-routing technique in BM-AODV routing protocol is very near to 1 implying that the proposed re-routing technique is fairly accurate and acceptable. Variance in the average network energy consumption depends on the number of nodes in the route from source to destination and the expected PDR to an extent of almost 84 %. A conspicuous lower value of 'Significance F' further enhances the trustworthiness of the proposed Markov re-routing technique. The functional relation obtained is decisive in predicting the average network energy consumption for desired expected PDR and number of nodes in the route from source to destination.

5. Conclusion

This paper has proposed the concept of initiation of re-routing just prior to the failure of a node in the path from source node to destination node. The proposed Markov based re-routing technique has been validated mathematically. The mathematical analysis indicates an appreciable increase in the percentage of packets reaching from source node to destination node. Latency is observed to decrease by an average of almost 50 %. Multiple regression analysis performed has helped to quantify the impact of multiple causal variables ie. number of nodes and the corresponding PDR, on the energy consumption of the wireless sensor network. Results are indicative that the node battery energy is more efficiently utilized along with an appreciative improvement in PDR on implementation of the proposed generic Markov based re-routing technique. Further work is in progress regarding optimization of the relation between energy consumption, PDR and number of nodes between the source and destination in a WSN.

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Mobile Health Applications : Literature Survey

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ABSTRACT

The purpose of this study is to review smart phone based healthcare technologies commonly called as mHealth. Also, we compare the different health based applications on different platforms such as Android, iOS and Blackberry. This paper proposes a literature survey of the past, existing and emerging technologies of Healthcare applications to help all users understand this domain.

Keywords: Healthcare professionals (HCP), Android, iOS, Blackberry, mHealth.

I. Introduction

Mobile Health is a global phenomenon that has received significant attention over the last few years**.** The use of mobile devices by health care professionals (HCPs) has transformed many aspects of clinical practice[1]. Mobile devices have become significant in health care, leading to rapid growth in the development of medical software application for these platforms. Numerous apps are now available to assist HCPs with many important tasks, such as: information and time management; health record maintenance and access; communications and consulting; reference and information gathering; patient management and monitoring; clinical decision-making; and medical education and training.[1]

Mobile devices and apps provide many benefits for HCPs, perhaps most significantly increased access to point-of-care tools, which has been shown to support better clinical decision-making and improved patient outcomes[1].However, some HCPs remain hesitant to adopt their use. Despite the benefits they offer, better security and standard practices regarding mobile medical apps need to be established to ensure the consummate use of these increasingly wordly apps into medical practice. These measures will raise the barrier for entry into the medical app market, increasing the quality and safety of the apps currently available for use by Health care professionals.[1]

II. Background

Healthcare professionals mainly used pagers for mobile communication until the availability of cell phones in 1990s. The advent of mobile Personal Digital Assistants (PDAs) during 1990s enabled healthcare professionals to organize their contacts and calendars electronically, adding another device in their pockets.[8] The combined use of a pager, a cell phone and a PDA is now replaced by a single device called a "smart phone", which is becoming very revolutionary among professionals as well as the public. Recent years have seen an increased adoption of smart phones by healthcare professionals as well as the general public. A smart phone is a new technology that combines mobile communication and computation in a handheld-sized device, facilitating mobile computing at the point of care. The main objective of this study is to classify the smart phone-based healthcare technologies in the literature according to their functionalities and summarize them in each category. We present a systematic literature review in this regard. To the best of our knowledge, this study is the first study for classifying and summarizing healthcare applications for smart phones in a systematic literature review format. The healthcare system is highly mobile in nature, involving multiple clinical locations such as clinics, inpatient wards, outpatient services, emergency departments, operating theaters, intensive care units (ICUs), laboratories, etc[8] As such, working in the healthcare system requires extensive mobility of healthcare professionals as well as communication and collaboration among different individuals, including their colleagues and patients.[8]

III. Advent of Mobile 'APPS' :

The rapid integration of mobile devices into clinical practice has, in part, been driven by the rising availability and quality of medical software applications, or "apps." [8] Apps are software programs that have been developed to run on a computer or mobile device to complete a specific purpose. Faster processors, improved memory, smaller batteries, and highly efficient open-source operating systems that perform complex functions have paved the way for the development of a flood of

medical mobile device apps for both professional and personal use.[8]

The ability to download medical apps on mobile devices has made a wealth of mobile clinical resources available to HCPs. Medical apps for many purposes are available, including ones for electronic prescribing, diagnosis and treatment, practice management, coding and billing, and CME or e-learning.[8] A broad choice of apps that assist with answering clinical practice and other questions at the point of care exist, such as: drug reference guides, medical calculators, clinical guidelines and other decision support aids, textbooks, and literature search portals. [8] Many mobile apps are not intended to replace desktop applications, but are meant to complement them in order to provide a resource that has the potential to improve outcomes at the point of care. The use of medical apps has become frequent and widespread; 70% of medical school HCPs and students reported using at least one medical app regularly, with 50% using their favourite app daily.[8]

In July 2008, access to apps was further revolutionized by the launch of the Apple iTunes Appstore, which gave iPad, iPhone, and iPod Touch (iTouch) users the ability to shop for and download apps from an online marketplace.[1] As of January 2014, Apple reported that a staggering 1 million apps were available through the iTunes Appstore.[1] In 2011, Apple created the "Apps for Healthcare Professionals" section within the medical category of the iTunes Appstore, a unique feature among mobile app marketplaces.[1] In 2013, this section was further divided into subcategories including: reference, medical education, EMR and patient monitoring, nursing, imaging, patient education, and personal care.[1] Google launched a 'Google Play' shop that provides a variety of apps, for mobile devices that use the Android operating system. To reach more users, some mobile apps have been made available for use on either Apple or Android platforms or both.

IV. Emerging Technologies and Future Trends.

Many trends regarding the use of mobile devices and apps in health care have been envisaged. As better health outcomes become the ultimate goal of the health care system, apps will be needed to fulfil that purpose. The prevention and management of chronic health conditions, such as diabetes, obesity, and heart disease, present serious problems for HCPs, patients, and the health care system. Patient care management and compliance are difficult challenges, too, so apps that successfully address these issues are needed and eagerly awaited. Apps that support caregivers and promote better communication among patients, physicians, and other

resources have also been identified as important unmet needs. As patient ownership of mobile devices increases, new opportunities for direct communication with HCPs and for improved self-monitoring and disease prevention are expected to develop.

Future mobile apps are expected to include even larger databases, as well as CDSS prompts that will aid in clinical decision-making, similar to features that are already built into the EMR systems on desktop computers in clinical settings.[1] There is also a need to develop standards for mobile apps so that they can integrate seamlessly with its capabilities, such as EMRs and patient monitoring systems.[1] Such measures will enable HCPs to use mobile apps in a more effecient way that hopefully leads to improved patient's health.

V. Application Distribution [8]

In this study, a total of 83 applications were discussed. Among them, 57 applications were designed for clinicians, 11 applications were designed for medical or nursing students, and 15 applications were designed to be used by the patients. The distribution of these applications for the major smart phone OS platforms are: 74 applications are developed for at least one OS platform and the remaining 9 applications can be accessed either on a web-enabled or java-enabled smart phone. None of the six OS platforms support all of these 74 applications. iOS is the most popular platform for healthcare smartphone applications because 57 out of 74 applications are developed for iOS. 57 applications for healthcare professionals focusing on disease diagnosis (21), drug reference (6), medical calculators (8), literature search (6), clinical communication (3), Hospital Information System (HIS) client applications (4), medical training (2) and general healthcare applications (7); 11 applications for medical or nursing students focusing on medical education; and 15 applications for patients focusing on disease management with chronic illness (6), ENT-related (4), fall-related (3), and two other conditions (2). The disease diagnosis, drug reference, and medical calculator applications were reported as most useful by healthcare professionals and medical or nursing students.[8]
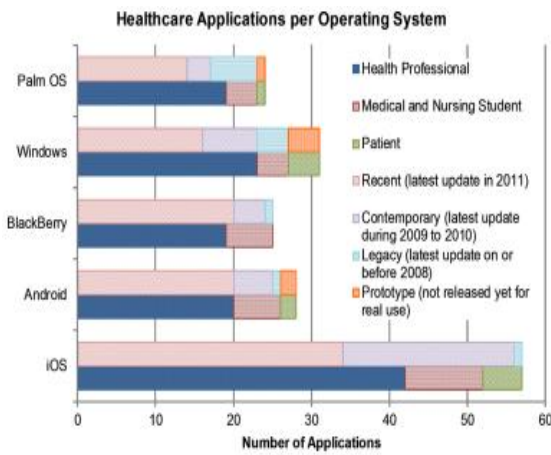
Fig.1:   Number of Applications on different platforms.[8]

VI. Comparison

Apps	Health Tracker	Doctor+	Healthy Living	Med Scape	(Our app)
OS	Symbian	Windows	BB	iOS	Android
Touch screen	No	Yes	No	Yes	Yes
Virtual keyboard	No	Yes	No	Yes	Yes
GPS based feature	No	No	No	No	Yes
Security	No	Yes	Yes	Yes	Yes
Fixing Appoin-tments	No	No	No	No	Yes
Prescrip-tion storage	No	No	No	No	Yes
BMI feature	No	No	Yes	Yes	Yes

Fig.2: Comparison of some apps on different platforms.

VII. Conclusions

Medical devices and apps are already invaluable tools for Health care professionals (HCPs), and as their features and uses expand, they are expected to become even more widely incorporated into nearly every aspect of clinical practice. [1] However, some HCPs remain reluctant to adopt their use in clinical practice. Although medical devices and apps inarguably provide the HCP with many advantages, they are currently being used without a thorough understanding of their associated risks and

benefits.[1] Rigorous evaluation, validation, and the development of best-practice standards for medical apps are greatly needed to ensure a fundamental level of quality and safety when these functionalities are used.[1] With the implementation of such measures, the prime decider of an app's value may ultimately be its ability to provide meaningful, accurate, and timely information and guidance to the patients in order to serve the aim of improving patient 's health.

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Telemedicine with Automated ECG Analysis

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ABSTRACT

The trend of mobile communication has been growing up from past several years. It can be used as integral part in Health care Technology. Due to modernization heart problems are gradually increasing. The difficulties of transportation and limitation of cardiologists availability at many places are raising the need of telemedicine and automated analysis of ECG. This paper describes implementation of Telemedicine for heart patients with the help of automated ECG Analysis .ECG Analysis can be done with the help of C6713 DSK and code composer studio. Telemedicine is implemented using GSM Modem. The system proved to be quick and reliable.

Keywords : ECG machine, C6713 DSK, microcontroller, GSM Modem, Handset.

I. Introduction

Today, heart patient and senior citizen population who have more heart problem is increasing, so the number of people who need constant attention for their heart problem is increasing .Though the hospital can accommodate many patients but the number of doctors are limited. Thus, they may not able to reach all patient simultaneously. Thus it requires to find system that can analyse ECG automatic using digital signal processing. ECG stands for Electrocardiogram. This is used to detect arrhythmia of heart. The word Telemedicine can be described as medicine with telephone Technology. This can be supported with an automated ECG Analysis. After analyzing ECG, on the basis of certain condition controller with trigger GSM Modem to send a short message to a short message to doctor's mobile if ECG of a heart patient is abnormal.

A short message to doctor's mobile if ECG of a heart patient is abnormal.

II. Block Diagram of System
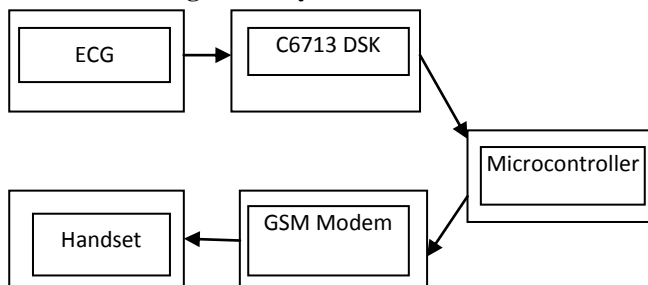
Figure 1 : Block Diagram

The figure 1 shows main blocks used for this system.

ECG machine: This is used to take ECG of the patient. It contains noise removal filters as ECG taken from electrode has many noises.

C6713 DSK: This digital signal processor developed by Texas Instruments .This can be used to run MATLAB Code for analyzing ECG.

Microcontroller: This will be triggered by C6713 DSK if there is any abnormality. After it, this will trigger GSM Modem. AT Commands of the GSM Modem will be executed by microcontroller.

GSM Modem: This is used to send a message to a particular number which is specified by microcontroller.

III. ECG Outline:

ECG is measured by placing electrode on patient's body at certain places. ECG is basically a voltage that is generated by contraction and expansion of heart .As shown in figure 1 .This ECG is taken by machine in which there are certain filter to filter out noise. ECG with lower noise has defined peak values those are P, R, T, U and certain Valley those are Q and S. These peaks and certain segments and interval like P-R segment, S-T segment, QRS interval is used to detect abnormality and types of problem of heart.
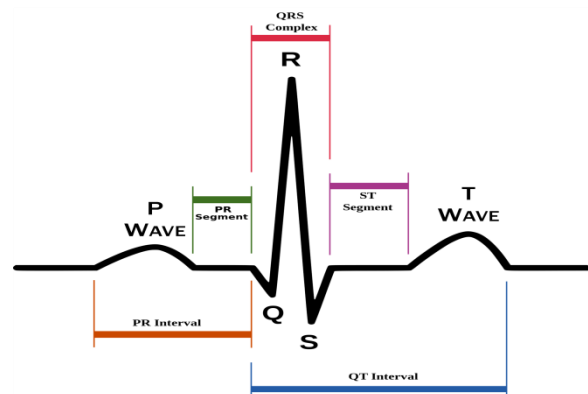
IV. Methodology:

In conventional method, ECG is analysed by cardiologists by examining its Interval and peak Value. In Automated ECG analysis, this procedure will be done automatically using Digital signal processing and MATLAB. If the abnormality found then doctor will be informed by SMS using GSM. This procedure will be done in certain steps which are mentioned in below flowchart (Figure 3).
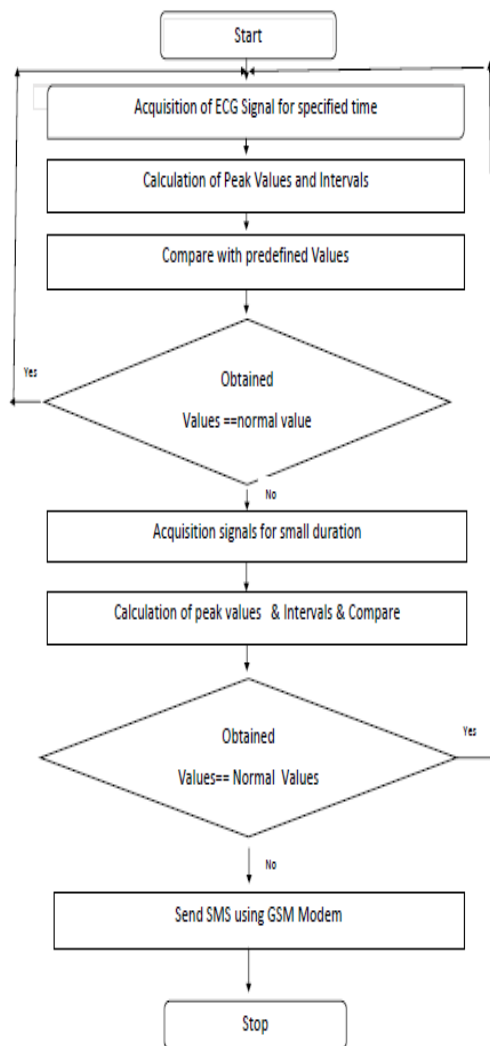
Figure 3 Flowchart

1. ECG Acquisition
ECG of patient is acquired using ECG machine. This machine is connected with the C6713 DSK Development board. Sampling frequency for the acquisition is varying according to ECG machine but it should be higher than 500 Hz. ECG machine is connected to Line in input pin .This acquisition continuous for particular time interval. This signal value stored in memory of the DSK board.

2. ECG Analysis
Peak and segment calculation : To analyse ECG, Calculation of peak and various segment is required. For this purpose MATLAB is very useful tool. Peak value of stored ECG that is stored as array can be calculated using 'findpeaks'. This function has two return value those are value of peaks and it's indices in array. It will find local maxima of the given array of ECG. This is used to find peaks P, R, T and U.

```
[pks,locs] =findpeaks(ecg,'sortstr','descend');
Pks =pks(1:4);
locs=locs(1:4);
```
To find Valleys Q and S, the whole array of ECG is made negative and then peak values of that negative array is found out. That values are made negative again

to get original values .Location of these values are also deduced from that array.
```
neg_ecg=(- ecg);
[Valley,locs2]=findpeaks(neg_ecg,'sortstr','descend');
Valley=(- Valley (1:2));
Locs2=locs2(1:2);
```
Location array of both peaks and valleys are concatenated together and is sorted in ascending order. This sorted array is used to calculate segment values. To calculate segment, location of former peak is subtracted from later peak and then multiply with sampling period. 'locs' is an array of peak location "locs2" is an array of Valleys location.
```
all_locs=[locs locs2];
all_locs=sort(all_locs);
```
For calculation of QRS interval location of Q peak is subtracted from location of S peak and after it will multiply with sampling period. This will give value of segment or interval QRS.

$$QRS\_complex=0.001*(all\_locs(4)-all\_locs(2))$$

Comparison with Normal Value: After measurements of peak value and segment these value will be compared with the stored normal value. These normal values are stored in memory of C6713 DSK board. Peak value of measured ECG will be compared to peak values of stored database. Segment value will be checked with their normal specified range. On the basis of this comparison condition of heart patient will be decided.

If values will be found abnormal then this time above mentioned process will occur for short duration of acquisition. After this once again comparison will occur and on the basis of last comparison trigger signal will be generated if the condition is abnormal.

3. Microcontroller and GSM Modem

In continuous two comparisons; if condition is not normal then microcontroller will receive a trigger pulse. This microcontroller have AT Command stored on its memory. This will be used to send message to a particular saved number using GSM Modem. This will directly send a message as it is triggered by

V. Conclusion
This system has mainly benefited because of its automated ECG analysis. Due to this feature it is useful for rural area where doctor is not going to visit that rural area hospital every day. During this time if any kind of abnormality will be found in patient's heart then doctor will receive a message. It is also useful in big hospital where number of doctors are limited.

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A Web Conferencing System Using WCF Framework

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ABSTRACT

In this upcoming phase of so many numerous and countless promising technologies catching up and also the day to day challenges which they cause to face requires constant progress and up-to-date by introducing most simple, smart, effective and easy to use applications for the end users to meet various business as well as individual needs. The Multimedia Conferencing always plays a vital role for an interactive communication over a network. Owing to the fact that a conferencing system requires real time properties, we will consider all the necessary factors to make the system more vibrant and efficient. In this paper, we intend to implement a web conferencing system with the help of web services using WCF, i.e. Windows Communication foundation (.NET Framework 4.0) which provides an easier way to create applications that capture, present, manipulate and store real-time based media. This application will incorporate all the real- time services such as video chat, audio messages, file manager services, whiteboard services in one single framework with the help of Silverlight, a plug- in power of .Net Framework. The purpose of this report is to offer a user friendly conferencing environment for reliable communication to the end users.

Keywords : H.32x; RTP; SIP; WCF; Web Services

I. Introduction

One-to-one interaction or communication has gained popularity today with the support and background of so many applications in use and still developing but when it comes to one-to-many or many-to-many interaction there is still a lot of scope and job to be done to make it more powerful and efficient. The Multimedia Conferencing is the most elemental aspects of communication in today's scenario where we bear so many challenges and task to perform and handle. The conferencing system has constantly been on the research agenda for quite some years and has acquired interest in the area of communication.

Previously for the purpose of communication socket programming was preferred and handled by writing some TCP socket based code that sustains sockets between different server and the clients. The client initially needs to request the server, a socket is open, the server processes the request, results get generated, further socket gets closed after process completion. Also keeping the performance aspect in mind, this technique may not scale very well. If the application is served by a keen server with a prearranged amount of clients, this solution can be still persuasive.

Instead of using TCP socket based code, web services can be used to interconnect events or messages between the invitation and the answer. The benefit of using a web service is that you don't have to manage the sockets yourself. You also don't have to worry about constituting every firewall on every client device to open a port for you. HTTP runs on port 80, and it is not blocked. Your clients can link with each other over HTTP, without firewalls. [1].

In multimedia networks, maintaining the precise QOS level is fundamental. The video conferencing can impose strict requirements and arise various factors that may alter the quality of service in the network which we also need to consider. [2]

Another important factor which we need to consider is the protocol to be used for the purpose of the call signaling during conferencing. There are already few products which are based on H.32x protocol standards for communication. SIP, i.e. Session Initiation Protocol, which is comparatively more viable protocol, is put on the schema of being the call signaling protocol for conferencing. Most of the study and researches on SIP based conferencing, however, have still remained unimplemented. [3]

The rest of the paper is structured as follows. In Section 2, existing work related to this system has been highlighted. In Section 3, protocol related to the system has been described briefly. In Section 4, the proposed framework for the system has been explained thoroughly. In Section 5, screenshots, related to the application has been shown. In Section 6, comparison has been done by well known similar applications. Finally, the last Section consists of conclusions and future work related to the system.

II. Related Work

In this Section, we will run through all the existing work carried out which are related to the application we want to implement. Here we will briefly introduce the WCF concept; the existing protocols used for conferencing, and also briefly emphasize the web services.

A. WCF

Windows Communication Foundation (WCF) is a structure for building service-oriented applications. We can

direct data as asynchronous messages from one service endpoint to another. A service endpoint can be a portion of a continuously accessible service hosted by IIS, or it can also be a service hosted in some application. An endpoint called as a client of a service requesting data from a service endpoint. The messages here can be as modest as a single character or word sent as XML, or as intricate as a stream of binary data. WCF is a malleable platform. Because of this advantage, WCF is also used in numerous other Microsoft products. Microsoft Silverlight is a platform for forming interoperable, rich Web applications that allow makers to create media-intensive Web sites. Inauguration with version 2, Silverlight has united WCF as a communication technology to associate Silverlight applications to WCF endpoints.

There are also many features of WCF which makes it the best choice for us to implement our application using this framework. It includes features such as: Service orientation, Interoperability, Data contracts, Reliable Messages, Multiple Encodings and Security support. [10]

Also, there are several advantages of using the WCF framework such as: [11]

- It is interoperable with other services
- Its services provide improved consistency and security in contrast to ASMX web services.
- The security model here does not need to make any changes in the code and binding properties. Just a few changes in the configuration will make your requirements.
- It has incorporated logging mechanism, altering the configuration file settings will provide this functionality. In other expertise developer has to write the code.
- Load balancing and also supports scalability.

B. Existing protocol: H.32x standard

It may cause a problem while managing all the data packets related to conferencing, as the users work with different location and environment. This calls for a standard to which the software must be convened. To aid the compatibility among diverse vendor solutions, ITU i.e. International Telecommunication Union, developed H.32x standard series; including H.322, H.323, H.324. H.322 is for applications over LANs, providing a guaranteed bandwidth. H.323 is for applications over LANs, providing non-guaranteed bandwidth and H.324 is for applications over the PSTN and mobile telephones. Among them H.323 standard enables networking and application vendors to support more deployable, manageable and affordable conferencing as well as it enables interoperability and compatibility. [4]

C. Web Services

The conferencing applications can be developed using web services either by using the principles on SOAP or on REST, which are briefly described below [5]:

SOAP (Simple Object Access Protocol), consist of three entities which include: a service provider, which will issue the required service in the registry; a service registry, which introduce us with the online service discovery and a service requestor, which will ascertain all the services by querying the registry. Here, messages are exchanged over HTTP easily.

REST (Representational State Transfer), employs the traditional node-server architecture, which is mostly used with HTTP but does not limit itself to a particular protocol. REST depends on three primary design principles: addressability, uniform interface and statelessness.

III. Protocol Description

Here we will study the protocols required in our application more specifically and in detail. The basic Real-time Transport Protocol and Session Initiation Protocol has been described below.

A. Basic Real- time Transport protocol

It is a transport protocol for real-time applications and used for real-time data transfer, which includes audio and video. Various properties such as loss detection, security, content designation, and continuous media are supported by RTP for real time applications. RTCP (Real Time Control Protocol) primary aim is to provide a feedback on the quality-of-service in the media distribution by occasionally sending the entire statistics information to users in a streaming multimedia session. Both the RTP and RTCP are designed in a manner to sustain an independent existence of the underlying transport and network layers [6].

B. Session Initiation Protocol

SIP is a lightweight, text-based signaling protocol used for establishing sessions in a network. SIP is an application-independent protocol; it simply initiates, terminates and modifies sessions without knowing any details of the sessions. This simplicity means that SIP was designed at the outset to be extremely flexible, scalable and extensible. It is a text-based protocol which can easily interact with other internet protocols. SIP is gradually becoming popular because of its excellent characteristics. [3]

SIP is not a perpendicularly integrated communications system. It is rather a module that can be used with other IETF protocols (e.g. RTP, RTSP and SDP) to build a complete multimedia architecture. [7]

There are five services for establishing and terminating a session in SIP [8]:

User location: determining the goal system to be utilized for communication;

User availability: determining inclination of the called party to engage in communications;

User capabilities: determining the media equally well as the parameters to be applied;

Session setup: "ringing", establishing of session parameters at both called and calling party;

Session management: transfer and closure of sessions, adapting session parameters, and summoning services.

When adding the functionality of scalable and more reliable protocol services for call signaling the existing protocol used for conferencing, which is H.32x standard has few limitations when compared to SIP i.e. Session Initiation Protocol.

Following are the advantages of SIP over H.32x standard: [9]

- Loop detection: When trying to localize a user over several domains, loops can occur. H.32x has no support for loop detection. Loops are certainly detected using SIP headers, as they specify all proxies that have handled the SIP packet.

- Distributed control: In H.32x, there is a need for a vital point when performing multi-user calls, which means that this vital point must be dimensioned for the size of the call. SIP sessions are scattered, making the need of this central point disappear.

- Small connection overhead: Launching a connection using H.32x takes about three times the data and about-turns paralleled to when using SIP.

IV. Proposed WCF Architecture

The following figure shows the proposed model of our application in which WCF framework has incorporated major portion of conferencing system in one single framework.
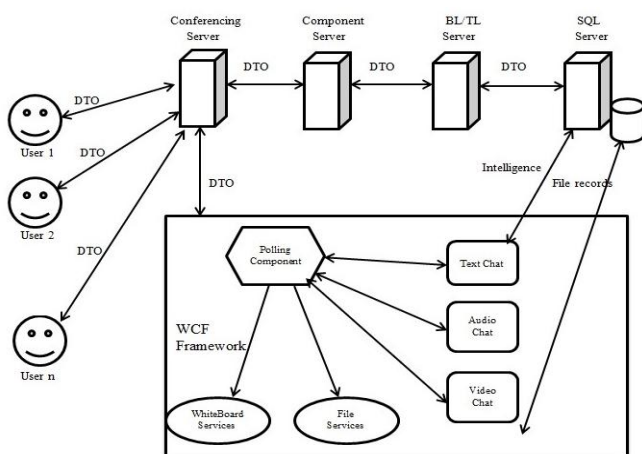
Fig1: Proposed WCF Architecture model

The above proposed model has merged all the services in one complete framework called as Windows Communication Foundation. The framework is more scalable and reliable because it uses the concept of Silverlight tool and replaces the traditional H.32x standard protocol with Session Initiation Protocol. Here in this model we have many different components and each

component is associated with some functionality. The multiple users/ participants are acting and participating in this system. The Component Server or Controller, consist all the relevant messages which have methods and protocol information, a number of header fields which specify the call properties as well as the service information and an optional message which consists data relevant for the session description.

The Conferencing server, which is basically responsible for managing the entire conferencing system with the help of a SIP signaling protocol. Managing services include: authentication, authorization and communication security from eavesdropping and manipulation of the contents. It also acts as a notifier, accepting subscriptions to the conference state. The Business Layer/ Transport Layer has the same functions of guiding the decision making process. The WCF framework has merged all the main services of the conferencing system in one single picture. The Polling Component, is responsible for controlling the two main services called as whiteboard services and file services. Both these services can act independent services or can be merged in one single component. Other small components such as text chat, video chat and audio chat have an important role to play during conferencing and thus needs to be merged and linked effectively. Other components such as SQL server, consist all the data and important information such as file shares during the conferencing, their entries, etc. on this component. The DTO i.e. Data Transfer Object is a design pattern used to transfer data between different software application subsystems.

V. Screenshots

1. Login Screen
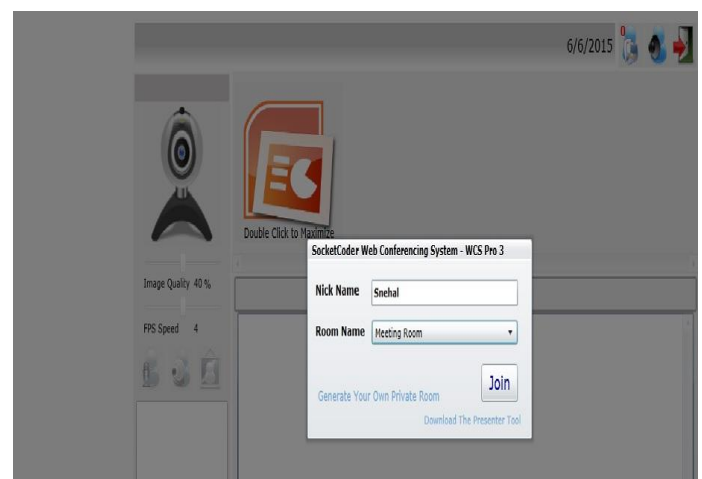
Fig 2: Login Screen

2. Successful login of participant 1
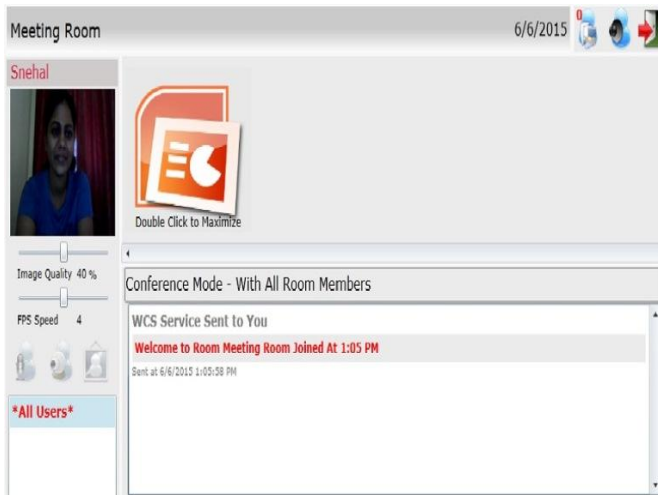
Fig 3: Successful login of 1ˢᵗ participant

3. Successful login of participant 2
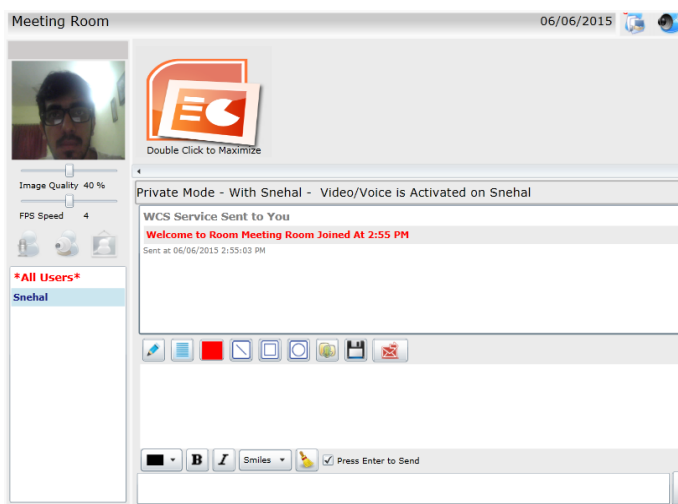
Fig 4: Successful login of 2ⁿᵈ participant

4. Participant 1 and 2 texting and video chatting among themselves
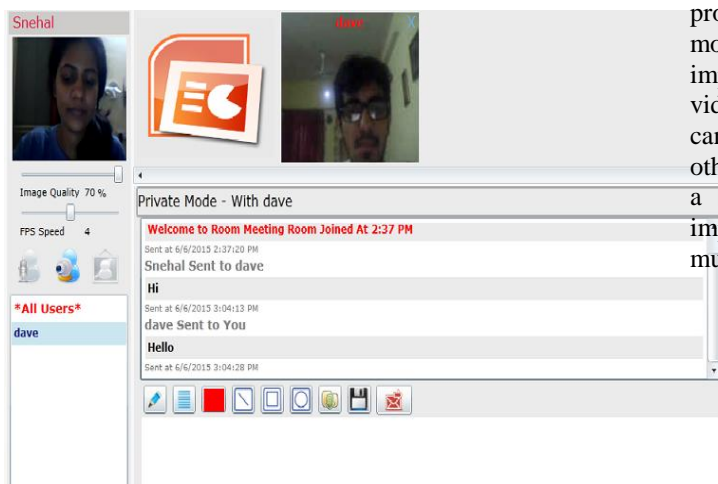
Fig 5: Participant 1 and 2 texting and video chatting

5. Participant 2 using the whiteboard seen at participant 1's end
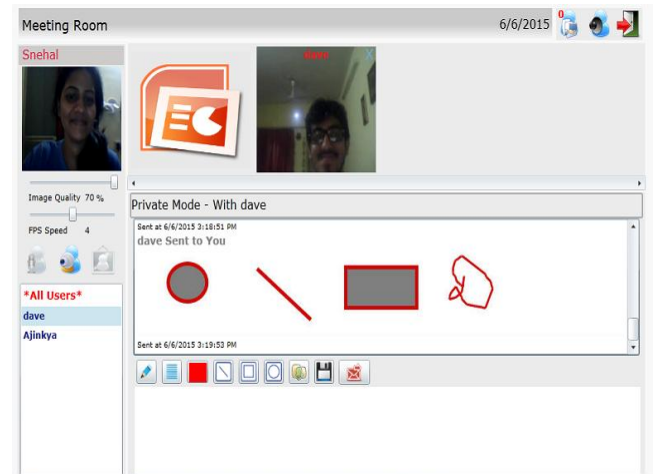
Fig 6: Whiteboard services being used among users

6. Participant 1 sharing a file
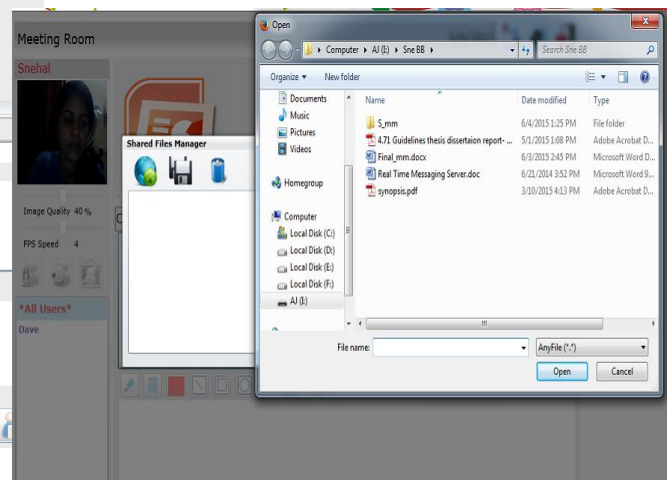
Fig 7: Participant 1 sharing a file

Other than the screenshots showed there are many other features of this application such as various file sharing properties such as: removing, sharing, sharing on private mode. Many white board services has been captured and implemented successfully. The main services of audio and video conferencing has also been implemented. Here user can also have a private mode chat during conferencing with others if he feel to need some private information only with a single user. Many other functionality has been implemented successfully for a simple and effective multimedia conferencing system.

7. Participant 2 saving a shared file
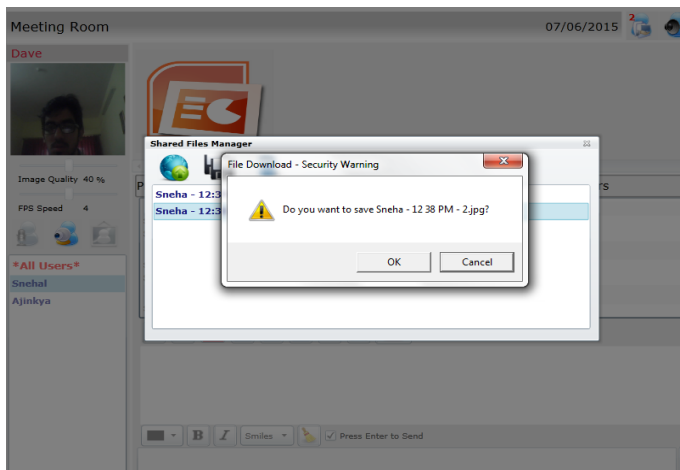
Fig 8: Participant 2 saving a file

VI. Results and Discussion

The comparison is built on a WCF/ SIP based system with some other well know conferencing application. The tested environment is between 4 users. With the help of bandwidth monitoring tool we have recorded the performance with respect to the consumed bandwidth.
MSN:
Download speed: 9.15 kbps
Upload speed: 8.38 kbps
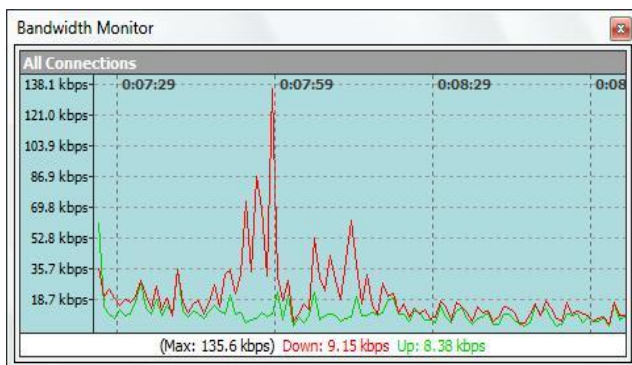
Fig 9: Bandwidth consumption by MSN

YAHOO:
Download speed: 16.0 kbps
Upload speed: 8.40 kbps

Fig 10: Bandwidth consumption by YAHOO

GMAIL
Download speed: 20.0 kbps
Upload speed: 16.5 kbps
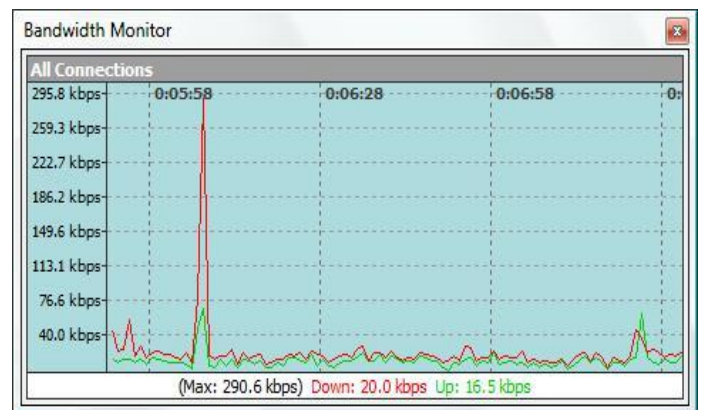
Fig 11: Bandwidth consumption by GMAIL

SKYPE
Download speed: 31.9 kbps
Upload speed: 10.6 kbps
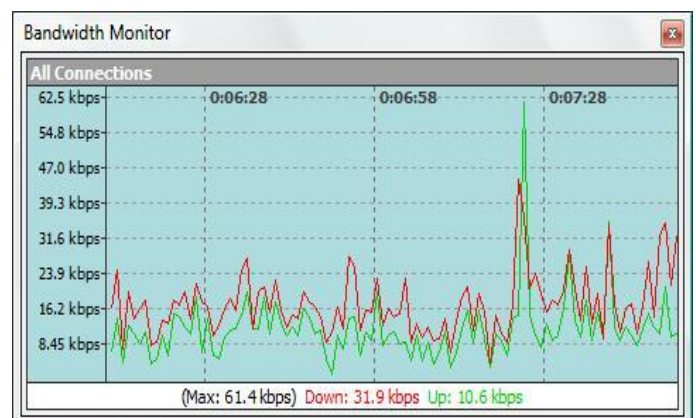
Fig 12: Bandwidth consumption by SKYPE

WCF Based system:
Download speed: 228.5 kbps
Upload speed: 32.2 kbps
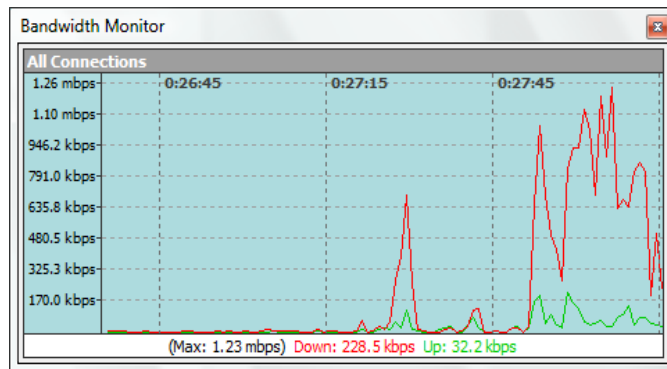
Fig 13: Bandwidth consumption by WCF system

VII. Conclusion And Future Work

Video conferencing has helped people to communicate more effectively. Instead of using TCP socket based code web services have been used for the purpose of communication. The WCF framework has been deployed where Silverlight tool is used to incorporate the entire platform in one single picture and making the application more simple and user friendly. SIP protocol is used instead of the H.32x for call signaling and various other purposes. For interactive interface and user experience additional features such as whiteboard and file sharing has also been implemented. This paper is part of the effort that aims to eliminate incompatibility between different platform-oriented solutions, by providing more simple, user-friendly and scalable application for the end users.

In future studies a variety of new functions to meet advanced requirements, such as inviting 'n' number of users to the conference, dial-out method, etc. still needs to be implemented. Mining structures that will give a brief history of the user, topic of interest, etc., can be implemented as an additional intelligence feature.

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Desktop 3D Printer

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ABSTRACT

The title of our project is "Desktop 3-D Printer". 3-D printing is a process for making a physical object from a three-dimensional digital model, typically by laying down many successive thin layers of a material. The process will include use of CAD, CAM, tools and software to design 3D models. The basic mechanical structure includes Extruders, Heated bed, Stepper motors, etc for building the object. The electronic implementation includes Bootloaders and Firmware like Arduino IDE, etc. The main objective is to gain knowledge and build a stable, economic and environment friendly project. Majority of the 3D printers are based upon the open source 3D printer project known as RepRap (short for replicating rapid prototype), we have also used this as our reference for the project.

I. Introduction

3D printing is a process of making a three-dimensional solid object of virtually any shape from a digital model. 3D printing is achieved using an additive process, where successive layers of material are laid down in different shapes. 3D printing is also considered distinct from traditional machining techniques, which mostly rely on the removal of material by methods such as cutting or drilling (subtractive processes).

Although scientists and technicians have long been fascinated with the idea of replicating technology, it was not until the 1980s that the concept of 3D printing really began to be taken seriously. The man most often credited with inventing the language of 'modern' 3D printer is Charles W. Hull, who first patented the term 'stereo lithography' (defined as "system for generating three-dimensional objects by creating a cross-sectional pattern of the object to be formed") in 1984.

3D printing is making of parts and products using a computer-driven, additive process, one layer at a time. 3D printing builds plastic and metal parts directly from CAD drawings that have been cross sectioned into thousands of layers.

It provides a faster and less costly alternative to machining (cutting, turning, grinding and drilling solid materials).

3D printer is a machine that creates a plastic or metal part one layer at a time (the additive fabrication method). Used mostly for quickly creating prototypes and molds, 3D printers are also used to build final parts. Available for myriad industrial uses as well as for the hobbyist, a variety of different technologies are used to form the layers.

All materials printer usually performs 3D printing processes using digital technology. The first working 3D printer was created in 1984 by Chuck Hull of 3D Systems Corp. Since the start of the 21st century there has been a large growth in the sales of these machines, and their price has dropped substantially. According to Wohlers Associates, a consultancy, the market for 3D printers and services was worth \$2.2 billion worldwide in 2012, up 29% from 2011.
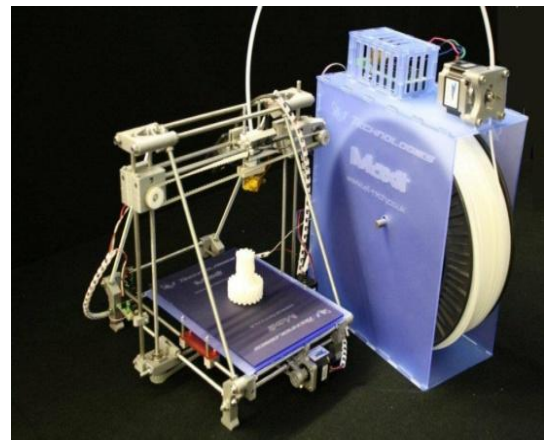
Figure 1: A sample picture of 3D printer*

The term additive manufacturing refers to technologies that create objects through a sequential layering process. Objects that are manufactured additively can be used anywhere throughout the product life cycle, from pre-production (i.e. rapid prototyping) to full-scale production (i.e. rapid manufacturing), in addition to tooling applications and post-production customization.

The 3D printing technology is used for both prototyping and distributed manufacturing with applications in architecture, construction (AEC), industrial design, automotive, aerospace, military, engineering, civil engineering, dental and medical industries, biotech (human tissue replacement), fashion, footwear, jewelry, eyewear, education, geographic information systems, food, and many other fields. It has been speculated that 3D printing may become a mass market item because open source 3D printing can easily offset their capital costs by enabling consumers to avoid costs associated with purchasing common household objects.

Using 3D printing technologies such as laser sintering and electron beam melting, "rapid prototyping" evolved into "rapid manufacturing," in which short runs of actual finished parts are made. Such techniques are also used to create products customized for each person, such as hearing aids, dental crowns and medical implants.

II. Scope of the Project

Desktop 3D printers are still in their nascent stage of development, though, traditional 3D printers have been used in industries for product prototyping since quite some time. The excitement around Desktop 3D printers is quite amazing; especially in U.S.A. and slowly everyone in other parts of the world including India are realizing the potential of 3D printing .The ability to create a 3D object just out of your imagination has given more power to the people. 3D printers can be used in a wide spectrum of applications ranging from domestic to industrial.

Currently, majority of the 3D printers are based upon the open source 3D printer project known as RepRap (short for replicating rapid prototype) in which works on the Fused Filament Fabrication technique in which a plastic wire of diameter 1.5 or 3 mm is fed into an extruder which melts it and extrudes it as a filament of diameter about 0.5 mm on the printing surface (heat bed) according to the data sent from the computer. In India, a few people have taken notice of this open source hardware project and have successfully implemented it. But most of them have imported the kits from other countries and simply assembled them, thereby increasing their cost of making a 3D printer.

By taking this as our final year B.E. project we will be ensuring that all the components are procured from India itself, even the extruder (one of the major component of a 3D printer) will be made by us in a workshop, thereby reducing the cost considerably. We will also make significant structural and design changes to enhance its efficiency, and reduce its cost further.

This project offers us a lot of scope for learning in the domain of design, material, CAD and CAM software tools. As the demand for Desktop 3D printer grows in the future, more and more developments and innovations can be expected. There are many areas for innovation in a 3D printer, starting from the type of materials to be used for printing to the time required in the whole process of 3D printing. We will be focusing on reducing the time required in the process of 3D printing.

III. Proposed System

We propose to implement a 3D printer using Fused Filament Fabrication. Our project mainly consists of two parts - mechanical and electronics. The proper working of both these parts is very crucial to our project. In Fused Deposition Modeling technique a plastic wire of diameter 1.5 or 3 mm is fed into an extruder which melts it and extrudes it as a filament of diameter about 0.5 mm on the printing surface (heat bed) according to the data sent from the computer. The extruder moves along the x axis and z axis direction whereas the heat bed moves along the y axis direction. This motion along x, y and z axes is controlled by a stepper motor. We will be using five bipolar stepper motors, two for z axis movement, one each for x axis and y axis direction and one for extruder.

The extruder is one of the main components of our project and its proper working is very crucial to the precision of the 3D objects to be printed by our 3D printer. We will be working on both the mechanical as well as electronic part

side by side. We hope to print various types of 3D objects with proper precision through our 3D printer in as less time as possible.
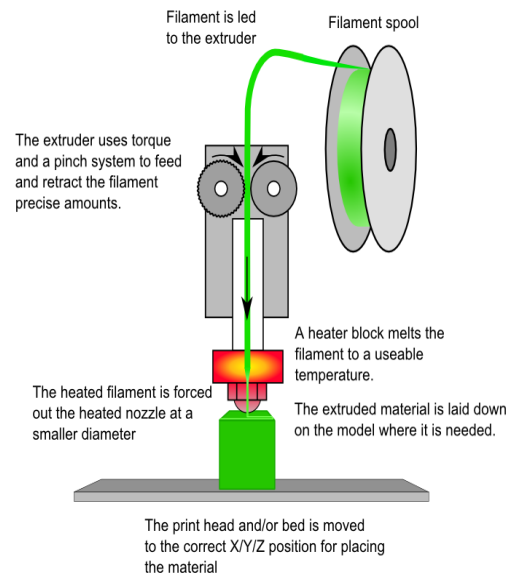
Figure 2: A diagrammatic representation of feeding and extrusion of a plastic filament

IV. Analysis

4.1 Process Model Used for the Project

Our project involves a lot of reading and comprehending of articles and materials available on the internet. Our project also involves a lot of operational management in the sense we have to make sure the right material and tools are available with us for implementing this project.

We have therefore first started with the literature survey by visiting various hardware shops for rods, nuts and bolts, etc. Some of the things that we need for the mechanical structure are hard to find, such as the linear motion belts, but still we are trying very hard to procure it. Similarly, for the electronics part, we have started with the literature survey and made sure that all the components are available in the local market itself.

Our project is based on the open source 3D printer project RepRap, so we already have a reference point for our 3D printer, we will be trying to make as many changes as possible to improve the efficiency, speed and performance of our 3D printer.

Once we are done with the literature survey, we will first develop and test our code on an Arduino board and after proper tests we will starting building our mechanical structure and simultaneously build our PCB also. Once we are ready, we will integrate both the mechanical and the electronics part and test the quality of the 3D print and then if anything is amiss, we will test and calibrate till we can get satisfactory results.

4.2 Feasibility Study

Our project includes two sections – mechanical and electronics, and hence it is a huge task for us to get both of them right and working. Also, our project is slightly on the costlier side with a lot of risks involved. But still we have decided to go ahead with this project after taking an informed decision and taking every member of our team into confidence.

A lot of things can go wrong with our project but we are confident that we will avoid such mistakes or find a novel way to get around difficulties arising from our project. We believe that with proper planning, group work and the guidance of our teachers we can successfully build a 3D printer. Also, we will be getting to learn a lot of new things while implementing this project.

V. Methodology and Design

We will first test our code on an Arduino board and then start building the mechanical structure for our 3D printer while side by side we will be working on the PCB design. Once it is completed we will keep testing and calibrating our 3D printer till we get a proper precision in our 3D printed object.

As explained earlier, our project consists of two parts - mechanical and electronics. We will be making them side by side. Apart from this, we will also be learning a few CAD and CAM tools such as, AutoCAD, Open SCAD and Repetier Host which will be required to make a 3D model and to generate the necessary G-codes to be sent to the 3D printer for printing. The CAM tools can used to change the speed of extrusion, the density of the objects to be printed and also the temperature of the extruder or heat bed, which thereby make a difference on the quality of the 3D printer.

In the following pages we will be discussing in detail about our approach with respect to the mechanical and electronic part of our project.

5.1 Printing procedure:
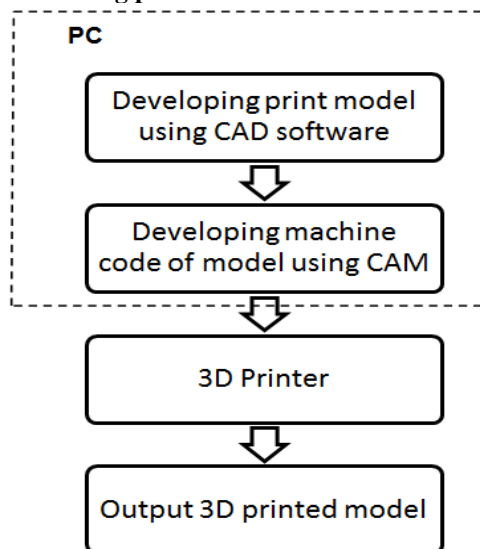
Figure 3

5.2 Flow Diagram:
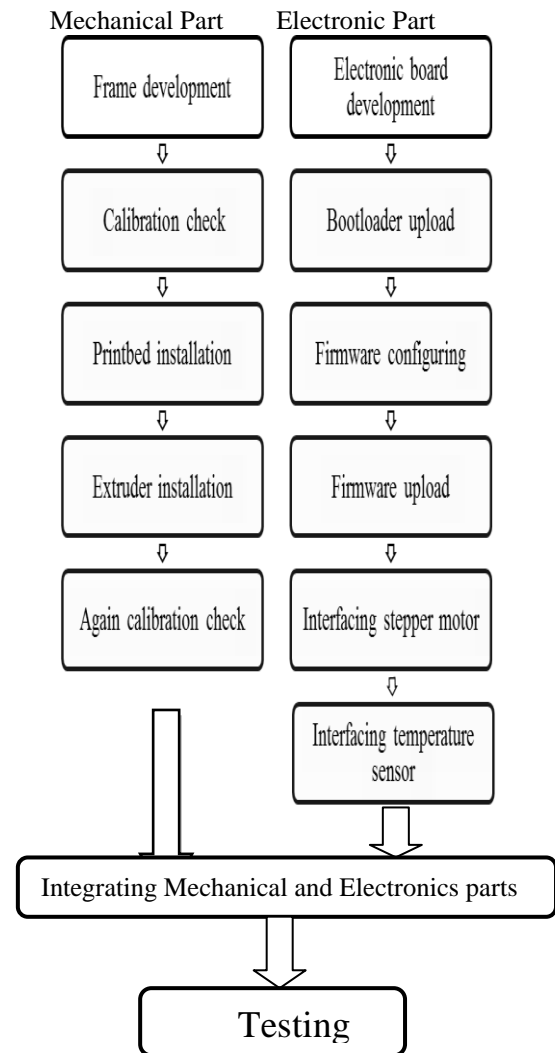
Figure 4

5.3 Mechanical Design -

A 3D printer should have a strong mechanical structure. We will be using five stepper motors, two for z axis movement, one each for x axis and y axis direction movement and one for extruder. Apart from all these, we will me using machine tools to make the extruder. Here we will be required to make the extruder with precise dimensions to get a proper filament width of 0.5 mm.
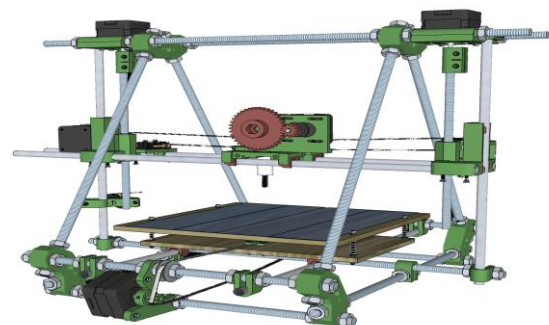
Figure 5 (A CAD model of a 3D printer)

The various components of the mechanical part of our project are in discussed in detail below :

- Mechanical Structure – We will be making the mechanical structure with the support of rods. We will be using both smooth as well as threaded rods. The diameter of the rods we will be using will be 8mm. Also, we will be using various sizes of nuts, bolts and washers. We will be using bearings and linear motion belts. We will be using roller as well as linear bearings. Both these bearings will be used for smooth movement along the x axis, y axis and the z axis. The linear motion belts play a very important role in reducing the backlash. There will also be an end stop along each axis so that a limit can be set for the maximum possible movement of the extruder along a particular axis.
- Stepper motors - We will be using five bipolar stepper motors, two for z axis movement, one each for x axis and y axis direction and one for extruder. We will be using two motors for the z axis so that there can be an equal upward or downward movement along the z axis direction.
- Extruder – It is one of the main components of our project. It extrudes the plastic as a filament with a diameter of 0.5 mm on the heat bed. It mainly consists of two sections – cold end and hot end. The cold end is the part of the extruder which acts as a feeder and grips the plastic wire and feds it into the hot end. This process is done with the help of a stepper motor, gears, roller bearings, a nut and a bolt. The size of the plastic wire can be 1.5 mm or 3 mm. The hot end consists of a thermistor for monitoring the temperature of the hot end and a heater resister to melt the plastic wire.

It will be made from brass in a workshop where we will be taking a block of brass metal and machining will be done to get a precise shape and the extrusion hole of about 0.5 mm so that the filament can be extruded on the heat bed. The hot end will then be enclosed with kapton tape. The hot end will connected to the cold end with materials like PEEK and PTFE.

- Heat bed – The whole process of 3D printing is time consuming and it can happen that when the first layer is printed, it starts cooling off while more layers are printed on top of it.

This causes a condition known as wrapping wherein the plastic cools off from the bottom. To avoid this we have to make sure that the plastic remains warm and cools gradually over a period of time.

For this we use a heat bed which makes sure that the bottom layer is warm as the top layers are printed on it.

5.4 Electronics design

- Description:
- o In our project we are going to use ATMEGA 1284P controller due following features.
- - Advanced RISC Architecture: 131 powerful instructions of which mostly are executed in 1 machine cycle.
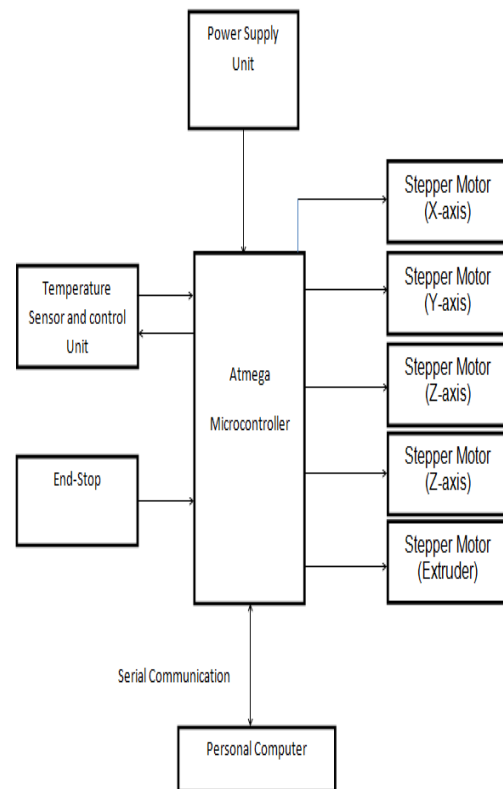
Figure 6: Block diagram

- - High Endurance Non-volatile Memory segments
- □ 128 Kbytes of In-System Self-programmable Flash program memory
- □ 4 Kbytes EEPROM
- □ 16 Kbytes Internal SRAM
- □ Write/Erase cycles: 10,000 Flash/100,000 EEPROM
- □ Data retention: 20 years at 85°C/100 years at 25°C
- □ In-System Programming by On-chip Boot Program
- - Peripheral Features:
- □ 8-channel, 10-bit ADC
- □ One Programmable Serial USART
- □ On-chip Analog Comparator
- - Special Microcontroller Features: Power-on Reset and Programmable Brown-out Detection
- o ATMEGA controller is supported by AVR and Arduino board. Both of them are having their own features advantages and applications. But in our project we are going to use arduino board. There are some following reasons due to which we are using this arduino board.

- Arduino is a single-board microcontroller to make using electronics in multidisciplinary projects more accessible.
- The software consists of a standard programming language compiler and a boot loader that executes on the microcontroller.
- Arduino IDE which is used for writing code for hardware is open source.
- An Arduino's microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external programmer.

o Stepper Motor

In our project we are going to use Stepper Motor. These Motors are used for motion of x,y & z axis. We are using total 5 Stepper motorsOne for X-axis, one for Y-axis, two for Z-axis and remaining one for Motion of Extrusion. All these stepper motors are interfaced with ATMEGA 1284P via stepper driver.

Advantages of Stepper Motor over DC motor-

- Stable and can drive a wide range of frictional and inertial loads.
- Needs no feedback. The motor is also the position transducer.
- Inexpensive relative to other motion control systems.
- Standardized frame size and performance.
- Plug and play. Easy to setup and use.
- Safe. If anything breaks, the motor stops.
- Long life. Bearings are the only wear-out mechanism.
- Excellent low speed torque can drive many loads without gearing.

o Motor Drivers

In this our project we are going to use 'Pololu' stepper motor driver. Pololu stepper motor driver are widely used and efficient motor drivers as compare to other motor drivers. There are some advantages or strong points of Pololu stepper motor driver as follows-

- Simple step and direction control interface
- Five different step resolutions: full-step, half-step, quarter-step, eighth-step, and sixteenth-step
- Adjustable current control lets you set the maximum current output with a potentiometer, which lets you use voltages above your stepper motor's rated voltage to achieve higher step rates
- Over-temperature thermal shutdown, under-voltage lockout, and crossover-current protection

o Electronics Implementation
- Bootloader

Generally, when you want to program a microcontroller, you need a programmer for that particular microcontroller. Apart from being expensive, it might have other disadvantages, like long programming times or too many interconnections between the micro and the programmer itself; some programmers are not capable of programming in circuit. Sometimes the micro is not available while mounted in the end product, as it might be inside a metal or plastic housing, with only some standard communications interfaces being available on a connector.

Many of these problems are addressed by a boot loader. For a hobby, sometimes it seems quite expensive to spend around thousands of rupees for such a device. In university laboratories, it might not be practical to get a programmer for each working bench, and the best solution is to provide the students with microcontroller samples which have already been programmed once and which have the Bootloader in the program memory. In the automotive industry, many Electronic Control Units are encapsulated in housings leaving very few pins accessible, but among these pins there generally is a CAN interface available, making CAN based Bootloaders very popular in this environment. So, the Bootloader has to be programmed in the program memory of the microcontroller just once, using a conventional programmer. After this, the microcontroller can be programmed without a programmer. Once in the microcontroller, the bootloader is such programmed that each time after reset it starts running like any conventional program. What it does however is different from a regular program. First of all, depending on what type of bootloader it is, it starts "listening" for incoming bytes via a specific interface. For instance, a UART bootloader will listen to the UART buffer of the micro, checking for incoming bytes. If the bytes start arriving, the bootloader will grab them and write them in the program memory in the sequence it receives them and at predefined locations. Once all bytes have been received, the bootloader executes a jump at the start of the memory zone it has received and then the "normal" program starts running.

- Firmware

It is the main program code for process control and functioning. Firmware developed and uploaded in microcontroller using Arduino IDE. Firmware accepts the G-code from PC through RS232 or USB and performs printing tasks.

- Heated Bed

A heated build platform (HBP) improves printing quality by helping to prevent warping. As extruded plastic cools, it shrinks slightly. When this shrinking process does not occur throughout a printed part evenly, the result is a warped part. This warping is commonly seen as corners being lifted off of the build platform. Printing on a heated bed allows the printed part to stay warm during the printing process and allow more even shrinking of the plastic as it cools below melting point. Heated beds usually yield higher quality finished builds with materials such as ABS and PLA. A HBP can also allow users to print without rafts.

VI. Results

Parameter/Model	Ultimaker 2	Mega prusa	Printerbot
Print Speed (mm/s)	30 - 300	38	60 - 65
Print Layer Height (Resolution) mm	0.02 - 0.2	0.35	0.1
Filament Sizes (mm)	3	3	1.75
Price (INR)	157534	90582.05	78706.41

Compare to other market printer Our result is

1. Print Speed (mm/s):45

2. Print Layer Height (Resolution): 0.1-0.2 mm

3. Filament Sizes (mm): 3

VII. Acknowledgements

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Automatic Braking System with Additional Safety Solutions

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ABSTRACT

Automatic Braking System (ABS) With Additional Safety Solution shows the use of GPS, GSM, and RF module for the safety of biker's .It deals with the automatic braking of bike when the obstruction closer is detected to avoid accident. It also sends the relative message when the accident is occurred an sends its current location .It does not allows the Ignition of the bike without wearing the helmet and also, when driver is drunken .It is application based project, which is been defined for specified application such as Bike.

Keywords : Microcontroller, GPS, GSM, RF module, Ultrasonic Sensor, Alcohol Detector.

I. Introduction

An Automatic Braking System with Additional Safety Solution, It helps us in the Road Safety concern .It becomes necessary to implement such technique which is not easy to bypass the basic rule of wearing helmet. The bike could not Start without wearing helmet. The helmet also consists of alcohol sensor and also if the alcohol is detected it would not allow the bike to start and it uses RF module for the signal transmission. The Ultrasonic Sensor is situated in the front side of the bike to detected the obstruction and the Automatic brakes are applied to avoid collision   In Prone areas of bike where the bike is likely to fall during the accident Switches are connected as they are pressed the message is send to various helping canters along with the location with the help of the GSM and GPS module. Reason for which the project is specified for bike because the bike accidents are more on roads comparable to other vehicles.

Flaws in Automatic Braking System (ABS) With Additional Safety Solution:

There can be flaw in the detection of the objects, sometimes unnecessary objects can get detected by ultrasonic sensor leads to unnecessary braking. Some human mistakes may also occur while handling the Bike.

Analysing all the facts, some of the common observed errors and mistakes are:

- Battery used in helmet should be charged or else the helmet will not be detected and bike won't start.

- Bike motor requires high current to drive. So need to use some source that can provide high current such as Relay

II. Objective

There is drastic increase in the bike road accidents nowadays. So the usage of such bike with additional safety solution can give helping hand to reduce the accidents .The involvement of the Alcohol Sensor, Helmet Switches ensure the safe system for bikers.

The GPS and GSM helps with the sudden recognition of accident spot, and tends to help the suffering individual.

III. Problem Formulation

As the project name itself demands to give the safety to the biker .But the problem is the sensor during the turning can detect unnecessary obstruction which can apply unwanted brakes. In case of massive accidents switches can washed out due to high impact .hence we are working on sensing capacity of the module and as well as on the reliability of the switches.

IV. Block Diagram

Figure 1 shows the simple transmitting block diagram of our project. The transmitter section consists RF encoder and RF transmitter, Battery, Alcohol Sensor, Helmet Switches .This will send signal to the RF Receiver and the Micro-controller of 8051 family will give signal to the GPS and GSM modules to send messages.

If the accident switches are pressed the Micro-controller will give signal to GPS and GSM module .It will relatively show the output on the LCD display.

Fig2 Explain about the working of the Automatic braking system, which also related to the Micro-controller. It applies brakes according to the suitable input from the sensor.
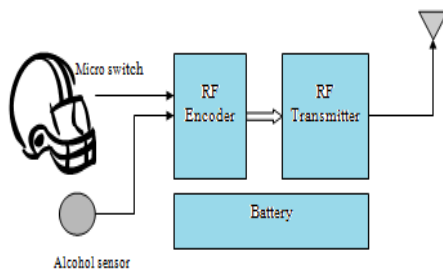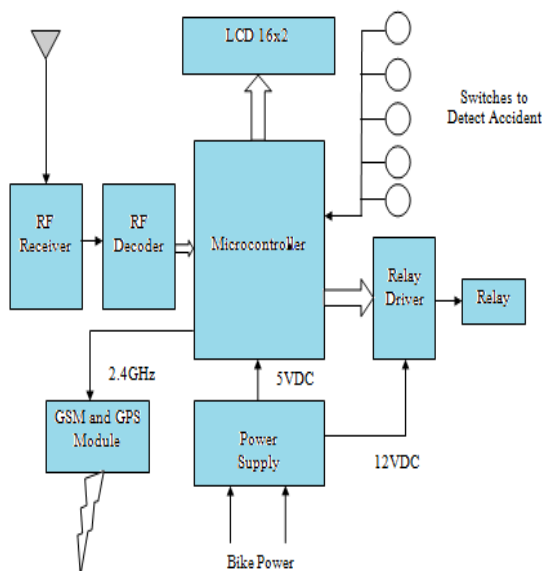
Fig.1 Block diagram of transmitter and receiver.
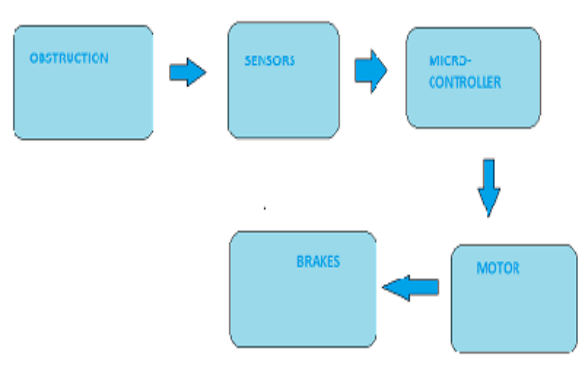
Fig.2 Block diagram of Automatic Braking system

V. Circuit Diagram

A large part of the project involved choosing the appropriate hardware components to detect the object, sense alcohol content and collision so that the microcontroller can control and provide a wireless data link and sends SMS. The initial idea was to search for an all-in-one solution that would have all the components integrated, allowing for the smallest size possible. Initially it was thought that a simple circuit could be built and attached to a microprocessor to control the power. But the cost of the circuit with

microprocessor is very high. It was decided that designing a simple circuit, with the help of the microcontroller and ultrasonic sensor would provide 80% accurate sensing and other status of sensors. The following sections describe the research process as well as the implementation of these integrated circuits. Hardware implementation was done in Eagle 6.0 which is having the facility of PCB layout print.

Requirement Analysis Phase

Interfacing methods of different modules with microcontroller:

- Interface microcontroller with HT12E and HT12D
- Interface microcontroller with LCD,MQ3 and motor.
- Interface microcontroller with Ultrasonic sensor, GSM and GPS module.
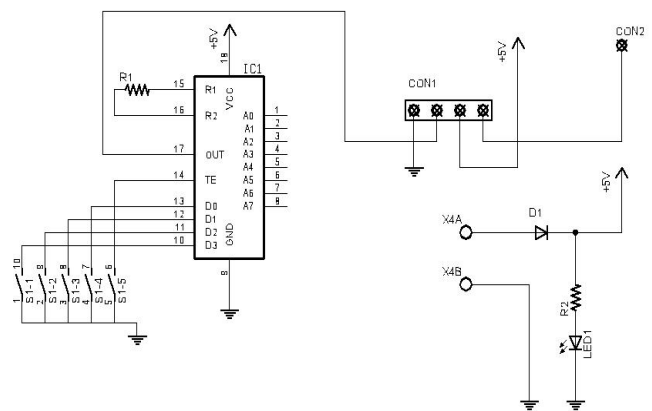
Figure 1.Circuit Diagram of Encoder and Transmitter.

Encoder :

An encoder can be a device used to change a signal (such as a bit stream) or data into a code. The code serves any of a number of purposes such as compressing information for transmission or storage, encrypting or adding redundancies to the input code, or translating from one code to another. This is usually done by means of a programmed algorithm, especially if any part is digital, while most analog encoding is done with analog circuitry.

Transmitter :

The function of a radio frequency (RF) transmitter is to modulate, up convert, and amplify signals for transmission into free space. An RF transmitter generally includes a modulator that modulates an input signal and a radiofrequency power amplifier that is coupled to the modulator to amplify the modulated input signal. The radio frequency power amplifier is coupled to an antenna that transmits the amplified modulated input signal. Power amplifiers are required in radio telecommunication systems to amplify signals before transmitting, because a radio signal attenuates on the radio path. We are using transmitter to transmit a signal that, 'the helmet was putted on by the biker'.
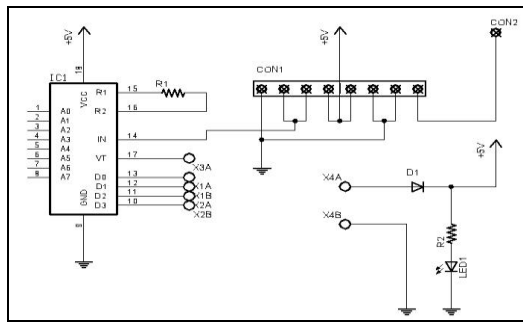
Figure 2: Circuit Diagram of Decoder

RF-Decoder:

A decoder is a device which does the reverse of an encoder, undoing the encoding so that the original information can be retrieved. The same method used to encode is usually just reversed in order to decode.

Microcontroller 40 Pin 2 (X):
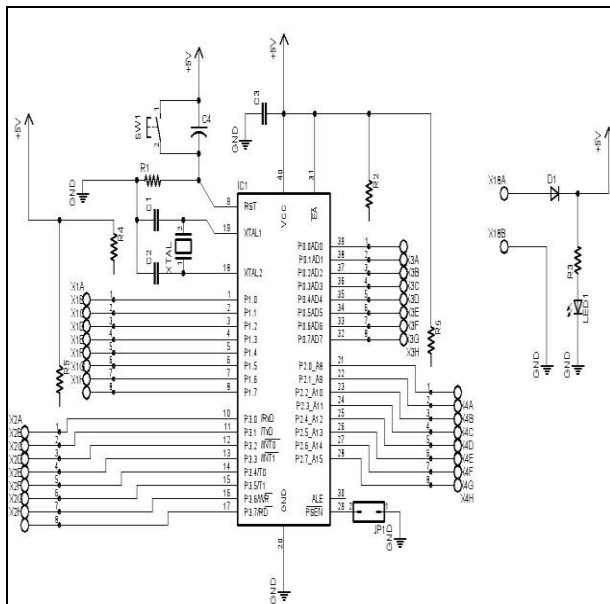
Figure 3: Circuit Diagram of 40 pin microcontroller.

The above is the minimum system configuration i.e. required for a microcontroller to start or to run properly, this the common circuit for any microcontroller based embedded system.

VI. Software Implementation

According to the hardware circuit design features, required algorithm is as written. First the system initializes each module, and then alcohol sensor sense the helmet wear or not and alcohol content processed by controller. When the receiver receives the command, it will be displayed on the LCD display. If user clear the helmet and alcohol requirements then ignition access will open otherwise block the ignition and sends SMS to related number. Then ultrasonic sensors will activate and starts sensing the collision object if any object comes in the decided range it will detect and automatically breaks and after object goes away from the range its released the brake to initial position.

If accident happens then it detects using the sensor processed by microcontroller. When microcontroller receives the signal then it also allows reading the GPS location from Rx pin .controller sends the SMS of accident to relative and hospital numbers along with the GPS location. If user presses the bypass switch in delay interval then this process aborts. We wrote the program in Embedded C using below algorithm.

Algorithm

- Detect helmet is wear or not.
- Detect alcohol content level is below the normal or not.
- Display corresponding result on LCD.
- If helmet wore and alcohol content below the normal then open the access of ignition. If not sends the SMS.
- Check the ultrasonic sensor. And start detecting the collision object .If detect the object in the range apply breaks and released after clear it.
- If accident happens and microcontroller receives the signal then sends SMS and if a bypass switch is pressed then cancel the process.

VII. Future Recommendation

In future we have a tendency to plan to construct our intelligent system during a compact size and additionally as globally acceptable to notify the No entry and No parking areas.

Government should enforce laws to install such system in each 2 wheelers. By implementing such mechanism in 2 wheelers, the deaths attributable to due to driving and alternative road fatalities are often brought to zero p.c. And also indicates No parking area which would reduce the crowd of the vehicle in those areas. No entry area is mainly allocated during the development or repairing of the road, if the rider enters in such area this system would immediately intimate as No entry area and vehicle can stop automatically.

In case of any accident it might send the messages to the friends continuously about the location of the accident happened until the first aid reaches the rider. Our system helps to know the location of the vehicle for rescuing in the case of theft incidents.

VIII. Acquired Benefits

- Provides a better security to the biker.
- In the case of accidents, where every minute is important, the user can be traced within a second, so as to provide him with all necessary help will be simplified.
- As after wearing helmet, it is necessary to provide code, through mobile is necessary, it is impossible to steal a bike, as a unique code is provided to each biker. Suitable during long distance journeys.
- Can be modified for four wheelers.

IX. Conclusion

The proposed methodology is used to make an intelligent project for bike safety and solutions according to automatic braking system and intelligent helmet using controller. This technology will minimize the road accidents in India and saves the life of human being. This project is restricted to some range. So this can be further modified by increasing module range and other mechanical applications.

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Adaptive Traffic Control

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ABSTRACT

During past few decades, western society has been constantly confronted with problems caused by increasing road traffic. This increase in traffic demand leads to a heavily congested network and has a negative effect on traffic safety, air pollution, and energy consumption. The expectations of the use of telematics technology in road traffic in this respect are high, since this technology could lead to system innovations (e.g., advanced vehicle guidance), which in the long term can contribute to the problems faced.

Vehicle-to-vehicle communication can further advance the development of ADA systems. Cooperative ACC (CACC) is a further development of ACC that adds vehicle-to-vehicle communication, providing the ACC system with more and better information about the vehicle it is following. With information of this type, the ACC controller will be able to better anticipate problems, enabling it to be safer, smoother, and more "natural" in response. Although CACC is primarily designed for giving the driver more comfort and convenience, CACC has a potential effect on traffic safety and traffic efficiency. It is of importance to understand the traffic-flow effects of CACC early in the development so that, if they are discovered to inadvertently create problems, the design can be adjusted accordingly before adverse traffic effects are widely manifested. Apart from that, it is recommended to study the traffic-flow effects of CACC so that these (comfort) systems can be developed to best support future advances.

I. Introduction

The concept has its roots in swarm robotics. Consider the situation of 2 robotic vehicles operating in an normal line follower mode. Let us consider the line the Robots are following, is the road on which the Robotic vehicle is moving. Two such roads with Robotic vehicles moving on them merge into a single road. The Robotic vehicles use swarm robotic algorithms and communicate with one another using Zigbee Pro module (IEEE -802.15 – 2.4 GHz) fitted on top of it.

They adaptively adjust with one another and form a merged queue on the common road without colliding with each other and maintaining a safe distance with each other's. Down the line, the road bifurcates or trifurcates and each Robotic vehicle goes along their own designated paths. The entire operation takes place in fully autonomous mode without any human control, either through wired or wireless device. The Diagram below explains the flow of moving vehicles.
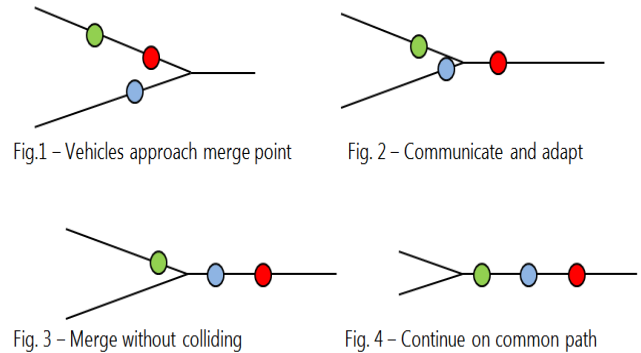
Fig.1 – Vehicles approach merge point

Fig. 2 – Communicate and adapt

Fig. 3 – Merge without colliding

Fig. 4 – Continue on common path

II. Objective

Our objective is designing a vehicle that can communicate with other vehicles on the road and avoid the collision and accidents we are using E-Yantra Firebird V robot as a prototype hardware system and XBee module for establishing a communication path between the prototypes.

III. Motivation

Building more roads and highways is no longer a feasible solution to reduce traffic congestion, a problem that has countless consequences. As expanding the infrastructure is often not practicable, due to the great expense and because most of the major traffic cities have already reached their maximum capacity for roads and highways, and with the ongoing advancement of artificial intelligence and wireless technology, the emphasis has turned to telematics technology integrated with Adaptive Traffic Control (ATC).

The need of adaptive traffic control is increasing which provide advance safety in any kind of road situation. On other hand by implementing adaptive systems in vehicles the vehicles will consumes less fuel and avoid the wastage of fuel due traffic congestion. The Adaptive Cruise Control (ACC) has been already implemented and used in luxurious car. When driver switches the car on the ACC mode; the car goes into the autonomous mode where the acceleration and deceleration is control by the car for maintaining the safe distance from the car ahead of it on a single lane. The 'ATC' deals with the extension of 'ACC' where the vehicles coming from different lanes will not collide at the merging point thereby increasing the safety features of the car and creating an intelligent vehicle system.

Program Flowchart

```
┌─────────────────────────────────┐
│   DEFINE OPERATING FREQUENCY     │
│   & INCLUDE ALL HEADER FILES     │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│        INITIALIZE LCD            │
│        INITIALIZE ADC            │
│     INITIALIZE MOTOR PORTS       │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│       INITIALIZE BUZZER          │
│   INITIALIZE POSITION ENCODER    │
│ INITIALIZE PWM FOR VELOCITY CONTROL │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│   SET ISR FOR POSITION ENCODER   │
│ & CONVERT COUNTS INTO DISTANCE (mm) │
└─────────────────────────────────┘
                │
                ▼
┌─────────────────────────────────┐
│ SET ISR FOR RECEIVE COMPLETE INTERRUPT │
│ (USART0) & SET BAUDRATE FOR TRANSMISSION │
└─────────────────────────────────┘
                │
                ▼
         ◇ IF SHARP
           SENSOR > TH ◇ ── YES ──▶ STOP
                │
                NO
                │
    ┌───────────────┐◀────▶┌───────────────┐
    │  TRANSMITER   │      │   RECEIVER    │
    └───────────────┘      └───────────────┘
            │                      │
            ▼                      ▼
┌─────────────────────┐  ┌─────────────────────┐
│ IF COUNT < TH1 THEN │  │ IF UDR=1 THEN FORWARD│
│   FORWARD & UDR=1   │  │ IF UDR=2 THEN STOP   │
│ IF TH3 > COUNT > TH2 │  └─────────────────────┘
│  THEN FORWARD & UDR=2│
└─────────────────────┘
```

System Model

```
┌─────────────────────────────────┐
│    ADAPTIVE TRAFFIC CONTROL      │
│  3-LANE TRAFFIC MANAGEMENT       │
│    COLLISION AVOIDANCE           │
│ WIRELESS XBEE TRANSMISSION       │
│    IN BROADCAST MODE             │
└─────────────────────────────────┘
```



```
┌──────────────────────┐      ┌──────────────────────┐
│   ADAPTIVE CRUISE     │      │    CO-OPERATIVE       │
│      CONTROL          │      │  ADAPTIVE CRUISE      │
│                       │      │     CONTROL           │
│  SINGLE LANE SAFETY   │      │                       │
│                       │      │  2-LANE COLLISION     │
│   MAINTAIN SAFE       │      │    AVOIDANCE          │
│  DISTANCE FROM THE    │      │                       │
│ VEHICLE IN FRONT ON   │      │ ESTABLISHES VEHICLE   │
│  THE SAME LANE BY     │      │   –TO-VEHICLE         │
│    USING SENSOR       │      │  COMMUNICATION        │
│                       │      │                       │
│  NO VEHICLE – TO –    │      │ TWO XBEE'S ONE ACT    │
│     VEHICLE           │      │ AS TRANSMITTER AND    │
│  COMMUNICATION        │      │  OTHER RECEIVER       │
└──────────────────────┘      └──────────────────────┘
```


Firebird – V Atmega2560 (E-Yantra & NEX Robotics)
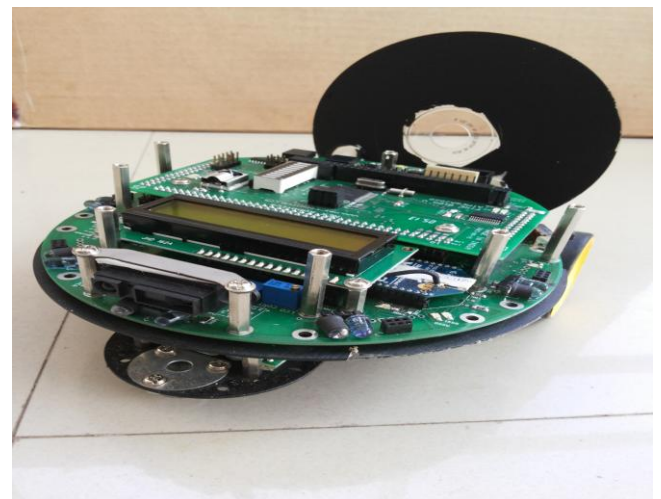
IV. Experimental Study

- The white line sensors are used for dedicating the path for the robot to travel on; basically resembling the vehicle running on the road.

- Sharp & IR proximity sensor is used for maintaining the safe distance from the robot running on the same lane.

- LCD is used as an indicator display which shows different parameters like velocity of the motors, sensor values for analysis and distance travelled by the robot.

- For displaying the sensor values the Microcontroller uses the inbuilt ADC for converting the sensor analog outputs into digital values.

- The distance is calculated by using the concept of position encoder i.e. for each pulse the shaft counter increments; increasing the distance travelled in millimeter.

- Velocity control i.e. variable speed of the robot is achieved by using the PWM concept and is calibrated between 0 (min) – 255 (max) velocity of the robots (vehicle).

- Zigbee is used for establishing vehicle to vehicle wireless communication and in broadcast mode it transmits as well as receives simultaneously by using Interrupt Vector Control.

ATC for Single Lane
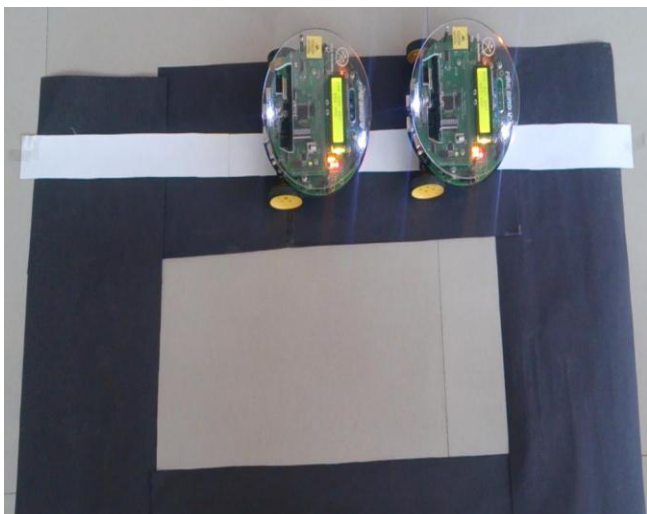
ATC for Two - Lane
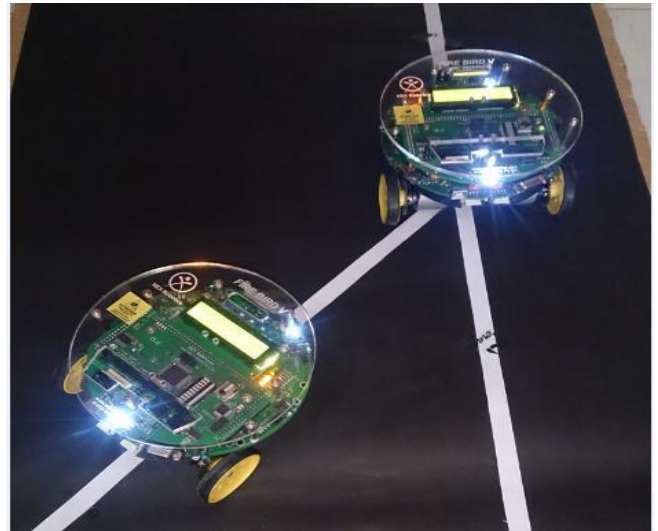
ATC for Three – Lane
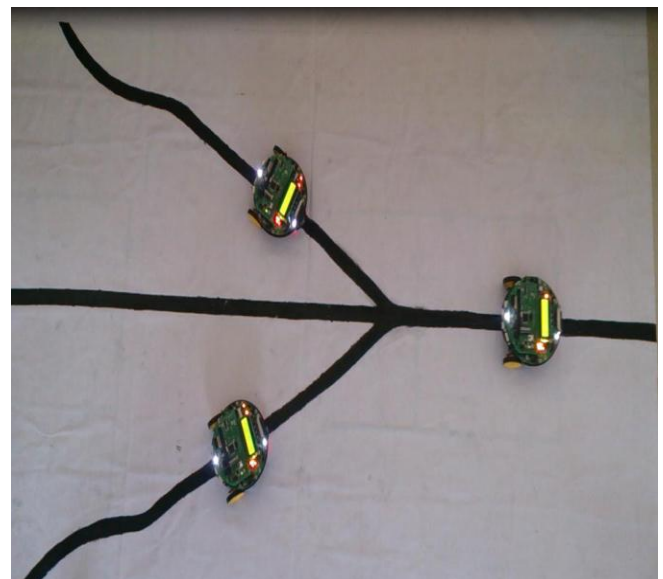
V. Applications

1. Collision Avoidance Systems for Vehicles.
2. Autonomous intelligent Robotic Motion on Plant Shop Floors.
3. Automated motion with collision avoidance for Yacht, Ships and Cruises.

VI. Conclusion

Road safety is major issue nowadays, especially for highway traffic where accidents are common. Adaptive Traffic Control (ATC) is a step taken to minimize the accidents. Some ACCs give early warning of accident situation, while others try to avoid it. Traditional solutions to this issue involve mainly automatic control systems for individual vehicles.

The future is smart intelligent vehicles that are completely independent of the driver to reach the desired destination which can avoid collisions and accidents by enhancing the safety features of the vehicle. Adaptive Traffic Control is step taken towards such an intelligent vehicle which can reduce traffic congestion by eliminating the traffic signals and establishing vehicle to vehicle communication and controlling the brakes, acceleration & deceleration.

This concept can be applied in future by extending the work on its research. By not just communicating with nearby vehicles but the cluster of vehicles by using image processing and communication networks concept with it and adapt to the lane traffic more efficiently.

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Human Skin as Input Device

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ABSTRACT

We present a technology that allows human body for acoustic transmission, which enables in realizing skin as an input surface. Transverse and longitudinal waves that propagate through the body are examined to resolve finger tap location on the arm and hand. These mechanical vibrations are collected using an array of piezoelectric sensors contoured on the armband. The armband developed is wirelessly connected to the computer thus achieving naturally portable, constantly accessible and on-body input system. The device has a range of 120 meters in line of sight or 40 meters in indoor or urban area. To encounter efficiency, potential and limitation, experiments on user based upon BMI study is illustrated. This technology consumes lesser hardware footprint and develops effective method of mobile interaction between human and computer.

Keyword : *Bio-acoustics, finger input, buttons, gestures, on-body inter-action, projected displays.*

I. Introduction

The increasing popularity of sophisticated mobile technology has supported the emergence of multimedia, entertainment, and augmented reality applications for mobile computers. These developments of small portable electronic devices motivate the need for simple and efficient portable input devices. However, their small size typically leads to limited interaction space, which consequently diminishes their usability and functionality. Since size of buttons and screens cannot be increased without losing the primary benefit of portability. Devices such as keyboard, pointing device, joystick, mouse, optical, pointing stick, touchpad, touchscreen and trackball chorded input scheme to interpret finger movements. Another option is to opportunistically appropriate surface area from the environment for interactive purposes. We can use small mobile device to turn tables on which it rests into a gestural finger input canvas. The limitation of this method is tables are not always present, and in a mobile context, users are unlikely to want to carry appropriated surfaces with them.

Appropriating augmented reality and wearable computers for enhanced interactions with small mobile systems delivers increased external input surface area. Furthermore, proprioception – our sense of how our body is configured in three-dimensional space – allows us to accurately interact with our bodies in an eyes-free manner. In this paper, we present our work on a device that allows analysing mechanical vibration, which propagate through the body for development of finger input wearable device.

The contributions of this paper are:

1) We describe the design of wearable armband sensor for acquisition of mechanical vibration.
2) We describe an analysis approach that enables our system to resolve the location of finger taps on the body.
3) We assess the robustness and limitations of this system through a user study.
4) We explore the broader space of bio-acoustic input through prototype applications and additional experimentation.
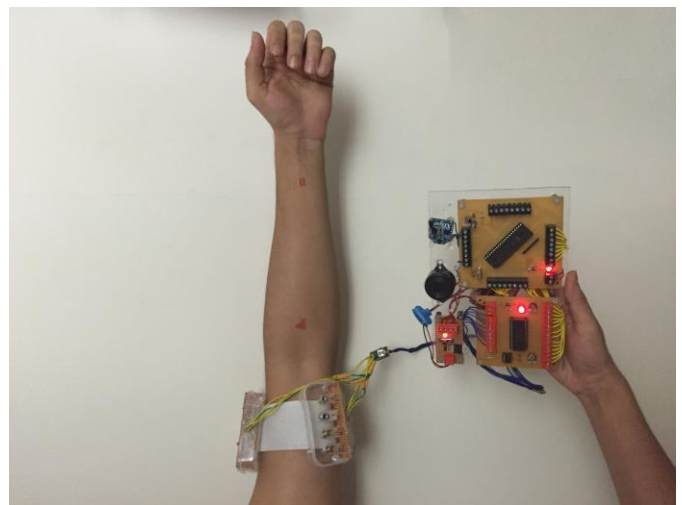
Figure 1 : An armband consisting of piezoelectric sensors built in array. These sensors detect vibrations transmitted through the body. The two array of sensors as shown above contain four, cantilevered piezoelectric films, responsive to a different frequency range due to addition of weights.

II. Objective

The main objectives of developing human skin as input surface are:

1. To introduce the concept of bio-medical human interface in electronics.
2. To allow user to tap their skin to control audio devices, make calls, navigation purposes, play games, i.e. provide interface with the desired application.

III. Problem Formulation

The primary objective is to provide an always- available mobile input system that is, an input system that does not require a user to carry or pick up a device. Techniques currently developed are limited in its precision in unpredictable acoustic environments, and suffers from privacy and scalability issues in shared environments.

IV. Block Diagram

Figure 2. Shows the block diagram of project. It consists of ADC0809, controller (8051), Bluetooth modem (XBEE- S2) and piezoelectric sensors. It is a simple illustration of how we have implemented our project and the various parts involved in it.

1. Piezoelectric Sensors: This prototype contains eight small cantilevered piezoelectric elements configured to be highly resonant and sensitive to frequencies acts like a mechanical Fast Fourier transform and provides extreme out-of-band noise suppression, allowing the system to function even while the user is in motion.

2. Controller (8051):It helps in carrying out bit level Boolean logical operations directly and efficiently on select internal registers and select RAM locations.

3. ADC0809: ADC0809 data acquisition component is a monolithic CMOS device with an 8-channel multiplexer, 8-bit analog-to-digital converter, and microprocessor compatible control logic.

4. Bluetooth modem (class 1): Bluetooth is a packet-based protocol with a master-slave. Bluetooth operates in the range of 2400–2483.5 MHz. Bluetooth wireless Access up to a radius of 328 feet (100m). In particular this device is used for the exchanging data over short distances.
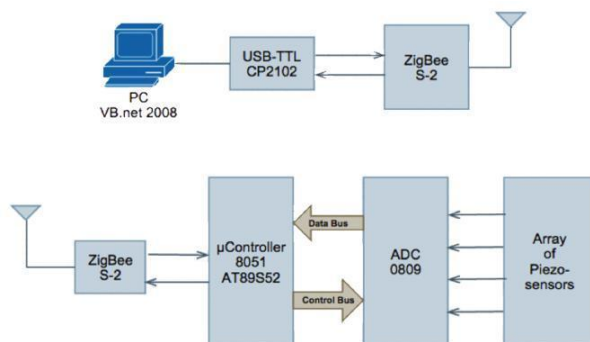
Figure 2: Block Diagram.

V. Software Implementation

In our prototype system, we e capture data from the ten sensors connected via TTL UART 6PIN Module Serial converter CP2102 to a conventional desktop computer, where a application developed in vb.net interfaced with the device.

Each channel was sampled at rate that would be considered too low for speech or environmental audio, but was able to represent the relevant spectrum of frequencies transmitted through the arm. This reduced sample rate (and consequently low processing bandwidth) makes our technique readily portable to embedded processors.

Data was then sent from microcontroller over a local socket to our primary application, written in vb.net. This program performed three key functions. First, it provided a live visualization of the data from our eight sensors, which was useful in identifying acoustic features (Fig. 3). Second, it segmented inputs from the data stream into independent in-stances (taps). Third, it classified these input instances.

The program recorded the timestamp as a potential start of a tap. If the intensity did not fall below a second, independent closing threshold between 100ms and 700ms after the onset crossing (a duration we found to be the common for finger impacts), the event was discarded. If start and end crossings were detected that satisfied these criteria, the acoustic data in that period was considered an input event. These are fed into the trained database for classification. We use an event model in our software once an input is classified, an event associated with that location is instantiated. Any interactive features bound to that event are fired. We readily achieve interactive speeds.
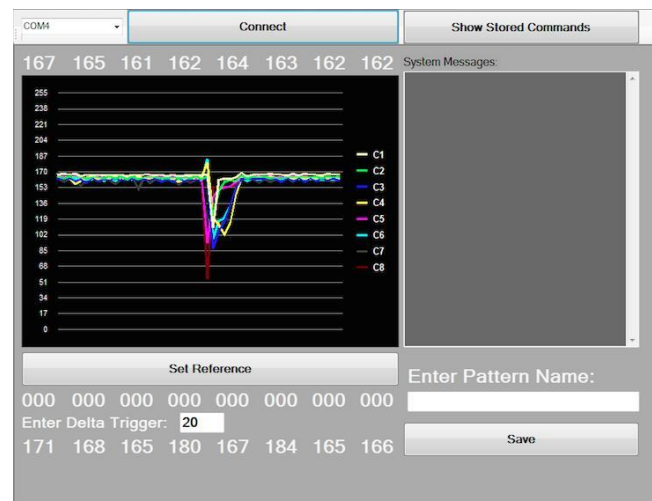
Figure 3: Screenshot of pattern generated due to finger tap
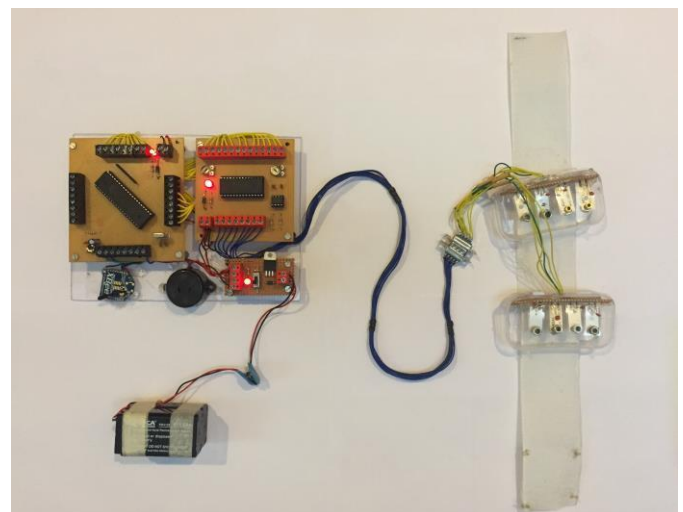
Figure 4: Armband connected to ADC0809 and µController AT89S51

VI. Algorithm

The system consists of an armband consisting of cantilevered piezoelectric sensors will be strapped on arm. The tapping on certain predefined areas of your palm, fore arm will generate longitudinal and transverse waves, which will be detected by piezoelectric sensors. A pattern will be generated which is then compared with the database stored in computer, thus the later matches with the stored database there will be a controlling action i.e. your arm will act as the i/o device

similar to the touch screen, mouse and keyboard.

VII. Experiment

To analyse the performance of our device, we performed experiments on people of different age groups and different B.M.I index. There were 20 candidates aged between 20yrs to 45 yrs. having B.M.I index in the range of 21(normal) to 31.9(obese). The Accuracy of these experiments varied according to the B.M.I index. People with Higher B.M.I index had lowest Average accuracies.
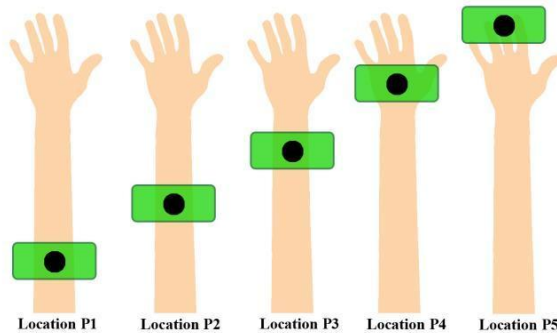
Figure 5: Location used for experiments

Following were the results of the experiments performed. We predefined 5 points namely P1, P2, P3, P4 and P5.

The following table shows the accuracy of the following predefined points.
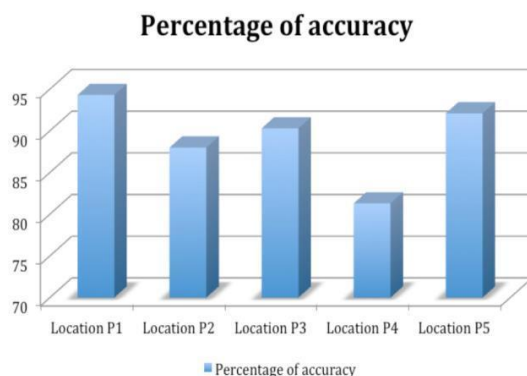
Figure 6: Accuracy of experiment conducted location.

The above accuracies are determined by performing 10 sample taps on each predefined points. It is not surprising to get highest average accuracies at points predefined closer to the sensors.

VIII. Future Scope

This paper describes an input device for mobile and wearable computers. Armband mounted sensors are portable and unobtrusive, and allow rapid input using all fingers. Probabilistic character disambiguation allows non-chorded input, providing smooth transition from traditional input devices. In addition, hands do not have to be held in a specific position during input operation, so that input can be entered while the user is standing or walking with their hands at their sides. Several improvements can be made to each element of the system. For example, integration of Pico projector implements better human computer interaction. Furthermore, advancement in embedded system leads to compact device design.

IX. Conclusion

The proposed technology appropriates the human body as an input surface. We have developed wearable armband for sensing bio-acoustic vibration in order to detect and localize finger taps on the forearm and hand. This will enable us to have always-available input system that does not require an external hardware, which needs to be carried by the user. Work has been done to accurately detect varying ranges of BMI and perform accurate skin input recognition in all environmental conditions. This project can be further equipped by increasing its range in industries and large-scale applications just by configuring it with the required devices.

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2. Microprocessor Architecture, programming and applications (Gaonkar).

Power Theft Monitoring System

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ABSTRACT

Aiming at the disadvantage of current anti-theft technology, a novel smart grid based wired power theft monitoring system is proposed in this paper. The system consists of transformer sensor node, controlling station, transmission line sensor node, and wired consumer sensor node. The proposed software module also incorporates different data aggregation algorithms needed for the different pathways of the electricity distribution system. This design incorporates effective solutions for problems faced by India's electricity distribution system such as power theft, and transmission line fault. The proposed architecture is designed for single phase electricity distribution system, and this design can be implemented for three phase system of electricity distribution with minor modifications.

I. Introduction

Many developing countries confront widespread theft of electricity from government owned power utilities. In India Electricity theft leads to annual losses estimated at US$4.5billion, about 1.5 percent of GDP. Who are the losers? Honest consumers, poor people, and those without connections, who bear the burden of high tariffs, system inefficiencies, inadequate and unreliable power supply. Line faults may be caused due to over current or earth fault. If there happens to be a connection between two phase lines then over current fault occurs. Earth fault occurs due to the earthing of phase line through cross arm or any other way. Now in India, there is not any technique to detect the specific location of the fault immediately. Power theft is another major problem faced by Indian electrical system.

1.1. Problem Statement

Today there is no algorithm available for the automatic mechanism for detecting illegal power theft on a grid. Ineffective and inefficient present methods of detecting and preventing Power theft cause a revenue loss along with damage to personal and public property. Large amount of power shortage is caused due to power theft. One of the challenges in stopping power theft is the difficulty in detecting power theft. In particular it is difficult to find the exact location where power theft is occurring. Measurement of parameters like power line current and power line voltage has not been available in a satisfactory way to optimize power network management.

II. Proposed System

The architecture consists of four modules namely, Controlling Station (CS), Transformer Sensor Node (TSN), Transmission Line Sensor Node (TLSN), Consumer Sensor Node (CSN). The proposed architecture is shown in Figure.
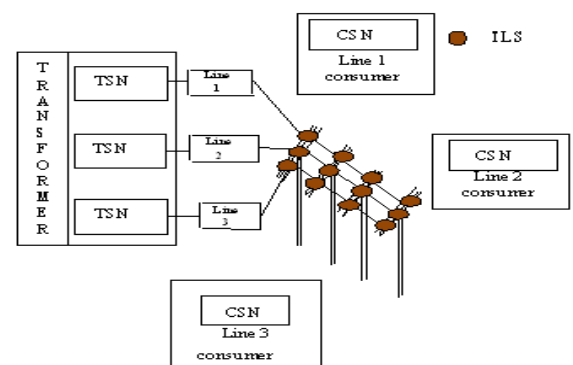
CSN is a consumer power metering device that measures the power consumed by the consumer and send the data periodically to the TSN. Each feeder of the transformer has a TSN which monitors power through each line and collects data from CSN aggregate it and send to the CS. TLSN is another module associated with distribution line, mounted in each distribution line posts.

III. Process Model
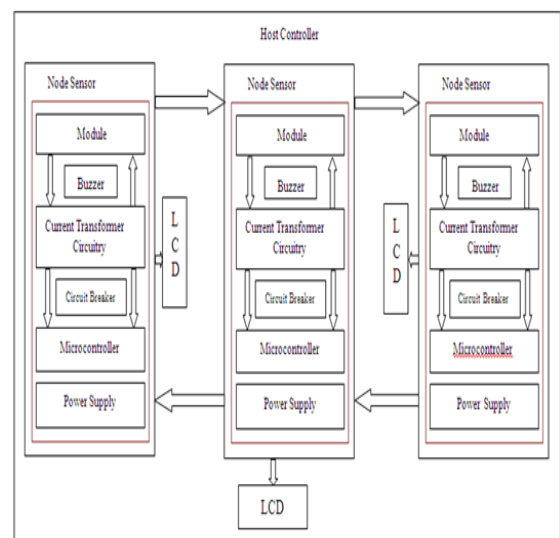
3.1 Current Transformer Circuitry:

We are using Winson WCS2702 current sensor IC. The WCS2702 consists of a precision linear Hall sensor integrated circuit with a copper conduction path located near the surface of the silicon die. Applied current flows through the copper conduction path, and the analog output voltage from the Hall sensor IC linearly tracks the magnetic field generated by the applied current. The accuracy of the WCS2702 is maximized with this patented packaging configuration because the Hall element is situated in extremely close proximity to the current to be measured.

3.2 LCD :

LCD stands for Liquid Crystal Display. As the output of our circuit should be displayed in some form or the other, so we have selected LCD display as it can display 16 characters at a time. It is also easy to interface with the microcontroller without any decoder. So it is better than the seven segment display.

IV. Data Flow Algorithm
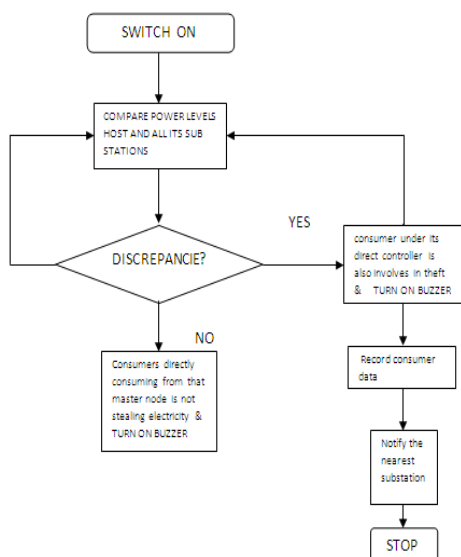
V. Hardware Simulation Results

- System powered on.
- System initializing Slave acknowledges mastering addressing.
- Master microcontroller compares the power consumption from all slave receivers to that of it.
- Node microcontroller plus compares power consumption downstream its position.
- If the comparison in last step (5th) is equal, that sector is OK.
- If the comparison in last step (5th) is unequal, i.e. response from all consumers is less than power being provided; sensor/ at that node will transmit a theft signal to its master along with difference.

- Master node will compare the power consumption from all its slave nodes & last consumer.
- If the comparison in the 8th step the shortage is equal to the shortages from all slave nodes (under the authority of that master node), then consumers directly consuming from that master node is not stealing electricity. That sector is ok.
- If the comparison in the 8th step the shortage of master node is more than that of all slaves node under its authority, then the consumer under its direct controller is also involves in theft.
- **Case 1: Without any load at area side and no tempering** In this case there is no power consumed at the area side. So at the LCD of area node power will be zero. And same power will be transmitted to the substation and power displayed on the LCD will be the system power i.e. 5.30 watt as shown in the fig.

- **Case 2: With load at area side and no tempering.** The power consumed by the load will be displayed on the area LCD and same will be transmitted to substation LCD as shown in fig.
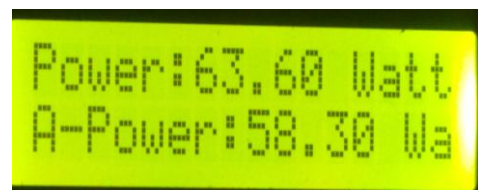
- **Case 3 : With load at area side and tempering** The power consumed by the load will be displayed on the area LCD as shown in fig. (a) And power tempered in between the area and substation will get added with the load power and transmitted to Substation LCD as shown in fig. (b)
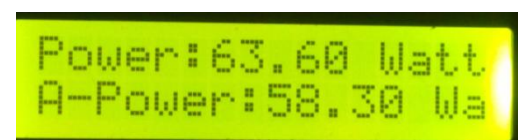
Fig (a)

Fig (b)

VI. Advantages

The proposed system provides the solution for some of the main problems faced by the existing Indian grid system, such as wastage of energy, power theft, manual billing system, and transmission line fault this method will reduce the energy wastage and save a lot of energy for future use. We can detect the location from where the power is being stolen which was not possible before. Optimized use of energy. Real time theft monitoring currently used energy meters can be modified into this sensor, so no need to replace currently used energy meters.

VII. Limitations

One major disadvantage of this project is that it is not capable of detecting the exact location from where the power is being stolen. Cannot determine who is stealing, but no any other existing system is capable. If implemented on a large scale it may take a lot of time and manual input.

VIII. Future Scope

In future, this project can be implemented and validated in remote areas. Future enhancements can be incorporated to suit the system for three phase electric distribution system in India. Along with all this new architectural components can be incorporated, so that the system can be completely used for optimizing the energy consumption. This method will reduce the energy wastage and save a lot of energy for future use. GSM module can also be used in place of wired network. The National Electricity Policy aims at laying guidelines for accelerated development of the power sector, providing supply of electricity to all areas and protecting interests of consumers and other stakeholders keeping in view availability of energy resources, technology available to exploit these resources, economics of generation using different resources, and energy security issues.

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Consumer Buying Behavior towards Internet Advertising :
An Innovative Tool of Promotion Marketing

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(*Wikipedia: Source*)

ABSTRACT

As internet advertising is the key to online marketing, this study seek to identify and explore the factors that impact internet advertisement on consumers intention to purchase This study seeks to explore the factors that contribute to the effectiveness of online advertisement and affect consumer purchasing intention.

This is an Analytical Descriptive study based on primary quantitative data was collected on the basis of Convenience Sampling from the consumers of Bandra region of Mumbai city. The degree of perception towards the internet advertising was quantified by using 4-point rating scale. Parameters have been quantified by calculating basic inferential statistics. After Statistical Analysis it shows a significant impact of internet advertising factors on customer's buying behavior.

Key Words : Buyer's behavior, Internet advertising, Traditional advertising.

I. Introduction

The rapid technological development and rise of new media and communication channels tremendously changed the advertisement business landscape. However the growing dependency on internet as the ultimate source of information and communication, make it a leading advertisement platform.

Internet advertising is also called online advertising, and it is a form of advertising which uses the internet to deliver promotional advertising messages to consumers.

The internet has become an ongoing emerging source that tends to expand more and more. The growth of this particular media attracts the attention of the advertisers as a more productive source to bring in consumers. A clear advantage consumers have with online advertisement is the control they have over the item, choosing whether to check it out or not.

1. Exploration
2. Entertainment
3. Shopping
4. Information

Following table 1 indicates the rapidly growing digital advertising market around the world for the period of 2011 to 2015 in percentage.

Table 1: Digital Advertising Market

	2011	2012	2013	2014	2015
News paper	20.3	18.9	17.8	16.8	15.9
Magazines	9.4	8.8.	8.3	7.8	7.3
Television	39.9	40.2	40.1	40.1	40
Radio	7.1	7	6.9	6.7	6.6
Cinema	0.5	0.6	0.5	0.6	0.6
Outdoor	6.7	6.6	6.5	8.4	6.3
internet	16.1	18	19.8	21.6	23.4

As internet advertising is the key to online marketing, this study seek to identify and explore the factors that impact internet advertisement on consumers intention to purchase especially in a developing country context. There are different forms of internet advertising, some of them are mentioned below.

A. Types of Internet Advertising

- Display Advertising: It consists of static or animated images as well as interactive media including audio and video. It uses demographic and geographical targeting i.e. capturing users cookie and browsers history to determine demographics, location and interests.
- Affiliate Marketing: It is a form of online advertising where advertisers place campaigns with a potentially large number of publishers, who are only paid media fees when the advertiser receives web traffic.
- Social network Advertising: It is one of the most popular forms of internet advertising, where advertising on social media networks can take the form of direct display ads purchased on social networks; self-serve advertising through internal ad networks and ad serving on social network applications through special social network application advertising networks. Social networks like Face book give advertisers a huge variety of targeting options for their advertising campaigns.
- Mobile Advertising: It is generally carried out via text messages or applications. The obvious benefit of mobile advertising for brands is that mobile devices like smart phones are usually close to owner throughout the day. Different mobile advertising tactics include: idle screen advertising, app-advertising, double click for advertisers etc.
- Pop-up: A pop-up ad is the one where a new window opens in front of the current one, displaying an advertising or entire web page.
- Trick banner: It is one that attempts to trick people into clicking often by imitating an operating system message. Usually used by matrimonial sites which show ladies and have banners like "find your love" in shaadi.com.
- Floating ad: The most basic floating ads simply appear over the web page, either full screen or in a smaller rectangular window. It is a type of rich media web advertisement that appears uninitiated, superimposed over a user-requested page, and disappears or becomes unobtrusive after a specific time period around 5-30 seconds.

- E-mail advertising: It is one of the best ways to advertise your business to the most relevant users and is one of the favorite tools of internet marketers, whereby promotional mails will be given to potential users. E-mail advertising can be carried out through different types of emails such as- Email Newsletters, Transactional Emails, Direct emails etc.
- Video advertising: The idea behind video advertising is something is to create an interesting and interactive video clip of business product and promote it on the web using various video and social media channels.
- Search Engine Advertising (SEO): It is one of the most solid, slow and yet effective form of online advertising method which is affordable. SEO is actually the process which involved the improvement of the search engine visibility of a website which is made by making some basic changes on various elements of a website along with some external promotional activities.
- Search Engine Advertising (SEM): It is another method of improving the search engine visibility and the only difference with SEO is that user has to pay for websites inclusion in search engine and similar channels. SEM is highly recommended if user is in need to quick instant and relevant traffic through search engine. The more one is willing to pay, the higher will be the traffic but the only drawback is that once user stops paying, and his website will be out of the frame.

The development of the Internet tool was accompanied by a business turnaround which has deep effects on the rules of marketing and particularly the Company-Customers Relationships.

The graphical interface that the Web can create between the company and its customers promotes its use as a medium of marketing communication. The strengths of e-communication are endless particularly for companies, at the same time it also suffers from a few weaknesses.

B. Strengths & Weaknesses of Internet Advertising
Strengths:
- Reach more Customers
- Cost effectiveness
- Personal touch
- Expert insight
- More targeted audience
- Highest penetration
- Promptness
- Accessibility
- Maintenance Convenience
- Easy update on product

Weaknesses:
- Some methods are costly
- Intrusive ads
- Copyright and other legal problem
- Banner blindness
- Internet frauds
- Overloading of ads
- Slowdown of web pages
- Spam

C. Comparative Analysis on Traditional and Internet Advertising

Table 2: Traditional V/S Internet Advertising

Attribute	Traditional Advertising	Internet Advertising
Form	Print advertisements, Television Commercials, radio broadcasts, billboard signs, poster display.	Banner ads, pop-up windows, interstitials, paid search, classifieds, rich media ads.
Format	Well defined size or duration.	Indefinitely creative palette giving way to complex variations and multiple formats.
Timings	Prime time is leisure time.	Prime time is work time.
Objective	Delivering brand or product awareness or passing information.	Can lead to multipurpose Delivering brand / product awareness/ passing information/ Sales and customer service.

D. Key Words

- Buyer's behavior: A management theory component which analyzes the purchasing habits of individuals and/or groups, primarily used for marketing purposes, the analysis include an examination of perception, desire, decision-making and satisfaction.
- Internet advertising: Use of internet as an advertising medium where promotional messages appear on a computer screen. S since the communication software (browser) reveals sufficient   information about   the site's visitors, online advertising can be custom-tailored to match user preferences.
- Traditional Advertising: Traditional advertising is what most people think of when talking about advertising or marketing. This includes the "usual" venues for media placement, such as newspaper, radio, broadcast television, cable television, or outdoor billboards.

II. Review of Literature

An extensive literature review is done on the concepts and theories related to web advertising. A review of Research papers, articles is undertaken to take note of and acknowledge work that has been done in the field of Internet advertising as such. The Researcher has collected secondary data from reputed Journals and Magazines, Newspapers, articles, Internet websites and Archives.

According to *Vikas Bondar (2000)* Internet is a really good thing. The Internet gives people a greater amount of information as we need. It is the best way to get a comparison of the products that we need. If we are interested in buying, it is best for us to check the Web sites. Also if we would like to make our own Web page we can do this, without paying a lot of money. Year after year

we get more and more new, interesting information and in the future the Internet use will increase more than now. This article explains how internet is useful tool for advertisement.

According to *Dr. Gurmeet Sing and Mr. Harish Gautam (2002)* study revealed that web advertising and Internet Marketing in Punjab is still in its infancy. Only a few people use net and those who use it are least interested in purchasing through net. Some of them don't have credit card and some of them are fear sharing the number with the web-site because of hackers. But the most drastic thing is that those who have experienced the purchase through net are not satisfied with their purchases.

J. Suresh Reddy (2003) has published article in Indian Journal of Marketing. Title of article is "Impact of E-commerce on marketing". Marketing is one of the business function most dramatically affected by emerging information technologies. It can create closer yet more cost effective relationships with customers in sales, marketing and customer support. Companies can use web to provide ongoing information, service and support. It also creates positive interaction with customers that can serve as the foundation for long term.

Scott F. Geld (2003) has written the article entitled "Cost savings between Traditional marketing and Internet Marketing". According to his opinion Marketing can be defined as 'whatever you do to promote and grow your business' including market research, advertising, publicity, sales, merchandising and distribution. With traditional marketing techniques all of these things are delivered in print format or in person. Internet marketing however, uses the power of online networks and interactive media to reach your marketing objectives. No paper, no telephone calls, no in person appearances. Internet marketing can save your time, money and resources.

Neelika Arora (2004) has published research article entitled "Trends in Online Advertising" in Advertising Express. As per her article the global online advertising revenues are expected to touch US $10bn by 2006. In India, the revenues at present are estimated to be Rs. 80 cr. and are expected to increase six times more within the next five years. This article explains demographic profile of Indian users. It also gives the Comparison between global trend and Indian trend.

V.Kumar and Denish Shah (2004) have published research paper entitled "Pushing and Pulling on the Internet "The internet is fast emerging as a domain sales channel. The Internet is expanding& it influences consumer which shifts the consumer behavior. It has changed the way product awareness is created, developed new modes of product consideration. It also creates new means of purchasing products. This has brought new opportunities, challenges and threats (in the form of competition) to both existing and new business.

Dr. Rajesh Mahajan and Prof. Sunil Kumar (2004) have published their research paper entitled "Organizational Participation in Web Based E-markets" in Indian Journal of Marketing. The present research work on "Organizational Participation in Web Based E-markets" is

an attempt to know the level and nature of participation by the industrial units located in Punjab, primarily dealing in Hand Tools and Sports goods. Web penetration is surprisingly helping this organization to exploit the markets globally.

Taylor, Strutton, and Thompson (2012), found however, that social media users' message sharing behaviors are also attributed to the need for self-enhancement. When consumers perceive an online advertisement to be consistent with their identity, they are more likely to share the message with others because it is representative of who they are and what they like. Thus, "advertisers should consider the symbolic and self-expression properties of their online ads and match them to targeted consumers' self-concepts". In other words, the marketing of a company needs to share similar characteristics with its target market's interest.

The article "Web ads that work" from Website www.maxpc.co.uk explains which Software tools can be used to design Web ad. Unlike most other media, an online ad has the potential to react and interact, with the target market. The target market is young and looking for fun and excitement.

Statistics show that using the phrase 'click here' increases click through by around 20 per cent. The real power of online advertising lies in combining the interactivity of rich media formats (such as Flash) with great concepts. This is the area that offers the greatest opportunities for creative and memorable advertising.

III. Objectives of the Study

1) To study the factors influencing the customers buying behavior towards internet advertising.
2) To analyze the Strengths and Weaknesses of internet advertising.
3) To give suggestion for improvement of buying behavior towards internet advertising.

IV. Hypothesis of the Study

- H_0: There is no significant impact of internet advertising factors on customer's buying behavior.
- H_1: There is significant impact of internet advertising factors on customer's buying behavior.

V. Need and Scope of the Study

Advertising is the branch of marketing that deals with communicating to customers about products, brands, services and companies. The internet as a global communication medium provides advertisers with unique and often cost-effective ways of reaching advertising audiences.

Advertising on the internet is almost a necessity for modern businesses, especially those that do business outside of their local community. Consumers use the internet for more than simply entertainment or information, as they do with radio, television, magazines and newspapers. Consumers use the internet to assist them

in nearly every aspect of life, creating countless opportunities to place relevant, targeted ad messages.

In addition to advertising, the web offers high impact opportunities to leverage word-of-mouth marketing and generate buzz about company. Product review websites and social media outlets allow customers to praise or condemn company business based on their personal experiences. Thus the internet ties the customer service components directly to advertising.

Internet advertising is the best choice for brands looking for long term, performance oriented campaigns with high penetration. Advertising involves a large amount of money and is always a big risk, since its consequences are not known. To lesson this risk companies try to advertise through magazines, newspapers and as well as the internet. Online advertising is effective because it allows direct response that beneficial to both the consumer and the seller.

As internet advertising is the key to online marketing, this study seek to identify and explore the factors that impact internet advertisement on consumers intention to purchase especially in a developing country context.

The extent and variety of internet advertising is growing dramatically. Businesses are spending more on online advertisement than before. Understanding the factors that influence internet advertisement effectiveness is vital. This study seeks to explore the factors that contribute to the effectiveness of online advertisement and affect consumer purchasing intention.

VI. Research Methodology of the Study

This is an Analytical Descriptive study based on primary quantitative data was collected through questionnaire which is self-administered by the researcher. Secondary data were collected from various published and unpublished sources such as bank documents, brochures, magazines, manuals, journals and internet.

A random sample of 200 respondents was questioned on the basis of Convenience Sampling from the consumers of Bandra-West and East region of Mumbai city. Bandra region is versatile area in metropolitan city of Mumbai.

The study adopts survey method for collection of data during December 2014 to May 2015. A questionnaire was given to study the various factors affecting the consumer buying behavior and data was analyzed with the help of 16 parameters. The degree of perception towards the internet advertising was quantified by using 4-point rating scale. Each parameter identified for the study is based on following four Dimensions:

1) *Reliability Factors*: It refers to the dependability of online advertising services offered.
   a) Correct information
   b) Updated information
   c) Opinion of peer/family/friends
   d) Anytime-Anywhere information

2) *Innovation Factors:* It refers to the element of innovative newness in the advertising which is the soul of any advertising, which creates the distinct image in the minds of consumer.
   a) Creativity & intellectual clarity in advertisement
   b) Interactive
   c) Impersonal form to advertise
   d) New products & services

3) *Effectiveness Factors:* This dimension is identified with effective and efficient services provided to consumers using internet advertising.
   a) Provides better choice
   b) Branded products
   c) Cost-effectiveness
   d) Global coverage

4) *Behavioural Factors:* It refers to factors which is indicative of their life style, perception and attitude towards Internet advertising.
   a) Shopping frequency
   b) Impulse buying behavior
   c) Shopping budget

Parameters have been quantified by calculating basic inferential statistics, which is mentioned in *Annexure 2.*

VII. Data Analysis

From the above analysis Advertising Impact was found out using SPSS package for all 200 respondents with respect to above 15 advertising Dimensions, which has given 2.70785 as Mean Score of Adv_Impact Factor. Using all these information Hypothesis Testing was done as per *Annexure-1.*

After Statistical Analysis in *Annexure-1* it shows a significant impact of internet advertising factors on customer's buying behavior specially with respect to following parameters.

- Creativity & intellectual clarity in advertisement
- Impersonal form to advertise
- Cost-effectiveness

A. Observations of the study

- Most of the people are influenced by friends, family and other peer groups while buying through internet advertising.
- Social media advertising is most preferable as a tool of internet advertising over other tools and traditional media. Display and E-mail advertising is preferred at second and third place.
- Among traditional form of advertising people prefer television the most. Radio and outdoor advertising is preferred at second and third place.
- Advertising through internet is better and effective for consumers to try new products and services.
- Though trust on internet advertising is increasing, however people are less confident on the information given for advertising a product or service.
- After looking at the advertisement given on internet, there is change in shopping frequency and shopping budget. i.e. an increase in impulse buying behavior and increased in shopping budget.

- Various ways of interaction possible on internet advertising between Buyer and Seller on queries related to product or services.

B. Suggestions of the study

- Internet advertising is still new to many; hence one should understand all relevant aspects including legal aspects such as design, copyright, other content requirements and guidelines with reference to internet advertising.
- Color, fonts, size of ad(s) and message etc. plays the critical role in getting ad(s) noticed and more important responded to.
- Message on ad(s) should be selected concisely and clearly and relate it to an emotion or situation shared by the consumers.
- Internet ad(s) should be placed where the right people will see them i.e. targeted audience. So choose the placement of ad(s) according to age, gender, interests, hobbies and all psychographic (income, education, hobbies etc.)
- Attracting the eye comes first-keep in mind that what they see reflects directly on company. Any site where one is advertising should have good reputation and be sure that site should not disappoint consumer with "next step". Further site should load quickly, be easily navigated and not require too many forms to complete to get final order or check out or call.
- The best way to decide what type of internet advertising to do is consider your own experience with online ads. Be careful regarding Pop-up ads as it has become more hated than calls from telemarketing.

VIII. Conclusion

Internet advertising is on all time boom and is bound to take Indian advertising on all new level. The main strength of internet as an advertising medium is its ability to reach out a vast audience at one go. Internet advertising medium is versatile and it stands apart from the conventional advertising medium. Its highly flexible medium that allows you to make changes during the course of the campaign as market is highly dynamic. The study shows that internet advertising plays an important role in selling product as it affects consumers buying behavior. Hence make it easy for customers and provide ways for people to return purchases.

Finally it is noticed that with the increased adoption ad fission of the internet. World Wide Web is becoming gradually a standard advertisement platform.

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QUESTIONNAIRE

[1] Please ( ) the box that indicates your age group:

16-20 yrs. ☐   21-25 yrs. ☐   26-35yrs. ☐
36-45yrs. ☐   46-55yrs ☐   55+yrs ☐

[2] Please ( ) the box that indicates your Gender:
Male ☐   Female ☐

[3] What is your general view about shopping? Please ( ) the most appropriate option.
Leisure ☐ Essential ☐ Routine ☐ Undecided ☐

[4] How frequently you are browsing on the internet? Please ( )the most appropriate option. (On Daily basis)
Once ☐   Twice ☐   Thrice ☐   Four times ☐
Five times or more ☐   Irregular ☐

[5] Approximately how much time do you spend on internet? Please ( ) the most appropriate option. On Weekly basis)
0-3 hrs. ☐   4-6 hrs. ☐   7-10 hrs ☐
More than 10 hrs. ☐

[6] While browsing on internet do you manage to catch the advertisements very often? Please ( ) the most appropriate option.
Yes ☐   No ☐

[7] Sometimes your email inbox may be flooded with the advertisements. Do you delete them without reading? Please ( ) the most appropriate option.
Yes ☐   No ☐

[8] Which form of internet advertising do you find the most effective? (Rank the following from 1-7, 1 for most effective and 7 for least effective)
Email advertising ☐
Social media advertising ☐
Display advertising ☐
Content advertising ☐
Referral advertising ☐
Affiliate advertising ☐
Search engine advertising ☐

[9] Rank the following (from 1-7, 1 for most important and 7 for least important) on how much they influence your buying behavior?

News paper advertising ☐
Magazines advertising ☐
Television advertising ☐
Radio advertising ☐
Cinema ☐
Outdoor advertising ☐
Internet advertising ☐

[10] Please ( ) the most appropriate option related to internet advertising that you might consider while deciding your purchase?

1=NOT AT ALL**; 2**=SOME EXTENT**;**

3=VERY MUCH**; 4**=FULLY EXTENT

Sr. No.	Questions	1	2	3	4
1	Have you ever purchased a product or service based on information you received about it through internet advertising?				
2	Do you find information shown in advertisement is reliable?				
3	Do you think that internet has provided more effective platforms to new product or services as compared to other marketing advertisement channels?				
4	Do you think advertisements on internet helps in choosing products or service?				
5	Do you agree that in this busy world, advertisements on internet help you to update your knowledge about different product or service?				
6	Do you ever share your comments with friends or family about product or service that you have purchased through internet advertisements?				
7	Do you agree that your shopping frequency is increased due to emergence of internet advertising?				
8	Do you think impulse buying behavior has increased due to emergence of internet advertising?				
9	Does your shopping budget have increased because of internet advertising?				
10	Do you think advertisements on internet have added more branded products in your shopping basket?				
11	Do you find that internet advertising is more appealing to target audience in terms of creativity and intellectual clarity?				
12	Do you agree that internet advertising is more interactive for customers towards dealer?				
13	Do you consider that 24*7 information through internet advertising helps in buying right product at any time and from anywhere?				
14	Do you believe that cost effectiveness of internet advertising helps in bringing down the price of the product?				
15	Do you consider that internet advertising is impersonal place to advertise?				
16	Do you agree that internet advertising has more wide range or global coverage for promotion of product?				

Annexure-I Hypothesis Test
Mean vs. Hypothesized Value

2.00000	hypothesized value
2.70785	mean adv_impact
0.84654	std. dev.
0.05986	std. error
200	n
199	df
11.83	t
4.38E-25	p-value (one-tailed, upper)

Hence, Null Hypothesis is Rejected

Annexure-2 Statistical Responses of Consumer Buying Behaviour

No.	Parameters	N	X	M	Z	S.D.
	Reliability Factors					
1	Correct information	200	2.42	2.00	2	.853
2	Updated information	200	2.77	3.00	3	.770
3	Opinion of peer/family/friends	200	2.68	3.00	3	.776
4	Anytime-Anywhere information	200	2.96	3.00	3	.832
	Innovation Factors					
5	Creativity & intellectual clarity in advertisement	200	2.61	3.00	2	1.098
6	Interactive	200	2.81	3.00	3	.843
7	Impersonal form to advertise	200	2.89	3.00	4	1.111
8	New products & Services	200	2.81	3.00	3	.781
	Effectiveness Factors					
9	Provides better choice	200	2.84	3.00	3	.876
10	Branded products	200	2.60	2.50	2	.957
11	Cost-effectiveness	200	2.40	2.00	2	1.027
12	Global coverage	200	3.21	3.00	4	.872
	Behavioural Factors					
13	Shopping frequency	200	2.53	2.00	2	.820
14	Impulse buying behavior	200	2.92	3.00	3	.910
15	Shopping budget	200	2.39	2.00	3	.970

Ethnographic Study in relation to Environmental Conservation with Reference to Hinduism

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ABSTRACT

The multicultural base of the India represents numerous types of festivals. Some of them show the religious origins, whereas majority involves seasonal change and had some cultural significance. The celebration days of some of the festivals directly represents the co-relation with the natural environment, so the human life get benefited. The present study focus on the seasonal period of Indian festivals in context to the role of the such festivals in relation to nature conservation.

Keywords–*Ethnographic study, Environmental Conservation*

I. Introduction

Ethnography is the systematic study of people and cultures. It is designed to explore cultural phenomena where the researcher observes society from the point of view of the subject of the study. Ethnographic research usually involves observing target users in their natural, real-world setting, rather than in the artificial environment of a lab or focus group. The aim is to gather insight into how people live; what they do; how they use things; or what they need in their everyday or professional lives. This ethnographic study examines the relationship between culture and environmental education with reference to Maharashtra. These festivals are with reference to Hindu calendar.

1. There are numerous types of festivals in India. Though many have religious origins. Other involves seasonal change or has some cultural significance. Also certain institution celebrates their own festivals to mark some significant occasion in their history. These occasions could be the day these institutions were founded or any other event which they decide to commemorate annually. Seasonal festivals are determined by the solar and the lunar calendars and by the cycle of the seasons. The changing of the seasons was celebrated because of its effect on food supply. The festivals have a great significance in the human life. They increase love and affection among each other. It helps to maintain health. The health depends upon a diet and season. Therefore, Shravan month which comes in the rainy season has many fasts and Diwali comes in cool season in which sweets and nutritious food is consumed. It suggest the seasonal changes in food during festival which maintains our health, festivals are also important to maintain a health, mind which creates happiness in the life. The festivals become meeting grounds of relations and they worship rivers, birds, animals. Festivals have been carried from generation to generation. [1]

II. Methodology

The Descriptive method of study is used with reference to secondary data. The festivals are studies as the month order, with reference to Hindu calendar.

III. Results

The Hindu culture is represented by festivals which show the connection in relation to the environmental factors.

The festivals and their co-relation with environmental conservation is as follows :

A. Chaitra (Mar-Apr)
Gudhi Paadva (1 Chaitra) –
This marks the *beginning* of Hindu calendar, which falls around March or April of the Western calendar. A gudi or victory pole is erected outside their house which is tied with a cloth and some sweets.
Ecological Significance :
Neem leaves are eaten on this day to ward off illness during the new year. There is great amount of marigold flowers used to decorate the house which blooms abundantly during this season representing the co-relation with nature.

B.Vaishaakha (Apr-May)
Akshayya Truteeya –
Vaishaakh shuddh truteeyaa. In the Marathi calendar, 3 and 1/2 days in a year are considered as auspicious days on which you can buy gold, perform poojas etc.

Ecological Significance :
On this Day , the poojas performs which need mainly banana leaves, tulsi leaves and other medicinally important plant leaves, which help the people to acquainted with the importance of the natural ecosystem.

C.JyeshhTha (May-Jun)
Vat Pournima –
This is women's festival where women tie threads around a banyan (wad) tree and pray for the same husband in every birth (after Satyavaan-Saavitri's story).
Ecological Significance :
This festival come during monsoon season which brings the message of plant protection. As the Banyan tree is known for its longitivity and the huge canopy produce large amount of oxygen, this festival brings the message of nature conservation. Thus future generation do understand the importance of such plants, and do the plantation as it is the best season for plant growth and survival.

D.Ashadha (Jun-Jul)
Aashadhee Ekaadashi –
On this day, people go walking in huge processions to Pandharpoor singing the abhangas(chanting hymns) of

Saint Tukaram and Saint Dnyaneshwar to see their God Vithhal. People usually fast on this day.

Ecological Significance :

People go walking, thus reducing a major problem of vehicular pollution. At the same time, the women carry tulsi plant on their head throughout the journey, thus spreading the message of nature preservation.

E.Shravana (Jul-Aug)
Naag Panchami (5 Shravan) –

Snake festival in honour of the naga, snake deities. This tradition started long ago when farmers honored snakes for protecting their farms from crop-eating pests.

Ecological Significance :

This festival celebrated during rainy season. During this periods, the habitats of snakesget flooded due to heavy rains, they forced move to higher grounds. This may result into conflict with human beings. So, to understand the importance of such creature in our life, this festival play a major role in awareness about fauna of the area.

Raksha Bandhan/Narali Purnima (15 Shravana) –

Festival to honor the sea god Varuna. Brothers and sisters exchange gifts, the sister tying a thread as a *rakhi*, a symbolic bond, to her brother's wrist and brother vowing her protection. On this day, the fishermen community workship sea by offering coconut and flowers.

Ecological Significance :

After a long break, fishermen start fishing after this day. This helps the fish population to recover in good number as rainy season is breeding season for many fish species. Thus helping in maintain the ecological balance.

F.Bhadrapada (Aug-Sept)
Ganapati Utsaav (4th Bhadraparda) –

Festival dedicated to Lord Ganesh, the son of Shiva and Paravati. This festival is probably the longest of all, going on for ten days. People also install a Ganesh idol in their homes.

Ecological Significance :

Now a days, people are getting more environmentally concern and started installing clay (called shadu in Marathi) idols which are more ecofriendly than plaster of paris (the major material to make the ganapati idols.)

If you observe the body of Ganesha, it consists of a human form with the head of an elephant. Often people wonder about this strange combination. Reflect upon the nature of the elephant. It is an herbivorous animal that is extremely strong. It lives in a community and travels with the female guiding it. Humans share several qualities with the elephant. It enjoys a fantastic memory. Research is now showing that elephants are capable of expressing emotions such as joy, sorrow and deep loyalty within its communities. They even mourn for those who have died among them.

The form of Ganesha is one that unites humanity with the rest of creation. The human world and the animal world. That symbolises strength and intelligence.

The vehicle of Ganesha is the mouse. The mouse has ability to break down substances into their tiny parts. Thus giving the message to protect each and every species.

Ganesha also carries snake around his waist, which is a symbol of the energy which resides in all human beings. This energy can be used both beneficially or for destructive purposes.

Ganpati is connected to the natural cycle. When we bring this small mud idol home, we offer it all our love and devotion. This idol which collects our positive thoughts and energies is then returned to the earth, either through the rivers or even at home, it carries our goodwill to others and to our environment. We then are united through the earth, the waters and through our goodwill. We need to bring this awareness back into the way we perform our rituals.

Gauri Poojan -

Ganeshotsav also incorporates the Gauri festival. During Gauri Pooja, two idols of the goddess Gauri are decorated and worshipped.

Ecological Significance :

At some places, the Gauri idol is made by using different plant branches which are specifically available during that season. This helps the young generation the abundance of different plant species and its importance in terms of cultural and conservation point of view.

G.Ashvina (Sept-Oct)
Dussehra(Dasaraa) / Vijaya Dashami (1-10 Ashvina) - The festival associated with vanquishing demons, in particular Rama's victory over Ravana in the Ramayana, and Durga's victory over the buffalo-headed Mahishasura. People wash their vehicles clean on this day and decorate it with flowers and leaves of mango tree. Sweets are made.

Ecological Significance :

During this festival, people also exchange leaves of Apta (*Bauhinia racemosa*) tree as symbol of gold. Thus represents the importance of plants in relation to the wealth. Thus encourage people for plantation and conservation of species.

H.Kaartika (Oct-Nov)
Dev Diwali - is celebrated on Kaartik Pournima, celebrating the marriage of tulsi with God Vishnu.

Ecological Significance :

This festival symbolize the importance of medicinal plants in our culture such as tulsi plant and how the plant is culturally connected.

Diwali (Deepavali)(15 Kartika) –

Five day Festival of Lights to celebrate Rama and Sita's homecoming in the Ramayana. It signifies the victory of good over evil. The festival is the time for family reunion.

Ecological Significance :

The festival represents the use of traditional lamps made up of clay and spreading the message of use of natural light instead of using the electricity which is a major natural resource. It also encourage to go close to nature with colorful rangoli made with natural colours. As this festival come during the winter season, the special sweets and savouries like anarse, karanji, chakli, chivda, ladoo are prepared for the festival. This helps in building energy in body during the cold climate.

I. Margashirsha (Nov-Dec)

Datta Jayantee - Celebration of Gad Dattatraya, the three headed God.

Ecological Significance :
This God represents the tree Umber, very well known as Audumber (*Ficus racemosa*). Thus the belief for protecting the plant help to conserve the species.

J. Pausha (Dec-Jan)

Makar Sankranti (14 Jan) - This is the only festival which falls exactly on 14th of January every year. This festival marks Uttarayana(travel towards north pole) of the sun. In Maharashtra, the day is celebrated by giving and receiving sweets made of jaggery and sesame seeds called tilgool.

Ecological Significance :
Makar Sankranti (harvest festival also known by other various names) is the only Hindu festival which is based on the Solar calendar rather than the Lunar calendar. As the season come in winter season, the oil contain in the sweet prepared specially during this festival helps to maintain a healthy body.

K. Magha (Jan-Feb)
Maha Shivaratri –
Worship day of Lord Shiva. Maha Shivaratri is the great night of Shiva, followers of Shiva observe religious fasting and the offering of Bael(Bilva) leaves to the Shiva.

Ecological Significance :
The plant represented by 3 lobed leaves, named bael (*Aegle marmelos*) represents the Trishul. It is a very important plant in terms of its medicinal properties. All parts of this tree viz. root, leaves , trunk, fruit and seeds for curing human ailment.

L. Phalguna (Feb-Mar)

Holi (15 Phalguna) –
This festival is celebrated by lighting a bonfire. The sweet made for this occassion is *Puranpoli*.

Ecological Significance :
As the end of winter season, buring unwanted dried branches and leaves, and adding the remaing ash at the base of the plants as fertilizer send a strong ecological message.

Rang Panchami (16 Phalguna) –
Water festival held during Purnima (full moon) to celebrate the beginning of summer. Expect to be bombarded with water, paint, colored powder and other mixtures.

Ecological Significance :
Starting of Summer season, to reduce the body heat, this festival is celebrated as water festival.

IV. Conclusion

The present study represents the co-relation of the festival season with the ecological factors. So, it is very important to continue the harmony with nature. Eco – fairs and festivals focuses on local cultures, customs, traditions, wilderness, personal growth, social relations and learning new ways to live on our cultural values. Responsible Eco – fairs and festivals includes such programs that minimize the diverse effects on the natural environment and enhance the cultural integrity of local people.

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Ethnographic Research: Review to understand In Current Indian Context

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I. Introduction

Ethnography is a part of anthropological study which deals with in depth study with people (Anderson, 2009). Studying the behavior of humansin their natural environmentand observing their behavior through depth interviews is the prime objective of ethnographic research (Malhotra & Dash, 2009). Previously, this methodology was not much in practice. Nowadays, it is catching up. The possibility might be because of volatile market environment and changing cultural trend is compelling researchers to take up this methodology.

II. Methodology

Ethnographic research is a qualitative research wherein researcher needs less expertise on the research process. The respondents here are observed and interviewed in a non directional way (Wong & Wu, 2012). Grey (1998) identified six components which shows the uniqueness of this research. According to him, ethnography deals with culture and the researcher must be acquainted and with the respondent for a longer period of time. There must be some space between the research object. There must be systematic documentation of the behaviours. In true sense, fitting ethnographic research is not easy in the context of social research. The process details cannot be fit into any stated social research methods and also it is difficult to explain the process throughout the actual research.

III. Review and Discussion

Eminent study done on ethnography was based on two authors namely – Alfred Schutz (Wilson, 2002) and Hans Georg Gadamer. Alfred introduced a term known as phenomenology, which is very much similar to the concept of ethnography and is somewhere related to the method of ethnographic research. The whole idea is about 'lived' in the research environment. It emphasis the meaning what the live research objects gives to the activities they perform. It is required to understand their behavior. This emphasized the uses of qualitative research eventually emphasizing the importance of ethnographic research.

Area of Research	Author	Research Details
Consumer Behaviour	Hill (1993)	This research paper deals with some of the general the issues or dilemmas faced by researchers in ethnographic research. The author has given possible solutions and guide for future ethnographic study.
Accounting Education	Grey (1998)	Introduction of ethnography to those within the accounting/ education research community. Ethnography is a type of qualitative approach to social science which is associated with some traditions in sociology. But , some methodological issues arise in this research in ethnography in accounting.
Sales management	Hurley (1998)	Study focuses on radical, or transformational, change in sales organizations.Ethnographic methods and a review ofthe sales management and change literature, a seriesof propositions is offered describing critical factors for managing change in sales organizations
Small business	Ram (1995)	The paper focuses on the process of 'exchange' betweenresearcher and researched, which emerged as a key issue in a year-long ethnographic investigationof employment relations in three small firms.The paper considers howthe intensive level of involvement during the research was managed, the various modes of'exchange' that were negotiated, and their contribution to shaping an understanding of employment relations in the case study firms.Theorizing these processes can deepenunderstanding of substantive research issues, which is perhaps the key contribution of ethnographicwork.

Consumer Research	Wong & Wu (2009)	Ethnographicconsumer research has received little coverage in current marketing curricula. The innovation discussedin the present paper addresses this problem: it introduces the notion of "cultural relativism" and gives students hands-on experience in conducting cultural analysis of consumer products using ethnographicinterview data.Results showed that studentsunderstood the value of ethnographic consumer research and gained useful experience in collecting,analyzing, and interpreting ethnographic data.
Consumer Research	Horley et al. (2010)	Geographic information system (GIS)technologies were used to enhanceethnographic methodologieswithin a cultural research project. Mapping technologiescan broaden the scope of data available via interview practicesand produce innovative ways of communicating research results tostakeholder communities. A key component of the interview processwas a mental mapping" exercise whereby interviewees drewsketches, revealing important sites and linkages between peopleand places.
Global Marketing	Cayla & Penaloza (2012)	Drawing fromextensive ethnographic fieldwork in Indiawhere they followed several multinational companies, they show howwell-entrenched and enduring identities can obstruct the learning and strategic adjustments that are necessary to appeal to consumers in a new market environment.
Public Relations	L'Etang (2012)	This article presents an argument for anthropologically and ethnographically grounded work inpublic relations. It is suggested thatethnographic research could also aid public relations practitioners. The article adds to existingscholarship through its critique of existing literature that has explored culture in public relationsand its proposal that research based on ethnographic field-work and employing anthropological participant observation could reconceptualize the field and change its theoretical scope.
Change Management	Shipton et al (2014)	A very interesting study regarding changes in construction business has been studied here. Clients have continuous change requirements which are never recorded to study in detail. Since, this change is a must part of construction business, it will give immense input to improve the area. It might eventually help in lessening the changes. Construction of a hospital was considered here to explore the changes. This study is a live example of the field work that takes place in ethnographic study.
Information Systems	Baskerville & Myers (2015)	In this paper, a new type of ethnographic research develops wherein, respondents are also involved. Previous ethnographic research used only the observation method. It was named as design ethnography. It is basically about taking respondents in field.In accordance to this paper, this new development will contribute in information system which has the ability to bridge ethnographic research and design research.
Divergent Research Modalities	Reynolds (2015)	The article quizzes tensions and complementarities in the ways in whichopposing research modalities come to represent relationships amongst family and its effect on child exposure over time. The article highlights the differences occurring between demographic and ethnographic methods. while researching by taking care of different objects and values amongst each.

Since, the researcher does not impose any judgment for getting answers, the respondent feel free to go around with this research on their own terms.

Ethnographic research has developed into a new area known as design ethnography wherein along with the respondent the researcher also participates in the observed practices (Baskerville and Myers, 2015).

There are drawbacks in this ethnographic research which needs to be pinpointed also. One of the first drawback that gets identified is that the researcher becomes a learner of the culture of people rather than being an advisor or instructor (Baskerville and Myers, 2015). Second, reports from two ethnographic researchers on the same research objectives may vary. This might be due to the researcher interpretation or training on the research idea (Agar, 1982).Second, and one of the most interesting fact that lies with the drawback of

ethnographic research is culture. It plays a vital and crucial point regarding researchers doing research on same aspect but they themselves belong to different cultures. Generally these differences are seen people belonging to different countries studying on a similar topic. Their interpretation lies with the ingrained discipline imbibed in them from the place they belong to. European researcher might not be able to interpret human behavior in Asian countries. Culture is omnipresentin one's behavior. And it gets reflected in the research. Another different reason resulting to the drawback must be due to change in the research group. Their opinions can change accordingly. Time lapse also adds to the drawback of the research output. As time flows, opinions change. Again, keeping in mind the audience to whom the research will cater ethnographic research result may differ. If same set of sample is used for different target audience then the interpretation might be different. But in that situation, the different interpretation comes deliberately (Agar, 1982).

Despite ethnographic research is done as being 'lived' within the research situation, it might not be possible to take into consideration all round view of any aspect. As it considers longitudinal data, possible historical data might get distorted, lost or nonexistent. Again, human behavior cannot be extracted completely, and the researcher gets what the respondent wants to deliver.

IV. Conclusion

Ethnographic study in one hand is an evolving study and also it is such an area which gives an in depth view of a research objective. It is not practiced widely because of the subjectivity or the time length. But it is one of the most interesting and productive research methodology. This research methodology keeps the potential to bring out any trends in the change time wise and environmental change wise. It can be encouraged accordingly.

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Cap Prediction System

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ABSTRACT

Most of the students passed out from the 12th Std., find it difficult to obtain the list of colleges which will be available for them as per their CET score. They don't get a clear idea about which colleges they should enter in their choices and in which sequence. And thus sometimes end up getting admission into a college they didn't want as their first preference Due to incomplete knowledge and incorrect form filling they are not able to secure place in engineering college of their choice Thus we have prepared a system that will help them in form filling for securing admission in engineering college. This paper discusses the proposed system, overview of the design, various modules of the system and its implementation.

Keywords: *Centralized Admission Process, engineering college, web system, college cut offs.*

I.   Introduction

The Centralized Admission Process, or the CAP, is the admission process adopted by the Directorate of Technical Education (DTE), State of Maharashtra to conduct admissions to the engineering course across the state of Maharashtra. This means that any student who wishes to secure admission to an engineering course and wishes to pursue it in a non-autonomous college in Maharashtra has to use the Centralized admission process for this purpose. The title of this project, 'CAP Prediction System', is apt because this system which we have developed will try to help the students in the most important aspect which is the filling of the college preference form. The student will be able to enter all his/her related details and the system will provide them with a list of colleges suitable for them based on their entered details. This system aims to be a one-stop solution to preference form worries and the results provided by the system can be used by students to aid the form filling process.

II. Aim and Objective

- Provide the user an indicative list of colleges best suited to their score and preferences.

- This may help user while filling out the college preference form.

- Only colleges indicated can be filled to filter the form of all colleges which the user is not likely to get admission into.

- Preference form rules (top 4/5 colleges compulsory) can be career-defining. Students can avoid crucial errors by using our system.

III. Literature Survey

Engineering is one of the most lucrative sectors in the world today. Across countries, engineers enjoy a huge advantage over others due to their sheer skill set and ability. India has traditionally been a country which churns out a huge number of engineers every year. Hence, there is a lot of competition among students who wish to pursue engineering to secure admission into top colleges. This is made more difficult by extremely tough and rigorous examinations and usually long and grueling admission processes. There are many disadvantages of physical admission process. Thankfully though, a large number of universities have started conducting their admission processes online in recent years, and students naturally, have breathed a huge sigh of relief.

Completely online process - This is the type of admission process where all activities related to conducting admissions take place online, either on a dedicated website or through a common website used by all colleges.

Semi-online process - This is the type of admission process where some of the activities related to conducting admissions take place online while the others require the physical presence of students.

Existing System (Mock CAP) - The Mock CAP is the new addition to the process to get the students used to the process before the fill up the actual CAP Round 1 option form. This consists of only one round.

Here, the students fill up a similar preference form for colleges (minimum one choice and maximum 100 choices). The student is then provided a mock allotment of a college and branch of his choice. However, this is a mock allotment and is only indicative. The student cannot actually claim a seat in the allotted college.

Problems with existing system:

1. The Mock CAP takes into account the number of seats available in the respective colleges while providing the allotment. This means that he process mirrors the actual process where numbers of seats are considered. Thus, a student does not get an actual practice session wherein he/she can check the colleges available to them. The number of seats restriction takes into account the competition too and hence the students do not get a fair idea of available colleges.

2. The Mock CAP provides only one college as an allotment, again mimicking the actual CAP. This defeats the purpose of this round being a practice round as the student only gets one result. If more results are provided to the student, he/she will know his/her potential in securing admission to the colleges available.

In summary, the Mock CAP only helps the student go through the process once before going through the actual process. It doesn't actually help a student in the most important aspect- the filling of the college preference form.

IV. Proposed System

The proposed system, on the other hand, aims to help the candidate make a decision on what colleges or branches of engineering to apply for given the constraints and preferences he/she has. In the proposed system, the candidate enters the details which are then processed by the system's business logic to generate a list of possible colleges the candidate can apply to based on his/her details and preferences. The candidate is provided with the colleges along with branches that are nearest to his/her location, have suitable cutoff scores and also caste provisions. This is done by taking the previous years' cutoff scores into consideration and giving an approximate result. Thus, all the candidate's preferences are taken care of.

The system does not take into account the number of seats in the respective colleges. Thus, no changes are made in the database when a prediction is made. So, every candidate can get an open and unconditional result as to the colleges available for him/her without the results of other candidates affecting his/her prediction. This information can then be used by the candidate as a reference while filling out the actual form.

The most important advantage this system gives to the candidate is that he/she is made aware of the possibilities he can avail of and hence can make an informed decision while filling out the actual form. Many times, candidates fill up preferences in an order which is different from the one they need to fill or want to fill, because they are not aware of their possible chances in the process.

The process that we have developed has following advantages:
1) User friendly - The proposed system is user friendly because the retrieval and storing of data is fast and data is maintained efficiently.
2) Reports are easily generated - reports can be easily generated in the proposed system so user can generate the report as per the requirement.
3) Very less paper work - The proposed system requires very less paper work. All the data is added into the computer database immediately and reports can be generated through computers. Moreover work becomes very easy because there is no need to keep data on papers.

V. Proposed Methodology

The process adopted by proposed system is Bayes' theorem. Bayesian reasoning is applied to decision making and inferential statistics that deals with probability inference. It uses knowledge of prior events to predict future events. Bayes' theorem can be stated as follows :

Prob (B given A) = Prob (A and B) / Prob(A)

Naïive Bayesian classifier is used to predict list of colleges based on the inputs provided. The Naive Bayes' algorithm is based on conditional probabilities. It uses Bayes' Theorem, a formula that calculates a probability by counting the frequency of values and combinations of values in the historical data.Naive Bayes' makes the assumption that each predictor is conditionally independent of the others. For a given target value, the distribution of each predictor is independent of the other predictors. In practice, this assumption of independence, even when violated, does not degrade the model's predictive accuracy significantly, and makes the difference between a fast, computationally feasible algorithm and an intractable one. Using Bayesian terminology, the equation for Naïive Bayes' classifier is given as:

$$Posterior = \frac{Prior \times likelihood}{evidence}$$

Advantages of Naive Bayes' :

- *The Naive Bayes' algorithm affords fast, highly scalable model building and scoring. It scales linearly with the number of predictors and rows. The build process for Naive Bayes' is parallelized. (Scoring can be parallelized irrespective of the algorithm.)*
- *Naive Bayes' can be used for both binary and multiclass classification problems.*
  Thus, after considering the possibilities and weighing the pros and cons, Naïve Bayes' Classifier is apparently the most suitable classification algorithm for this system.

VI. Architecture

The architecture of proposed system is of a web system that consists of four major components
1) Browser or user interface. i.e front end.
2) Web server. (Query Passing)
3) Application server. (Query Processing)
4) Database. i.e., back end.

VII. Technical Requirements

Hardware:
1. Computer Machine
2. RAM 512MB,1.24GZ Processor
Software:
1. Server Side: Web Server – Apache 1.2, Apache 2.x, Xampp, Wamp.
2. Server Side: Database Server – MySQL 4.1, Oracle 10g.
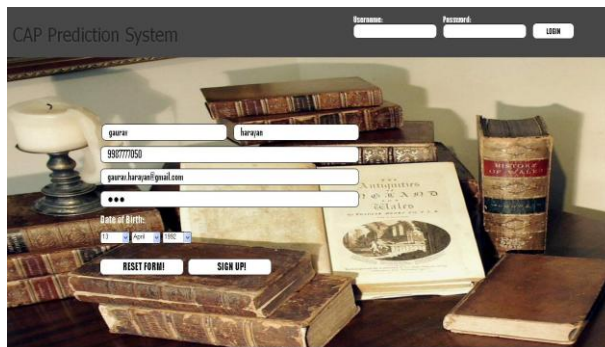3. Client Side: PHP – PHP 4.4.0 and HTML 5.0.

VIII. Modular Design

The proposed system is divided into four distinct modules.
1. Home page
   This is the home page of the system. Student must sign in first then able to use the system.
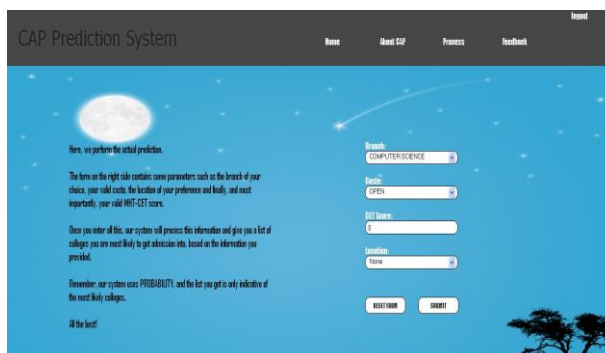
2.   Sign-up

This form allows student to Sign up first & then Login.
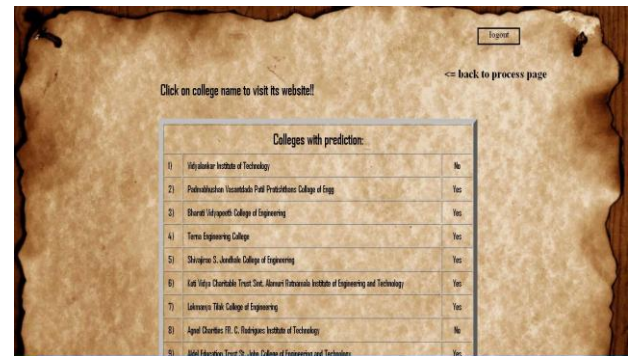

3.   Process

Students need to provide inputs such as Branch, Caste, Cet score and Location.

4.   List of colleges

Here the list of predicted colleges is displayed.

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Trip Planner Mobile Application Using Speech to Text Convertor

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ABSTRACT

Planning an itinerary before traveling to a city is one of the most important travel preparation activities. A travel planning approach using Internet has recently seen a hike because of the information that the users have at their disposal through internet, also most travelers need to plan prior to their travelling for energy saving and visiting maximum places of interests within their specific travel time. Our project provides the best path alternatives from the traveler's utility point of view according to real-time data and personal user preferences. Project will take inputs from users such as their budget, destination, date of journey, etc. Project will process the input and accordingly will provide various modes of transportation, various hotels, different places to visit and their description and news nearby them. All these things will be shown using google maps interface. Along with all these features, we are providing users with Forex related information, tourist guide and checklist and google translator. To make the project more user-friendly we will be integrating speech to text function in the project.

Keywords:*component;formatting;style;styling;insert(keywords)*

I. Introduction

Open data has been more popular recently. Plenty of open data is available through internet. It can be used freely, reused and can be redistributed by anyone. Our model takes various inputs from the user such as date of journey (DOJ), suitable budget of the journey and destination. Using Open data and user input, would be processed and possible plan would be generated.

In the past, most of the trip planning system only concerned the shortest path and shortest spending time for the trip without the real-time information. Many researches focused on the shortest path computation problem. However, the shortest path may not be the best solution for the trip planning in the real world. The traffic condition, departure time, even weather condition may affect the actual arrival time to the destination, especially the short-term.

In this paper, we are showcasing the features of our project "Trip-on-go". Model will display all possible best, cheap and less time consuming modes of transport, and hotels. Along with this, the weather, recent affairs till the destination and a checklist regarding thing to carry. The model will give a detailed information about the destination and the nearby places to visit with peoples review. Our application will also provide information regarding foreign exchange and where you can do the same

and current different currencies rate in that place. The model will be integrated with google translator which will help people to understand and speak different languages. All the features will be govern by speech to text engine enabling user to control by tip of their tongue.

II. Ease of Use

A. *Forex Facility.*
Providing a forex information in the app is what makes it more convenient for the user to calculate, know the ratings and exchange values of the currency.

B. *Languge Translator.*
Language translator makes the app more user-friendly and helpful for the user to communicate, translate and understand the foreign languages.

C. *Things to carry Checklist.*
This is an advanced module of the app which will give the users a checklist to carry things to the travelling destination such as to carry the following things: passport, jackets, raincoats, camera, tent (for outing purpose) and all the basic needed things.

III. Scope

There are many application which help us plan the trip. Most of the applications are useful for planning trip which are within user's country. And also there is no feature like text to speech. We are planning to attract people who wants to plan trip outside their country. And our speech to text will be very helpful for all kinds of travelers who love to travel but are lazy to plan their trip or someone who is visiting for the first time and they don't know about the place that much and want a professional advice about the trip and the destination they are visiting.

The people who want to get frequent news or the facts about the destination they are planning to visit will be really helped by using our model. Our project will also be helpful for those who needs to access forex as we are providing possible information regarding it.

We are developing our model in such a way that it will very user friendly and will makes users job easy throughout their travel.

IV. Features

We take user input as budget, destination and date of visit. Also we will ask the user about his likes as he likes to visit, monuments, pilgrimage places or if he likes restaurants having Indian food or if he likes Chinese. The user will input all about his likes and according to that we will plan the user's itinerary.

The algorithm will prepare a different plan for every user according to their likes and dislikes. The budget will vary from every user. So if the budget is less then the algorithm will display options according to or close to the budget. The cost of modules will be adjusted according to the modules in the plan. Users will get a choice to select the best which fits in his budget amongst each module.

The model will be having information regarding the current weather information and news nearby it.

The plan will include all the possible way of transport in real time like flights or trains all which are available according to the destination and users choice. The user will also get news and facts about the places he is going to visit beforehand on their application as a notification as an option according to the plan they have selected.

The application will also provide a checklist to the traveler before the commencing date of the journey about the things to carry while travelling like passport, tickets and also if it is cold at the destination then to carry warm clothes. The user can also make their own checklist in the application if they want to.

V. Literature Survey

Existing journey planners (see theaa.com or thetrainline.com) typically concentrate on one form of transport, providing information on mileage and directions, or number of stages and the time each will take. Transport direct (see transportdirect.gov.uk), a national journey planning service, extends this across routes combining all forms of transport including bus, train, air and car. In Australia, there are also several journey planners available for users in main cities, such as 'metlink' in Melbourne [1] [2 (see metlinkmelbourne.com.au), '131500 Transport Infoline' in Sydney,
(see 131500.info/realtime/newjourney.asp),
'TRANSLink' (see jp.transinfo.qld.gov.au) in Brisbane, 'Transperth' in Perth (seetransperth.wa.gov.au) and 'AdelaideMetro' in Adelaide.
Their simple functions include providing users with transport information based on start/end location and departing/arriving time. In advanced function, user can choose their preferences for transport mode, trip and other special requirements, such as fewest changes, only use services with wheelchair accessible vehicles, etc.   [3][4] Although the existing journey planners provide schedule and duration information effectively, realistic transport decisions involve constraints, such as weather, safety, fitness and environmental concerns. To address the lack of constraint expression, this research extends the existing journey planner concept to allow users to choose between available routes based on their multi-objective and priorities on transport concerns.

The application based on open data has become much more popular recently.[5]   Depending on OKF's (The Open Knowledge Foundation) definition, open data is the data that can be freely used, reused and redistributed by anyone. Any information that the government collects and is available for people to use is OGD (Open Government Data). Linked OGD (LOGD) is comprised of open government data and linked data that can promote data's reusability and value. The fundamental trip planning

problem is how to schedule a path with a minimum expected cost between the start point and the destination point. In the past, most of the trip planning system only concerned the shortest path and shortest spending time for the trip without the real-time information. Many researches focused on the shortest path computation problem in an abstract graph model .However, the shortest path may not be the best solution for the trip planning in the real world. The traffic condition, departure time, even weather condition may affect the actual arrival time to the destination, especially the short-term trip. In this paper, we showed how to practically design and implement the system for trip planning assisted by open data, and combine the real-time bus information to to make the forecast arrival time close to the real one. The rest of this paper is organized as follows. Section II describes the architectural overview, the system components, and the functionality of each component. Section III illustrates the processing flow of the proposed path selection scheme as well as a simple example. Section IV showed the result of the system demonstration and depicted the comparison with traditional trip planning system and ours.

[6] The evolution of tourism websites is converging to a set of features and best practices that are becoming standard, in such a way that developing a template and later customizing it to a given tourist region is becoming feasible. A very important feature in this kind of site is showing the touristic suggestions of what the tourist can find in the destination, optimally personalized for him/her. One problem in deploying such functionality however is the lack of user experience data suited to perform data mining when a new site is launched. This paper proposes a solution, customizable to any touristic region that harnesses the information available in Flickr, crossing it with a Point of Interest (POI) database and using Google Prediction API (Application Programming Interface) to generate personalized travel suggestions, based on the geographical itinerary the user defined with a trip planner tool.

 [7]The management of transportation systems has become increasingly important in many real applications such as location-based services, supply chain management, traffic control, and so on. These applications usually involve queries over spatial road networks with dynamically changing and complicated traffic conditions. In this paper, we model such a network by a probabilistic time-dependent graph (PT-Graph), whose edges are associated with uncertain delay functions. We propose a useful query in the PT-Graph, namely a trip planner query (TPQ), which retrieves trip plans that traverse a set of query points in PT-Graph, having the minimum traveling time with high confidence. To tackle the efficiency issue, we present the pruning methods time interval pruning and probabilistic pruning to effectively rule out false alarms of trip plans. Furthermore, we design a pre-computation technique based on the cost model and construct an index structure over the pre-computed data to enable the pruning via the index. We integrate our proposed pruning methods into an efficient query procedure to answer TPQs. Through extensive experiments, we demonstrate the efficiency and effectiveness of our TPQ query answering approach.

[8]The increasing popularity of GPS (Global Positioning System) device has boosted many applications, especially those for GPS information visualization. Information visualization techniques are invaluable tools in numerous applications. The goal of this work is to provide visual access to GPS information through the proposed trip planning web application. The main focus is on visualization, organization, fast retrieval, and effective understanding of GPS data mainly for public use, and the simplest way to plan the journey through the city.

The main objective is to introduce this internet-based application to the users of the public transport services. The GPS technology is a new technology in Macedonia and trip planning is not implemented yet, although it has been used in many countries remarkably within the last years. Combining the collected GPS and timetable data in order to bring passengers to a desired location, the goal of journey planner is to reduce travel related risks and uncertainties for passengers who want to travel to an unknown part of the city, or tourists, elderly people or people who usually do not use public transport service.

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Exploring the Various Techniques of Energy Harvesting

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ABSTRACT

Since 1990, the trend is moving faster towards the improvement of technology in the development of portable devices. But there has not been any assurance regarding the power supplies of these portable devices that need to perform and endure in hostile environments. Hence, energy harvesting is the need of the hour. Energy can be harvested or scavenged from unused ambient energy by deploying various energy harvesting techniques. We have explored the various energy harvesting techniques and have made a genuine attempt to analyze the advantages, disadvantages and applications of different energy harvesting techniques.

Keywords : Energy Harvesting; Power; Energy.

I. Introduction

Energy harvesting (EH) is a technique to capture, harvest or scavenge unused ambient energy such as vibrational, thermal, wind, solar, RF etc. and convert the harvested energy into usable electrical energy which is stored and used for performing sensing or actuation. The harvested energy is generally very small (of the order of mJ) as compared to large-scale energy harvesting using renewable energy sources such as solar and wind. Unlike the large-scale power stations which are fixed at a given location, the small-scale energy sources are portable and readily available for usage. Energy harvested from the ambient are used to power small autonomous sensors that are deployed in remote locations for sensing or even to endure long-term exposure to hostile environments. The operations of these small autonomous sensors are often restricted by the reliance on battery energy. Hence the driving force behind the search for energy harvesting techniques is the desire to power wireless sensor networks and mobile devices for extended operation with the supplement of the energy storage elements if not completely eliminating the storage elements such as batteries.

Energy harvesting systems generally consist of: energy collection elements, conversion hardware and power conditioning and storage devices as shown in Fig.1. Power density which is the power output per unit mass or volume is a key performance unit for the energy collection elements. The harvested power must be converted to electricity and conditioned to an appropriate form for either charging the system batteries or powering the connected load directly. Load impedance matching between the energy collectors and energy sources and also between storage elements and connected load is necessary to maximize the usage of the scavenged energy. Appropriate electronic circuitry for power conditioning and load impedance matching may be available commercially or may require custom design and fabrication. Various scavengable energy sources, excluding

the biological type that can be converted into electrical energy for use by low power electronic devices. Our environment is full of ample waste and unused ambient energy that needs to be tapped and converted to usable form. Unlike fossil fuels which are exhaustible, the environmental energies are renewable and sustainable for almost infinite long period. The energy harvesting process can be easily accomplished. As long as the conversion hardware is chosen correctly in relation to the energy sources, the environmental energy can be efficiently harvested and converted into electrical energy. For example the material of the photovoltaic cell in the solar panel is doped in such a way that when the solar radiation is absorbed by the cell the solar energy from the sun would be harvested and converted into electrical energy.[3] [5]

The energy harvesting process comprises of:

1) Energy conversion hardware that converts the environmental energy into electrical energy.
2) Electrical energy conditioning by the power management circuit.
3) Storage of harvested energy in the storage elements.
4) Supply energy to the electrical load. [Fig.1][5]

• *Benefits of Energy Harvesting*

Energy harvesting provides numerous benefits to the end user. Some of the major benefits about EH are stated and elaborated further:

EH reduces the dependency on battery power. With the advancement of microelectronics technology, the power consumption of the sensor nodes is getting lesser and lesser. Hence harvested environmental energy may be sufficient to eliminate battery completely.

• *EH reduces maintenance cost.* Energy harvesting allows for the sensor nodes to function unattended once deployed and eliminates service visits to replace batteries.
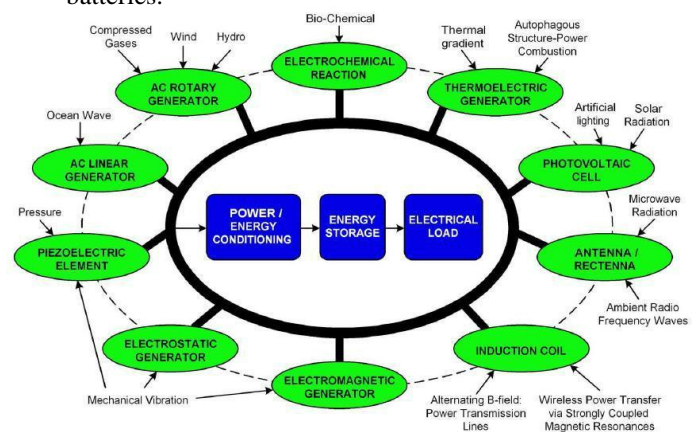

Fig.1. Energy sources and respective transducers to power autonomous sensor nodes.

- *EH helps to provide sensing and actuation capabilities in hard-to-access hazardous environments on a continuous basis.*
- *EH helps to provide long-term solutions.* A reliable self-powered sensor node will remain functional virtually as long as the ambient energy is available. Self-powered sensor nodes are perfectly suited for long-term applications looking at decades of monitoring.
- *EH helps in environmental protection.* Energy harvesting will eliminate the need for battery replacements and hence result in considerable financial saving.

II. Techniques of Energy Harvesting

We have studied and made a genuine attempt to appraise and analyze the existing energy harvesting techniques.

Various Techniques of Energy Harnessing based on different kinds of Energy types mainly categorized into Thermal Energy, Radiant Energy and Mechanical Energy. [Fig.2][3]

A. Mechanical Energy Harvesting

Mechanical energy harvesting indicates the process of converting mechanical energy into electricity by using vibrations, mechanical stress, pressure and strain from the surface of the sensor, high-pressure motors, waste rotational movements, fluids and force. The principle behind mechanical energy harvesting is to convert the energy of the displacements and oscillations of a spring mounted mass component inside the harvester into electrical energy. Mechanical energy harvesting can be: Piezoelectric, electrostatic and electromagnetic. Condition monitoring and structural health monitoring, Data Monitoring, Data Transmission, product monitoring during transport are the application area. [2][6]
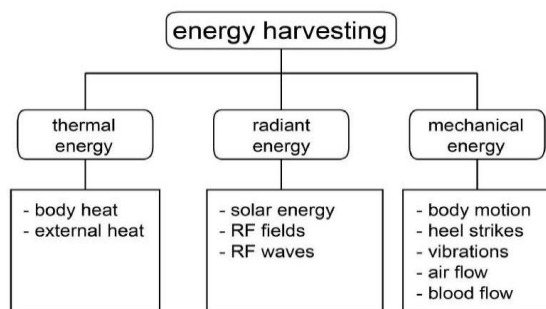

Fig.2. Types of ambient energy sources suitable for energy harvesting

1. Piezoelectric Energy Harvesting

Piezoelectric energy harvesting is based on the piezoelectric effect for which mechanical energy from pressure, force or vibrations is transformed into electrical power by straining a piezoelectric material. The technology of a piezoelectric harvester is usually based on a cantilever structure with a seismic mass attached into a piezoelectric beam that has contacts on both sides of the piezoelectric material. In particular, strains in the piezoelectric material produce charge separation across the harvester, creating an electric field, and hence voltage,

proportional to the stress generated. Voltage varies depending on the strain and time, and an irregular AC signal is produced [Fig.3]. Piezoelectric energy conversion has the advantage that it generates the desired voltage directly, without need for a separate voltage source. However, piezoelectric materials are breakable and can generate charge leakage surge. [2][6][9]
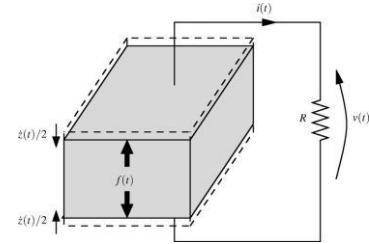

Fig.3. Principle of operation of the piezoelectric transducer.

2. Electrostatic Energy Harvesting

The principle of electrostatic energy harvesting is based on changing the capacitance of a vibration dependent variable capacitor [Fig.4]. In order to harvest the mechanical energy a variable capacitor is created by opposing two plates, one fixed and one moving, and is initially charged. When vibrations separate the plates, mechanical energy is transformed into electrical energy from the capacitance change. This kind of harvesters can be incorporated into microelectronic-devices due to their integrated circuit-compatible nature. However, an additional voltage source is required to initially charge the capacitor.[2][6]
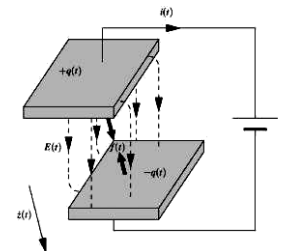

Fig.4. Principle of operation of the Electrostatic Transducer.

3. Electromagnetic energy harvesting

Electromagnetic energy harvesting is based on Faraday's law of electromagnetic induction. An electromagnetic harvester uses an inductive spring mass system for converting mechanical energy to electrical. It induces voltage by moving a mass of magnetic material through a magnetic field created by a stationary magnet [Fig.5]. Specifically, vibration of the magnet attached to the spring inside a coil changes the flux and produces an induced voltage. The advantages of this method include the absence of mechanical contact between parts and of a separate voltage source, which improves the reliability and reduce the mechanical damping in this type of harvesters. However, it is difficult to integrate them in sensor nodes because of the large size of electromagnetic materials. [9]
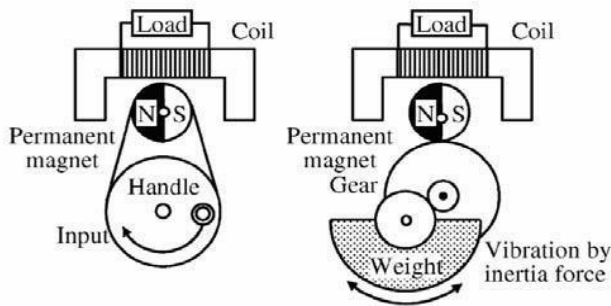
Fig.5. Principle of operation of the Electromagnetic Induction.

B. Photovoltaic Energy Harvesting

Photovoltaic energy harvesting is the process of converting incoming photons from sources such as solar or artificial light into electricity [Fig.6]. Photovoltaic energy can be harnessed by using photovoltaic (PV) cells. These consist of two different types of semiconducting materials called n-type and p-type. An electrical field is formed in the area of contact between these two materials, called the P-N junction. Upon exposure to light a photovoltaic cell releases electrons. Photovoltaic energy conversion is a traditional, mature, and commercially established energy-harvesting technology. It provides higher power output levels compared to other energy harvesting techniques and is suitable for larger-scale energy harvesting systems. [15][16]

However, its generated power and the system efficiency strongly depend on the availability of light and on environmental conditions. Other factors, including the

Fig.6.Photovoltaic (solar) power system.

materials used for the photovoltaic cell, affect the efficiency and level of power produced by photovoltaic energy harvesters. In homes, offices and in many commercial areas the photovoltaic energy used to get rid from electricity failure.

C. Thermal energy harvesting

Thermal energy harvesting is implemented by

1. Thermoelectric Energy Harvesting and
2. Pyro Electric Energy Harvesting.

1. Thermoelectric Energy Harvesting

Thermoelectric energy harvesting is the process of creating electric energy from temperature difference (thermal gradients) using thermoelectric power generators (TEGs) [Fig.7][7].
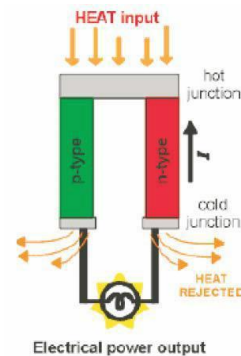

Fig. 7 : Thermoelectric generator

The core element of a TEG is a thermopile formed by arrays of two dissimilar conductors, i.e., a p-type and n-type semiconductor (thermocouple), placed between a hot and a cold plate and connected in series. A thermoelectric harvester scavenges the energy based on the Seebeck effect, which states that electrical voltage is produced when two dissimilar metals joined at two junctions are kept at different temperatures. This is because the metals respond differently to the temperature difference, creating heat flow through the thermoelectric generator. This produces a voltage difference that is proportional to the temperature difference between the hot and cold plates. The thermal energy is converted into electrical power when a thermal gradient is created. Energy is harvested as long as the temperature difference is maintained.

In any kind of electronic circuit TEG mounted between a power transistor and its heat sink that recycle some amount of energy.

2. Pyro Electric Energy Harvesting

Pyro electric energy harvesting is the process of generating voltage by heating or cooling pyro electric materials. These materials do not need a temperature gradient similar to a thermocouple. Instead, they need time-varying temperature changes. Changes in temperature modify the locations of the atoms in the crystal structure of the pyro electric material, which produces voltage. To keep generating power, the whole crystal should be continuously subject to temperature change. Otherwise, the produced pyro electric voltage gradually disappears due to leakage current. Pyro electric energy harvesting achieves greater efficiency compared to thermoelectric harvesting. It supports harvesting from high temperature sources and is much easier to get to work using limited surface heat exchange. On the other hand, thermoelectric energy harvesting provides higher harvested energy levels. Because of the various sizes of thermal harvesters, they can be placed on the human body, on structures and equipment. [7][16]

D. Wireless Energy Harvesting

Wireless energy harvesting techniques can be categorized into two main categories:
1. RF Energy Harvesting and
2. Resonant Energy Harvesting.

1. RF Energy Harvesting

RF energy harvesting is the process of converting electromagnetic waves into electricity by a rectifying antenna, or rectenna. Energy can be harvested from either ambient RF power from sources such as radio and television broadcasting, cell phones, Wi-Fi communications and microwaves, or from EM signals generated at a specific wavelength. Although there is a large number of potential ambient RF power, the energy of existing EM waves are extremely low because energy rapidly decreases as the signal spreads farther from the source. Therefore, in order to scavenge RF energy efficiently from existing ambient waves, the harvester must remain close to the RF source. Another possible solution is to use a dedicated RF transmitter to generate more powerful EM signals merely for the purpose of powering sensor nodes. Such RF energy harvesting is able to efficiently deliver powers from micro-watts to few mill watts, depending on the distance between the RF transmitter and the harvester. [5][6]

2. Resonant Energy Harvesting

Resonant Energy Harvesting, also called resonant inductive coupling is the process of transferring and harvesting electrical energy between two coils, which are highly resonant at the same frequency. Specifically, an external inductive transformer device, coupled to a primary coil, can send power through the air to a device equipped with a secondary coil. The primary coil produces a time-varying magnetic flux that crosses the secondary coil, inducing a voltage. In general, there are two possible implementations of resonant inductive coupling: Weak inductive coupling and strong inductive coupling. In the first case, the distance between the coils must be very small (few centimetres). However, if the receiving coil is properly tuned to match the external powered coil, a strong coupling between electromagnetic resonant devices can be established and powering is possible over longer distances. Note that since the primary and secondary coil is not physically connected, resonant inductive coupling is considered a wireless energy harvesting technique [5][6][16]. The Wireless energy Harvesting techniques are popular now a day to power small autonomous wireless sensors to power them on small scale power requirement, hence the applications such as Home automation, Smart city it is more effective.

E. Wind Energy Harvesting

Wind energy harvesting is the process of converting air flow (e.g., wind) energy into electrical energy. A properly sized wind turbine is used to exploit linear motion coming from wind for generating electrical energy. Miniature wind turbines exist that are capable of producing enough energy to power WSN nodes. However, efficient design of small-scale wind energy harvesting is still an on-going research, challenged by very low flow rates, fluctuations in wind strength, the unpredictability of flow sources, etc. Furthermore, even though the performance of large-scale wind turbines is highly efficient, small scale wind turbines show inferior efficiency due to the relatively high viscous drag on the blades at low Reynolds numbers [1]. On large scale power requirement, the Wind Energy Technique is feasible to recharge batteries.

F. Biochemical Energy Harvesting

Biochemical energy harvesting is the process of converting oxygen and endogenous substances into electricity via electrochemical reactions.

In particular, biofuel cells acting as active enzymes and catalysts can be used to harvest the biochemical energy in bio fluid into electrical energy. Human body fluids include many kinds of substances that have harvesting potential. Among these, glucose is the most common used fuel source. It theoretically releases 24 free electrons per molecule when oxidized into carbon dioxide and water. Even though biochemical energy harvesting can be superior to other energy harvesting techniques in terms of continuous power output and biocompatibility, its performance depends on the type and availability of fuel cells.[17]

G. Acoustic Energy Harvesting

Acoustic energy harvesting is the process of converting high and continuous acoustic waves from the environment into electrical energy by using an acoustic transducer or resonator. The harvestable acoustic emissions can be in the form of longitudinal, transverse, bending, and hydrostatic waves ranging from very low to high frequencies. Typically acoustic energy harvesting is used where local long term power is not available, as in the case of remote or isolated locations, or where cabling and electrical commutations are difficult to use such as inside sealed or rotating systems. However, the efficiency of harvested acoustic power is low and such energy can only be harvested in very noisy environments. Harvestable energy from acoustic waves theoretically yields $0.96\mu W/cm3$, which are much lower than what is achievable by other energy harvesting techniques. [17]

H. Medical Application Based Energy Harvesting

The energy harvest has fundamental importance in physics of the human body. Lot of research is going on in this field. All external as well as internal human body activities, including thinking, walking, running, arm movements, finger pressure, respiration, blood circulation, blood pressure etc. involve energy exchanges. Even at rest, the body continues to spend approximately 100 W to maintain internal organs, tissues and cells functioning. The human body during various activities produces power ranging between 81 (sleep) and 1630 W (sprint walk).The proportion of heat dissipated by different procedures from sleeping to a sprinting run depend on several factors such as temperature, humidity, air velocity, environment, physical activity, body, body area exposed and its thermal insulation, such as clothing and fats. Energy conversion in work represents only a small fraction of the total energy spent by the body.

Research on this topic has demonstrated various passive energy harvesting techniques for portable devices like thermocouples to collect energy through thermal gradient of the body, mechanical vibration and also the implementation of piezoelectric materials in the body subject to mechanical deformation and vibration [14]. Since it is possible to capture energy from various parts of the human body, one of the future associated applications will be the development of a human battery that generates electricity from glucose of the blood, capable of generating up to 100 W [15].

III. Conclusion

In this review paper, we have explored the various energy harvesting techniques and have made an attempt to analyse them. Energy harvesting techniques are necessary and required to meet the ever increasing power consumption requirements of the equipment's so as to enable them to sustain in the hostile environments. For large scale power requirement ranging from mW to Watts the advice the usage of Energy Harvesting Techniques based on Wind Energy, Solar Energy, Thermal Energy, Ocean Waves, Photovoltaic Energy, Mechanical Energy etc. For small scale power requirement ranging from μW to mW such as batteries one can prefer the Energy Harvesting Techniques based on RF Energy, Resonant Energy, Biochemical Energy, Acoustic Energy and energy harvesting from different parts of the body. Further work is in progress regarding measurement of ambient electromagnetic energy and its harvesting to enhance battery capacity in wireless sensor nodes.

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Real-time Smart Waste Management System

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ABSTRACT

In an environmental context, solid waste management is most challenging problem for municipals, which are facing a serious pollution problem due to the huge quantities of solid waste. If solid waste are not managed effectively it may lead to lots of issues related to environment and human health. There is needs of a system that gives information of the filling of the bin or garbage level in it that alerts the municipality so that they can collect the waste in bin on time and helps to clean the environment. This paper presents a brief review on technology like Zigbee, GSM etc. that enables the remote monitoring of solid waste bin in real time and which will inform the authorized person when the garbage bin is about to fill. These technologies are good enough to ensure the practical and perfect for solid waste collection and transportation monitoring and management for greener environment.

Keywords : Smart Bin; solid waste management.

I. Introduction

At present situation the volume of generation of municipal solid waste is increasing at very fast rate due to increase in population, industrialization and change in habit and life style of urban population [1]. The solid waste is consider as household's refusal and non-hazardous solid waste is from industrial, commercial and institution like hospitals, market waste, yard waste and street sweepings . This waste thrown into municipal bins or waste collection centers and then it is collected by the area municipalities to thrown into the landfills or dump into dumping areas. However, either due to resource crunch or inefficient infrastructure and facilities, not all of this waste gets collected and transported to the final dumping sites. If at this stage the management and disposal is not done properly, it can cause serious impacts on health and the problems to the surrounding environment. The main problems of the existing solid waste collection and transportation process and management system are Lack of the proper system for monitoring the trucks, trash bins, rickshaws and houses and Lack of information related to collection time and area. Due to this a considerable amount of 85% of the total solid management budget is exhausted on waste collection and transportation.

Though large numbers of research have been done on different aspect of solid waste management, but a few works have been done on bin monitoring. Some researchers discussed about Radio Frequency Identification (RFID), Geographic Positioning System (GPS), transportation model, waste collection with bin monitoring application [2]. The researchers collected bin data using GSM/GPRS communication from the bin to the server, which includes GSM/GPRS connectivity to each bin causing a large increase of operating cost. One researcher consider wireless sensor network for monitoring the bin status. But, the. The proposed system use wireless sensor network and can respond as soon as someone throw waste inside a bin. The aim of this work is to design a frame work that can collect data on bin status in real time which in turn helps to optimize waste collection route resulting reduced operation.

This paper is structured as follows: Section II illustrate the generalized system architecture of real time smart waste management system. Section III outlines different technology used to build overall system. Section IV shows the proposed model for waste management system Section V conclude the paper.
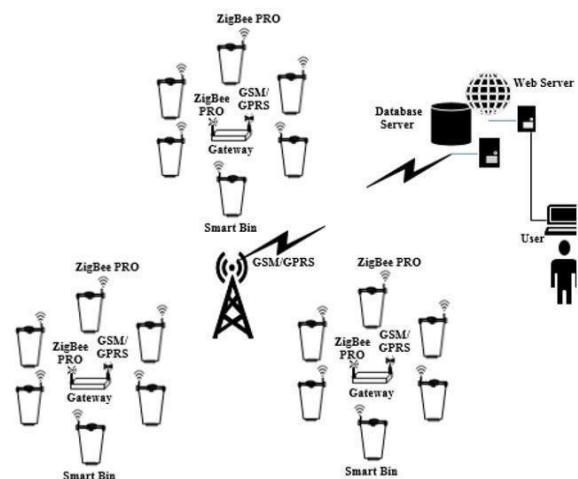
II. System Architecture

Fig. 1. System Architecture

The Smart Bin
The smart bin is composed of sensor node mounted on it for the data collection and transmission. The sensors are divided into two groups. One group is mounted with the bin cover and the other is in the bottom of the bin. The first group consists of, an ultrasound ultrasonic sensor. The other group consists of the load cell sensor. The load cell sensor measures the weight of the waste inside the bin.. The data measured by the sensors are sent to the gateway through ZigBee-PRO communication.[3]

Gateway
The smart bins send the data on bin status to the gateway. The gateway parses the data and stores to its local database. It then sends the data to the control station through GPRS communication [6]

Control Station

The control station receive real time data such as waste level in a bin through gateway and stored in into database It contains the central server which hosts the database and DBMS. The central server has web based user interface for bin status monitoring and operator interaction with the system. Further these data can be used by control station to feed programs like optimization engines and routing and scheduling applications. [6]

III. Integrated Technology

A. Sensors

Ultrasonic sensors are used to detect the level of bin. A set of three ultrasonic sensors will be placed so that the whole area of bin is covered. The bin will have a protecting box at the centre top where the ultrasonic sensors will be placed. The range of ultrasonic sensor may vary according to size of dustbin. The waste in the garbage bin may be of any state. Considering all the parameters, the specifications of the ultrasonic sensors can be implemented.[5]

Load cell will be placed at the bottom 4 corners of bin. These are used as secondary sensors. If the Ultrasonic sensors fail to give output, these can be used as reference. When the bin is cleaned and the load cell is at minimum value and the GSM module will send a message signal to server room indicating that the bin is emptied. An instrumentation amplifier will be used to amplify the output of load cell. The average of four signals of four load cells will be calculated. [5]

B. GSM and GPS

A GSM module is used to communicate with server room. When the bin is about to fill, with the help of GSM module, a message signal will be sent. The GPS module will help to identify the location of garbage bin. The message signal will also contain the coordinates of bin which will be provided by GPS module.

C. ZIGBEE

Zigbee module used to communicate server room over longer distances, through intermediate nodes to achive longer distance. It is low power, low cost wireless network standard specification for a suite of high level communication protocols using small, digital radios. It has a defined rate of 250 kbit/s, best suited for periodic or intermittent data or a single signal transmission from a sensor or input device.

D. RFID

Proposed model using RFID tag is for household waste collection. RFID technologies do not need line of sight and the data easily and more rapidly than a barcode system. This tag is fitted in bin.

The built-in RFID reader and PDA in collection trucks would automatically retrieve all sorts of customer information and bin information from RFID tag, mounted with each bin, allowing the bin to be

remotely identified. The PDA is a small, low-cost, highly versatile mobile computer such as a Pocket PC Then the weighting system measures the weight of each bin. The data is then used to calculate actual waste disposal charges for each individual household and sends it to the PDA for temporary storage after emptying each bin [4]

E. Microcontroller

A microcontroller will be programmed in such a way that it would control the power from being wasted. Microprocessor will allow the voltage to flow across sensors after a certain period of time. Monitoring the bin at every interval will lead to waste to energy through sensors. Thus, the sensors will be activated only after certain intervals of time. The output of GPS and GSM is also controlled by microcontroller
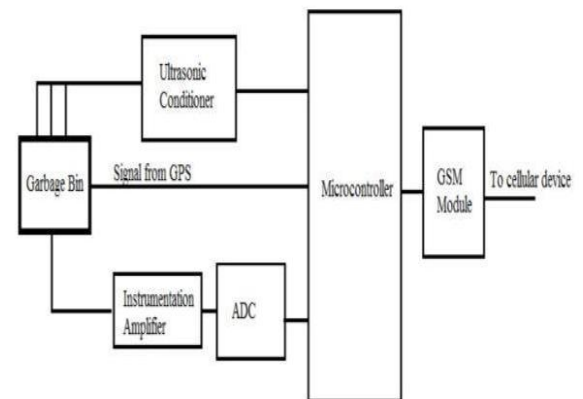

Fig. 2. Block diagram of Smart Bin

F. Power Supply

A variable regulated power supply is needed for a system as operating potential of different module are different. At remote node, it is a battery operated coupled with ICs regulator to get variable voltage. In future prospective, the entire nodes can be solar empowered embedded with rechargeable battery.

IV. Propose Model
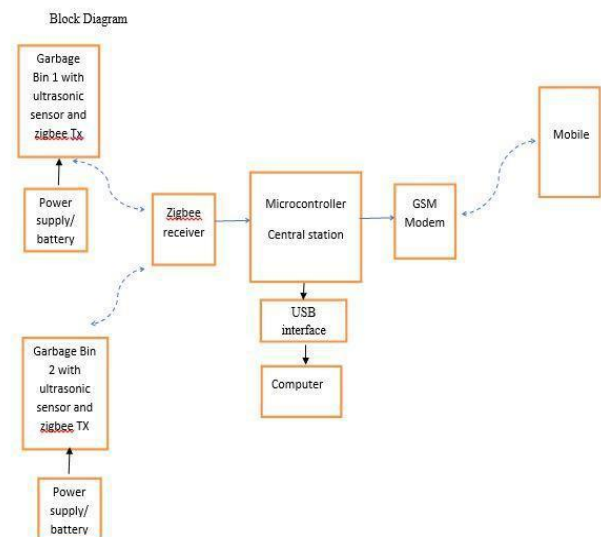
V. Conclusion

The management of Solid Waste is a important matter in which everyone needs to put responsive and immediate action without any delay. In this paper we have examined various real time waste management systems using different integrated technology. Different researchers proposed different system architecture but the objectives of all these is same. In a proposed system[5], amount of waste in a bin is monitor by load sensor placed bottom of the bin. But problem with the load sensor is that, it is not necessary that the garbage that are thrown to the waste bin are weighted light or heavy with their volume. Even if volume of a garbage is less but its weight is more. Thus sensor may give false signal to the controlling server station about fulfillment of bin even if it is not full. Ultrasonic sensors gives accurate level monitoring. In some proposed model GPS system is fitted on a bin for its locations but as position of municipal bin are fixed and always known to controlling station further use of Gsm model for each bin increases the system cost. As Gsm communication is carrier dependent thus massage need not necessary delivered in time also companies charges for each SMS.

Thus in propose model, Zigbee Pro module used to communicate server room over longer distances and can give real time status of bin. At controlling station gsm module used to alert areal waste management zone. For a future prospective web server can also build for effective graphic user interface of a system it is used for tracking and routing of GPS enabled waste collecting trucks.

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INSPEC Accession Number:14649014

Design and Analysis of CMOS Inverter Circuit with N-InGaAs and P-SiGe Vertical Nanowire Transistors

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ABSTRACT

This paper presents the integration of N Type-InGaAs and P Type-SiGe Vertical Nanowire Transistors (VNWT) into CMOS inverter circuit via numerical simulation approach for the first time. The drive currents of N-VNWT and P-VNWT are matched using $In_{0.53}Ga_{0.47}As$ Nanowire growth in N-VNWT and $Si_{0.75}Ge_{0.25}$ Nanowire growth in P-VNWT to obtain symmetric pull up and pull down characteristics. Design of CMOS inverter using InGaAs N-VNWT and SiGe P-VNWT integrated together on silicon substrate shows sharp on-off transitions with high voltage gain up to ~28. This is the best reported gain in comparison with reported Nanowire and FinFET based inverter results. The CMOS Inverter maintain good transistor characteristics, noise margins, excellent drive current and low leakage current up to 2nA, which makes this device suitable for low power applications. The proposed inverter circuit is compared systematically with N type-InGaAs and P type-SiGe based horizontal Nanowire Transistor (HNWT) based inverter circuit with the same numerical simulation approach. Our results prove that VNWT based inverters shows 14% increase in gain, 28% increase in higher noise margin and 9% increase in lower noise margin in comparison with HNWT based CMOS inverter circuit.

Index Terms : Vertical Nanowire, VNWT, HNWT, InGaAs N-VNWT, SiGe P-VNWT, inverter, noise margin.

I. Introduction

In today's complementary metal–oxide–semiconductor (CMOS) digital integrated circuits, silicon is used near 100%. Now with the geometries of MOSFET shrinking further down the 14nm, the performance of silicon as MOSFET channel material is questionable, with limitations in frequency of switching. In post-silicon era, the industry is moving from microelectronics to nano-electronics/photonics. Within a few more generations, classical scaling and shrinkage will no longer yield the sizable benefits of lower power, lower cost and higher speed processors. In the immediate future, the transition into less than 7nm is basically moving into non-Silicon CMOS switching, EUV lithography and increased on-chip photonics, a combination of control of electrons and photon flow in single integrated device [1]. The 3D growth of structures will be more prominent.

Silicon is the most commercially and also technically advantageous semiconductor material compared to other semiconductor materials. Silicon-based transistors are not fast in switching compared to many other semiconductor materials. It is very difficult to generate photons/light out of Silicon material. The electron mobility inside Silicon material is less compared to many other compound semiconductor materials including Germanium. At deeper nodes such as 14 nm, silicon is failing to offer reliable switch which can work at higher frequencies as well as generate light for high-frequency communication between different functional units inside a chip [2]. The P channel Silicon-Germanium MOSFET can be built similar to Silicon PMOS, without much process changes. But building NMOS from Germanium is found to be tough. So InGaAs can be used to build NMOS. InGaAs own a superior electron mobility making it a promising material for low-power high-performance applications by its current drivability.

In case of planar CMOS inverters, symmetry in rise time and fall time is achieved by matching the PMOS and NMOS drain current to equal currents. This was achieved by choosing width of PMOS transistor to be wider (typically ~2x) than that of NMOS device with same length, to compensate for the low value of the hole mobility.

In case of nanowires similar to the case of FINFETs the width or diameter is fixed and it is same for NMOS and PMOS devices. So, researchers have proposed many innovative methods to design and build inverters using FINFETs and Nanowires [3]. PMOS transistor length can be taken twice or thrice to match the drain current of NMOS Nanowire transistor. This method can be fabricated using conventional top down approach [4]. 1:3 ratio of number of NMOS and PMOS channel can be chosen to match the drain current of both the transistors. Three PMOS nanowires can be vertically stacked and the fabrication can be done using top down approach. More silicon area is required in this method. Germanium and Indium Gallium Arsenide (InGaAs) and other such high electron mobility materials are been successfully explored either to replace Silicon or to work along with Silicon [5]. The advantages of a Germanium and InGaAs over silicon is higher electron and hole mobility and density, which allows switching on and off of the CMOS transistor faster. A CMOS with p channel MOSFET using Germanium and N-channel MOSFET using InGaAs (Indium Gallium Arsenide) has emerged as one of the solution [6], [7].

In this work, III and V semiconductors are integrated together in a silicon substrate by using a InGaAs n-type Nanowire Transistor and SiGe based p-type Nanowire Transistor [9].The drain current of both devices are matched using optimization techniques and the inverter is designed using Vertical Nanowire Transistors and Horizontal Nanowire Transistors at the same gate length and the results are systematically compared.

II. Device Structure and Simulation Framework

We propose a novel CMOS Inverter design using N type-InGaAs and P type- SiGe Vertical Nanowire Transistors on silicon substrate. Fig.1.a and Fig.1.b shows the 3D schematic structure of the CMOS Inverter circuit considered in the numerical simulation using VISUAL TCAD-1.8.1[8]. As shown in Fig.1.a the Nanowire is grown vertically with InGaAs on silicon for n-type and with SiGe for p-type. It is covered with High-K Metal Gate (HKMG) stack of $Al_2O_3+LaAlO_3+WN$ at the gate. The entire structure is built on silicon wafer with <100> orientation. The device transfer and drain characteristics are depicted in Fig.2.a and Fig.2.b respectively and the simulation parameters are listed in Table. I.

TABLE I

PARAMETERS OF N-TYPE AND P-TYPE VERTICAL NANOWIRE TRANSISTORS

Symbol	Parameter	Ntype-Nanowire Transistor	Ptype-Nanowire Transistor
Lg	Channel Length	14nm	14nm
tox1	Gate oxide thickness-Al_2O_3-EOT	1.86nm	1.86nm
HNW	Height of Nanowire	100nm	100nm
dNW	Diameter of Nanowire	50nm	50nm
NW	Material for Nanowire	$In_{0.53}Ga_{0.47}As$	$Si_{0.75}Ge_{0.25}$
Nchannel	Doping of channel	$5.1 \times 10^{17} cm^{-3}$	$5.1 \times 10^{19} cm^{-3}$
Nsource& Ndrain	Doping of Source & Drain	$1 \times 10^{20} cm^{-3}$	$1 \times 10^{20} cm^{-3}$
Nsub	Substrate Doping	$2 \times 10^{15} cm^{-3}$	$2 \times 10^{15} cm^{-3}$
Ns/d_ext	S/D Extension Doping	$2.0 \times 10^{20} cm^{-3}$	$2.0 \times 10^{20} cm^{-3}$
<>	Silicon Orientation	< 100 >	< 100 >

To investigate the circuit performance of VNWT based inverters and ring oscillators, 3D TCAD simulations are performed using Visual TCAD-1.8.1 and Genius Device Simulator with advanced quantum models.

The partial differential equations solved in the simulations are,

$$\nabla . \varepsilon \, \nabla \psi = -q(p - n + N) \qquad \dots (1)$$

Where ψ is the electrostatic potential of the vacuum level, ε is the material permittivity, q is the electronic charge, n is the electron density, p is the hole density and N is the impurity concentration.

$$\nabla . J_n = q.Rn + q.\frac{\partial n}{\partial t} \qquad \dots (2)$$

$$\nabla . J_p = -q.Rp + q.\frac{\partial p}{\partial t} \qquad \dots (3)$$

$$J_n = q\mu_n \left(-n\nabla v + \frac{k_B T}{q}.\nabla n \right) \qquad \dots (4)$$

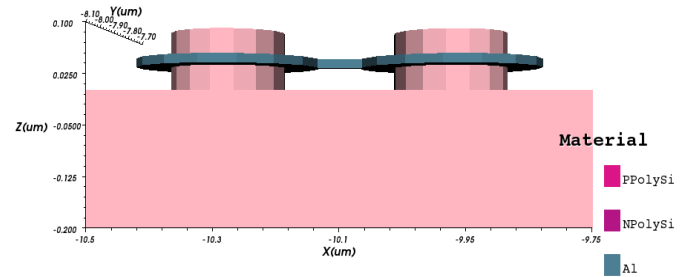$$J_p = q\mu_p \left(-p\nabla v - \frac{k_B T}{q}.\nabla p \right) \qquad \dots (5)$$

Fig.1. 3D isometric view of CMOS Inverter structure considered for numerical simulation using Visual TCAD
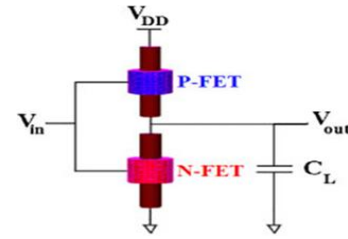

Fig.2. Schematic of InGaAs N-Type VNWT and SiGe P-Type VNWT based CMOS Inverter
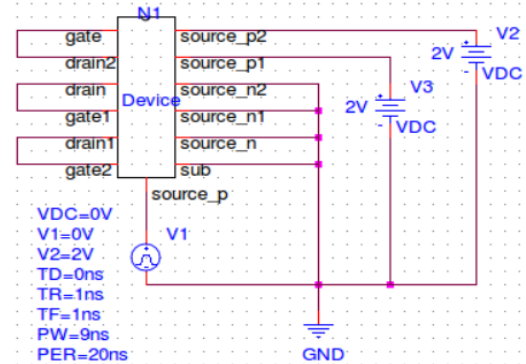

Fig. 3. Schematic view of inverter structure based on VNWT considered for numerical simulation using Visual TCAD.

$J_{n,p}$ is the carrier current density , R_n, R_p is the net electron and hole pair recombination rate, K_B is the Boltzmann's constant.

The Genius device simulator solves Schrodinger equation along with Poisson equation continuously to achieve self consistency. Band structure is modeled by including bandgap E_g , effective density of states in the conduction band N_c and valance band N_v and the intrinsic carrier concentration n_{ie}. Quantum effects are included in the simulation by adding Schenk's Bandgap narrowing model which includes band gap narrowing and Kane's model which includes Band to Band Tunnelling effect. Yeager's model is included in Genius device simulator to describe high field effect and mobility for InGaAs. The device structure is optimized and designed for 14nm gate length. Diameter of the device is optimized to 50m. equivalent oxide thickness (~1.86nm), and heavy source/drain doping

$(N\sim10^{20}cm^{-3})$. The channel doping of InGaAs N-VNWT is considered as $\sim10^{17}cm^{-3}$ and SiGe P-VNWT is considered as $5.1x10^{19}cm^{-3}$ to match the inverter characteristics in this work.
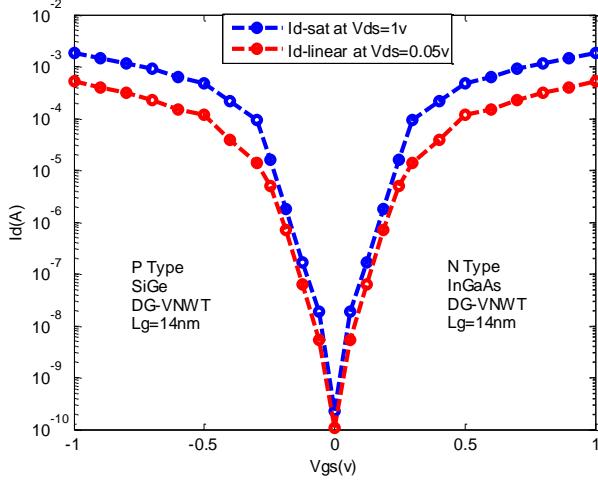

Fig.4. Transfer Characteristics of InGaAs N-VNWT and SiGe P-VNWT structure obtained from 3D numerical simulations for V_{ds}-sat at 1v and V_{ds}-linear for 0.05v .
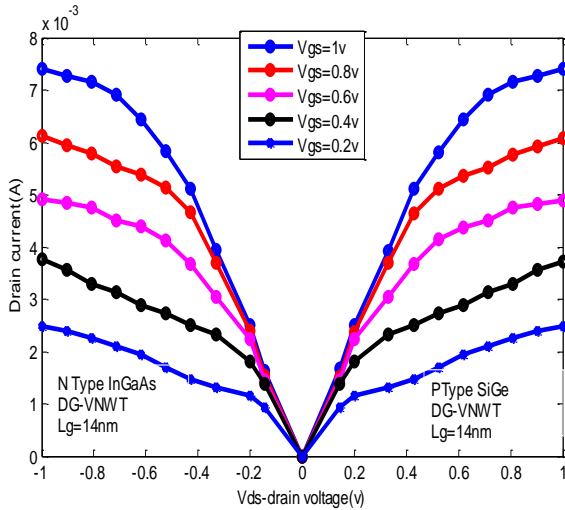

Fig.5. Output characteristics of InGaAs N-VNWT and SiGe P-VNWT structure obtained from 3D numerical simulations various gate drive voltages.

III. Simulation Results and Discussions

3.1. Design of CMOS Inverter circuit using InGaAs N-VNWT & SiGe P-VNWT

The vertical Nanowire FET structure with cylindrical gate geometry gives better electrostatic control with a high on current up to 7.74mA and leakage current up to 2nA. The dc sweep analysis of inverter at small intervals from 0V to 1V input range is performed. The maximum output voltage achieved for 1V input is 0.98V. The output waveform is plotted in MATLAB and shown in Fig.6. It shows the voltage transfer characteristics of inverter. The curve represents the output voltage taken from drain terminal.

The CMOS circuit functions as an inverter because when V_{IN} is 1V, V_{OUT} is approaching zero i.e. 0.06V, and when

V_{IN} is zero, V_{OUT} is 0.86V. Fig.7.a. shows V_{IN} & V_{OUT} curves of Inverter structure plotted interchangeably in x and y axis for V_{dd} at 1v. From the figure Noise Margin high is 0.35v and Noise margin low is 0.3v for a supply voltage of 1v. The simulation is repeated for V_{dd} at1.2v and the results are plotted in Fig.7.b. The curve shows a high noise margin of 0.45v and 0.35v.
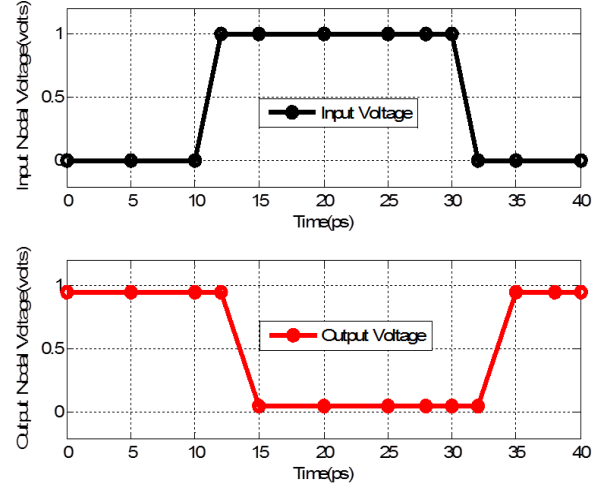

Fig.6. InGaAs N-VNWT & SiGe P-VNWT based Inverter transient response to an input pulse signal obtained from 3D VISUAL TCAD simulations.
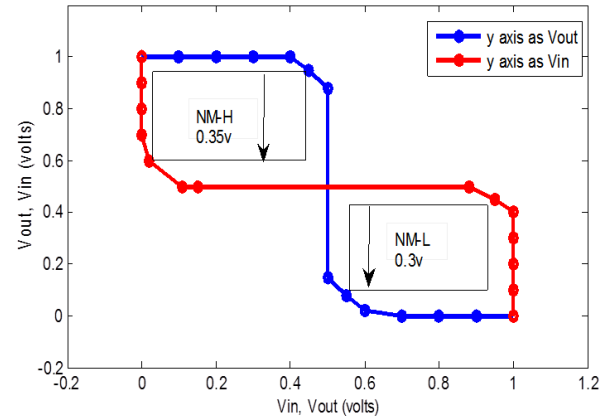

Fig.7.a.Transfer characteristics of inverter with V_{in} and V_{out} plotted interchangeably on X and Y axis with V_{dd} at 1v.
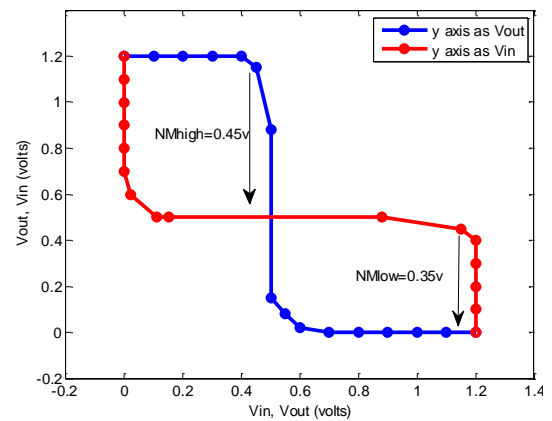

Fig.7.b. Transfer characteristics of inverter with V_{in} and V_{out} plotted interchangeably on X and Y axis with V_{dd} at 1.2v.

3.2. Design of CMOS Inverter circuit using InGaAs N-HNWT & SiGe P-HNWT

For comparison, N-type InGaAs and P-type SiGe Horizontal Nanowire Transistors (HNWT) based inverter is also built using the same gate length 14nm and same simulation parameters in VISUAL TCAD-1.8.1. The 3D schematic structure of horizontal inverter is shown in Fig.8 and the net doping density of the inverter is shown in Fig.9. Fig.10 depicts the transfer characteristics of HNWT based CMOS inverter and it has the maximum gain of 0.86. The results of VNWT based inverter is compared with SNWT based inverters and published results of Nanowire based inverters. The comparison shown in Table.II proves that VNWT based inverter is the better candidate for future inverters and digital circuits with remarkable high noise margin up to 0.45v and low noise margin up to 0.35v. In comparison with HNWT based inverters, VNWT based inverters shows 14% increase in gain, 28% increase in higher noise margin and 9% increase in lower noise margin. The proposed VNWT based inverter results are better in terms of gain and noise margin in comparison with published experimental Nanowire based Inverters [9], [10].
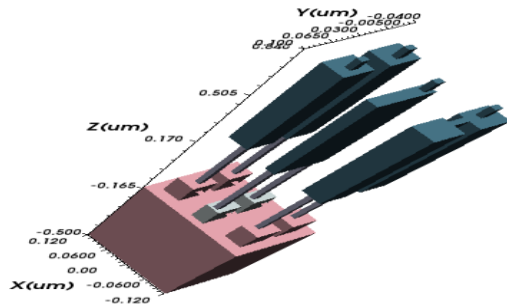

Fig.8 3D isometric view of horizontal Silicon Nanowire Transistor based CMOS Inverter structure considered for numerical simulation using Visual TCAD
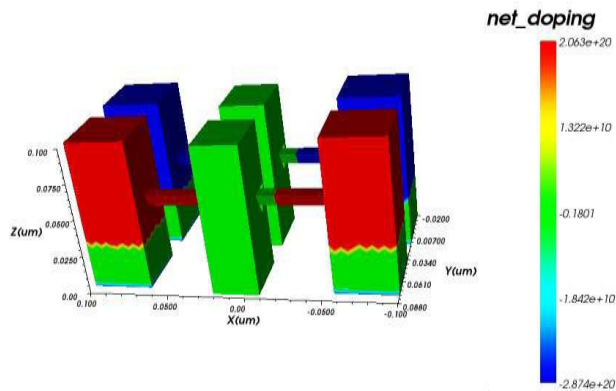

Fig.9. Net doping density profile of horizontal Silicon Nanowire Transistor based CMOS Inverter structure
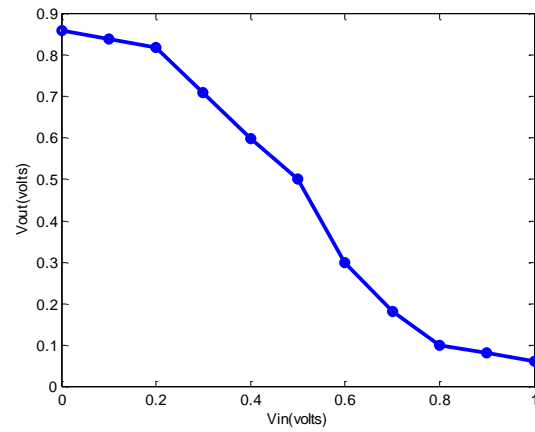

Fig.10. Transfer characteristics of HNWT based inverter with V_{in} at x axis and V_{out} at y axis.

TABLE II

COMPARISON OF INVERTER USING SNWT AND VNWT WITH EXPERIMENTAL RESULTS

Parameter	SNWT Inverter	VNWT Inverter	Experimental by K.D.Buddharaju.et.al [9]	Experimental by Zhixian Chen.et.al [10]
Gain of Inverter	0.86	0.98	0.96	0.97
Noise margin-High(volts)	0.35	0.45	0.45	0.478
Noise margin-Low	0.32	0.35	0.3	0.481

IV. Proposed Process Flow

The proposed device can be fabricated using top down approach as shown in Fig.10 by taking a silicon wafer.

- Silicon Wafer <100> orientation.
- Thermal oxidation for SiO2growth at 900°C.
- Dual Channel Circular opening with 100nm diameter by Electron Beam Lithography & wet chemical etching.
- Mesa Isolation of active regions.
- InGaAs Nanowire formation at 670°C using Metal Organic Vapour Phase Epitaxy and in-situ doped source/drain for N-VNWT.
- SiGe Nanowire formation using Metal Organic Vapour Phase Epitaxy and in-situ doped source/drain for P-VNWT.
- Al_2O_3 and $LaAlO_3$ high-k material deposition by Atomic Layer Deposition with A thickness of 10nm at EOT=1.86nm
- Gate material WN using Radio Frequency Sputtering technique.
- Etching of gate oxide Al_2O_3 by reactive-ion etching (RIE).
- Gate patterning with soft landing on InGaAs/SiGe.
- Spin coating with BCB and reactive-ion etching to isolate the gate and drain metals.
- Annealing at 420°C in N2 to obtain ohmic contacts at source and drain regions.

Fig.11. Proposed process flow for InGaAs/SiGe Vertical Nanowire Transistor based CMOS Inverter structure

and growing SiO_2 layer above the silicon layer. Active regions are defined for dual channel P-VNWT and N-VNWT and Mesa isolation of active regions is carried out [11]. InGaAs Nanowire for N type and SiGe Nanowire for P-Type are grown with dual channel on silicon di oxide. High-k Al2O3+LaAlo3 and metal gate WN deposition is done commonly for N type and P-type VNWTs [12], [13]. Gate patterning with soft landing on InGaAs/SiGe can be performed followed with self aligned source and drain formation for InGaAs and SiGe. Annealing at 420°C in N2 to obtain ohmic contacts at source and drain regions. Using these fabrication steps it is feasible to fabricate the proposed InGaAs and SiGe Vertical nanowire Transistor based inverter circuit.

V. CONCLUSION

Vertical Nanowire CMOS inverter with InGaAs N-type and SiGe P-type VNWTs has been demonstrated for the first time using 3D numerical simulation approach. The symmetry in NMOS and PMOS currents is achieved by using different doping levels of InGaAs and SiGe. The inverters show sharp transitions, high noise margins and high gain. The inverters operate very well down to 0.2V V_{DD} which suggests potential application for these devices in low-power low voltage designs. For comparison horizontal Nanowire Transistor based CMOS inverter is also designed using the same numerical simulation approach. In comparison with HNWT based inverters, VNWT based inverters shows 14% increase in gain, 28% increase in higher noise margin and 9% increase in lower noise margin. This kind of device is very promising for high integration density of nanoelectronics and optoelectronics devices.

VI. ACKNOWLEDGMENT

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Optimization of RF MEMS Switch

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ABSTRACT

RF MEMS is the area of MEMS which deals with design, analysis and development of RF components for communication domain. RF MEMS Switch is the basic building block used in design of filters, resonators, phase shifters. It is actuated electrically that causes a mechanical movement to achieve switching action. As switch dimensions increases, design complexity increases. This paper therefore focuses on the optimization of RF MEMS switch by orthogonal experiment method to obtain dimensions for simple design. Aluminum, gold and carbon are the elements selected for switch design. By using multiphysics software, different analysis was done for effective switch design. The results obtained showed that carbon had better mechanical resonant frequency (875746Hz) than gold(111769Hz) and aluminum (258547Hz) with less switching time(3µs) than that of aluminum(10 µs)and gold(23 µs). This indicates the significance of carbon in terms of high dynamic stiffness and high switching speed.

Keywords : Component; Optimization;switchig speed; Orthogonal experiment

I. Introduction

The advent of surface and bulk micromachining techniques triggered the development of RF MEMS components. The first MEMS Switch was demonstrated by Peterson [1]. RF MEMS Switch replaced its Traditional counterpart PIN/FET as it showed the desired performance in terms of near zero power consumption, low insertion loss, low intermodulation products and low cost [2]. Moreover, RF switches can be designed through batch fabrication that enables reduction in cost and ensures integration compatibility with associated electronic devices.

One of the parameter that influences the Dynamic performance of the switch at microwave frequency is switching speed. The speed of the switch depends on the Actuation voltage. This voltage in turn depends on the switch Geometry. Therefore, optimization of physical parameters of the device (Length, width and thickness) play a vital role. This paper determines the device parameters by orthogonal experiment method. The mechanical resonant frequency is then calculated to select the best combination of device parameters for both Al and Au beam. The switch is then designed using the selected parameters to obtain the desired results. The simple structure of the switch is designed in order to reduce the fabrication cost and design complexity. Switches designed in the past include difference designs which include Serpentine, cantilever springs[4], non-contact beam with comb drive actuator[5], spring folded suspensions[6], cantilever beam with variable lengths[7], structures with movable plates[8],low contact resistance[9]. After optimization, it is possible to design the switch that can be operated at high frequency with electrostatic actuation. For effective switch design, cantilever beam and the lower electrode are used for biasing and as the actuation voltage reaches pull in voltage the beam snaps down to lower electrode. A dielectric layer can be deposited on lower electrode to avoid DC contact. In on state, the beam is in steady position and as the pull in voltage is reached the capacitance increases causing signal to get grounded which is considered as the off state for the switch.

II. Orthogonal Experiment Method

Orthogonal Experiment Method is a technique in which an orthogonal array is created. This array consists of combination of different device parameters at different number of levels. In this paper, total four parameters are selected and an array is created for 3different levels. The 3 levels(Parameter values) selected for beam length, width and thickness are(80,100,200µm),(60,70,100µm) and (1,2,3µm) respectively.Here,four parameters are Length, width ,thickness and beam material(Al/Au). The resonant frequency for each of the experiment is determined by Multiphysics software. Table below shows a L9Orthogonal array.

No.	Length (µm)	Width (µm)	Thickness (µm)	First mechanical resonant frequency Hz	Beam Material
1	80	60	1	134498	Al
2	80	70	2	111769	Au
3	80	100	3	170537	Au
4	100	60	2	171661	Al
5	100	70	3	258547	Al
6	100	100	1	35564	Au
7	200	60	3	25714	Au
8	200	70	1	21179	Al
9	200	100	2	42668	Al

TABLE1. L9Orthogonal array

From the results obtained from Table 1. It can be observed that for Aluminium, number fifth combination is showing highest resonant frequency. It can also be observed for Gold, the second combination can provide best resonant frequency when length is greater than the width. These two combinations can be selected for switch design since it provides best frequency and hence greater Dynamic stiffness for the beam.

III. Dynamic Performance Evaluation

In this section different simulation analysis are performed on the switch with the Dimension selection obtained in section II for both Al and Au. 'Stationary', 'Eigen frequency, prestressed' with 'parametric sweep 'are the type of analysis that are performed to obtain the values of Pull in voltage, resonant frequencies and down state capacitances.
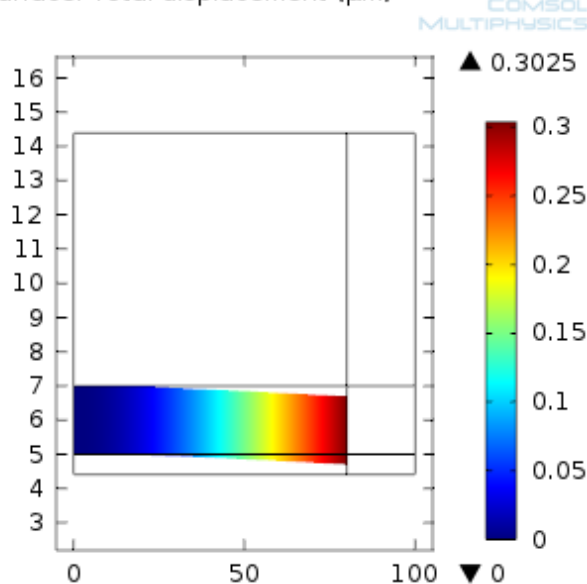

Figure 1. Displacement of the Beam(0.3μm)
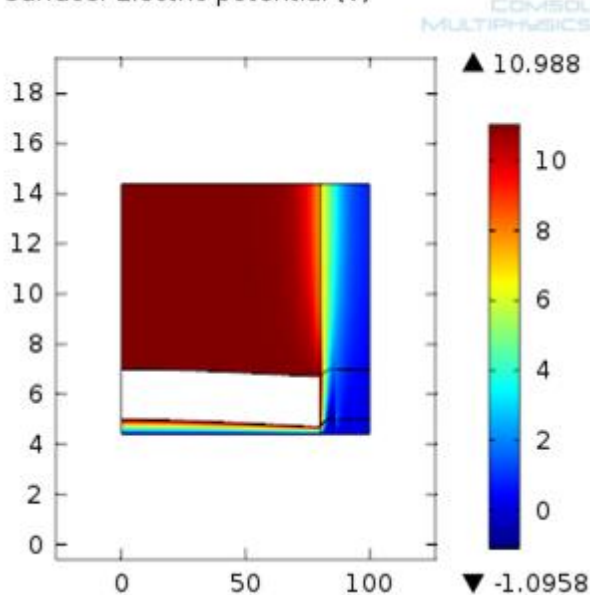
Figure 2. Out of plane Displacement for 10.98V
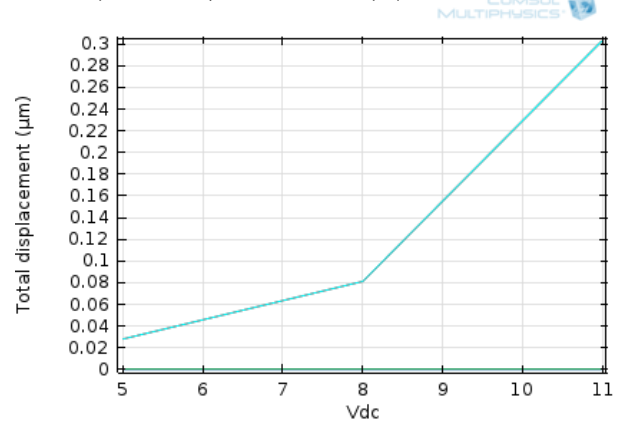
Figure 3. Displacement Vs. Bias voltage Vdc
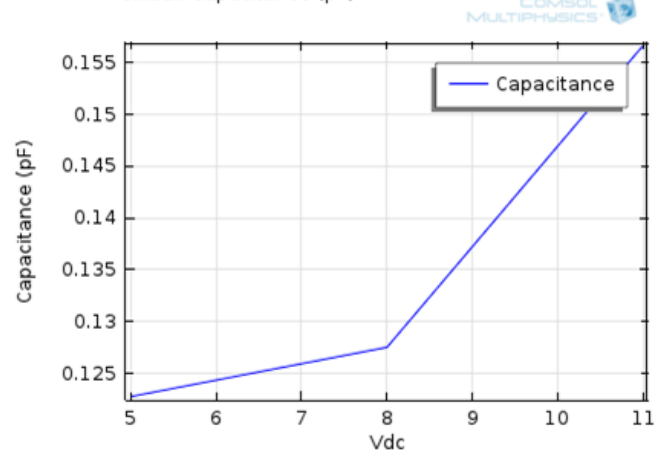
Figure 4. Capacitance vs. Bias voltage
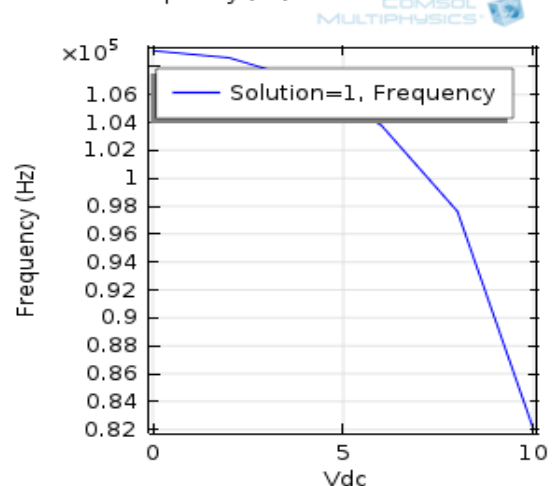
Figure 5. Eigenfrequncy vs. Bias voltage

Figures 1-5 indicates the dynamic performance for Au in terms of Pull in voltage, displacement, capacitance and resonant frequency with bias. From the figures it can be studied that simplest switch can be designed with a gap(distance between Cantilever and lower electrode) of 0.3μm for the bias voltage of 10.98V.The plots between Displacement and Vdc(Bias voltage) and also capacitance

vs.Vdc indicate a non-linear relationship. The capacitance is increased from 0.12pF to 0.15pf as the bias voltage is increased from 5V to 11V.

Similarly Figures 6-10 indicate the dynamic response/Behavior of the switch. The values for pull-in voltage, displacement, and capacitance are 12.20V, 0.27 µm and 0.18pF respectively. The Falling curve in Figures 5 and 9 indicate the reduction in Eigen frequencies with increased bias due to 'Spring Softening effect'.

Figure 6. Out of plane Displacement for 12.207 V
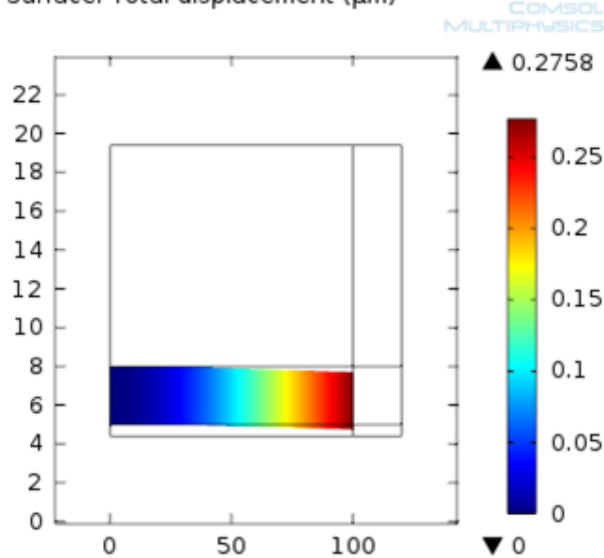
Figure 7.Displacement of the Beam(0.275µm)
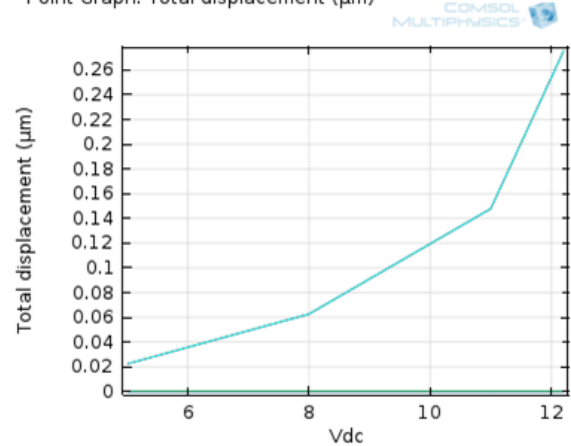
Figure 8. Displacement Vs. Bias voltage Vdc

Figure 9. Capacitance vs. Bias voltage

Figure 10. Eigenfrequncy vs. Bias voltage

(93)

Figure11. Designed Generic switch Model for Al
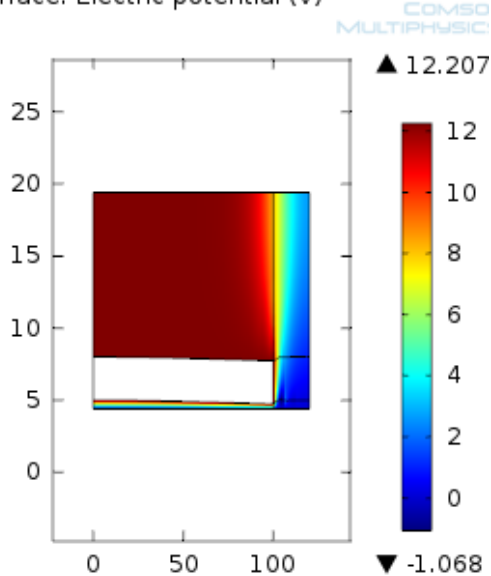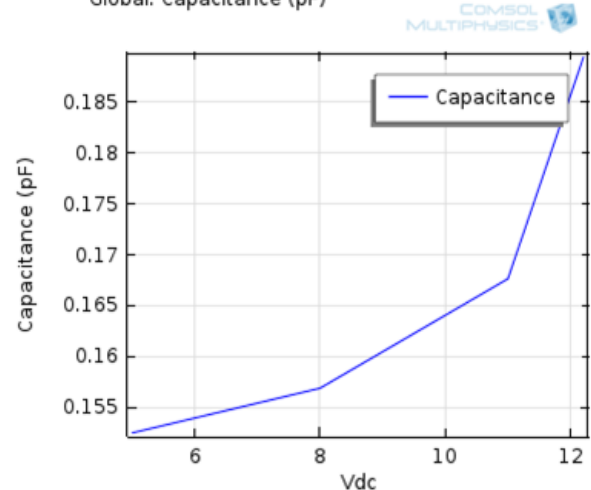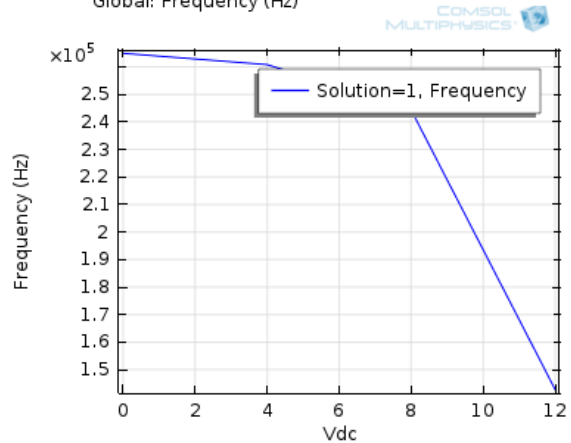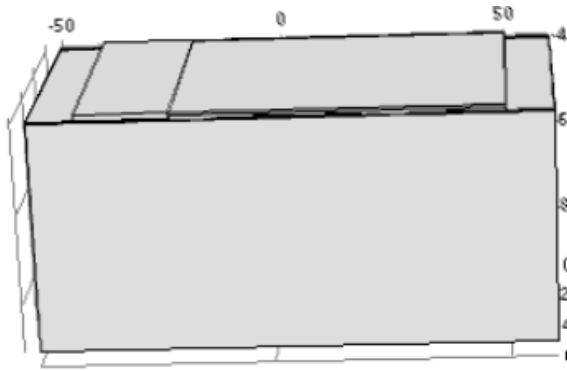
IV. Conclusion

The cantilever beam parameters were optimized by orthogonal experiment method to design the switch using Al and Au. The values of Length, width and thickness for Al were found to be 100μm, 70 μ and 3 μm respectively with first resonant frequency of 258547Hz. Similarly for Au length,width and thickness obtained were found to be80 μm,70 μm and 2 μm with first resonant frequency of 111769Hz. These results show that Al has better resonant frequency and hence better Dynamic stiffness along with high down state capacitance (0.18pf) than Au (0.15pF). The Pull in voltage for Au (10.9V) was obtained less than Al(12.2V). The plots in Figures3, 4, 5 and Figures 8,9,10 provide a set of values for further Simplest design of the switch.

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Evolving Trust Model for Manet using Secure Routing Algorithm

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ABSTRACT

Mobile ad hoc Networks became a major rising technology in mobile computing. In recent years, there has been a massive use of mobile computing devices that led to the event of ad hoc networking standards and provide the mobile nodes to line up self-organizing, adaptive and temporary networks. A mobile ad hoc network consists of wireless mobile nodes forming a short-lived network while not the centralized infrastructure. Trust management in MANETs is crucial once nodes establish a network, with an appropriate level of trust themselves. Trust system is used to offer network security services like access management, malicious node detection, secure resource sharing, and authentication. Additionally, secure routing based on trust management is a very important aspect in Manet system. Trust management is a multifunctional control methodology throughout which an important task is to determine trust between the nodes that are neighbors and create a routing path. The fundamental conception of this paper is to propose a trust primarily based secure routing theme in MANETs without using any centralized infrastructure. This paper projects towards a new data-monitoring theme for trust management on MANETs using autonomic principles. Additionally to this, it conjointly proposes a secured routing path choice based on trust values of nodes.

Keywords : Manet, Trust, Autonomic Trust Monitoring, Secure Routing

1. Introduction

Ad hoc networks are the new paradigm of networks providing restricted mobility with none underlying infrastructure. An ad hoc network can be a group of autonomous nodes or terminals that communicate with each other by forming a multiple hop radio network and maintaining connection throughout a decentralized manner. Each node functions as a host and as a router. The topology is usually dynamic since the nodes have a property of varying their positions with time owing to new node arrivals, node departures, and also the probability of obtaining mobile nodes.

Significant applications of MANETs embrace establishing survivable, efficient communication for emergency/rescue operations and military networks that can't believe centralized and arranged connection. Trust is always an important part among the design of any system and analysis of secure distribution systems. Trust is an important part of the strategy by those relationships develop. A trust model evaluates and sets up trust relationship among entities.

1.1. Challenges in MANETs

The following list of challenges shows the ineffective and limitations that require to be overcome in an extremely Magnet surroundings.

Limited wireless transmission range

The radio band in wireless networks are getting to be restricted and therefore data rates it offers are abundant lesser than what a wired network offers. This require the routing protocols in wireless networks to use the bandwidth continuously within the associate best manner by keeping the overhead as low as potential.

Routing Overhead

In wireless ad-hoc networks, nodes usually modify their location among the network. So, some stale routes are generated inside the routing table that leads to unimportant routing overhead.

Battery constraints

This is one in each of the restricted resources that are the numerous constraints for the nodes in an ad hoc network. Devices utilised have restrictions on the flexibility source to take care of movability, size and weight of the device, increasing the facility and process ability makes the nodes massive and fewer movable in these networks. So, the Manet node should optimally use these resource.

1.2 Attacks in MANETs

Trust management and trust computations are engaging target for attackers since major choices are taken a base on the computations. The following attacks are mentioned to analyze the trust system.

Denial of Service

A malicious node would possibly block the conventional use or management of communications facilities. The attackers send the maximum recommendations as possible to consume the huge amount of computing resources inside the trust scheming nodes.

Bad Mouthing Attack

Bad mouthing attack happens once a node provides unhealthy recommendations internationally regarding alternative nodes.

On-Off Attack

In this attack, malicious nodes can opportunistically behave smart and dangerous as per the importance of situation. To handle this attack, the recent samples is taken into consideration.

Newcomer Attack

A malicious node might discard its unhealthy reputation or distrust by registering as a replacement user. The malicious node simply leaves the system and joins once more for trust revocation, flushing out its previous unhealthy history and beginning to accumulate new trust.

1.3. Trust

Trust on a system is increased if the system has security mechanisms to save lots of its assets and actions. Trust is a subjective assessment by an associate agent or by different peer node. Assessment depends on the responsibility and data received from or traversing through that node throughout a given context. It reflects the belief/confidence/expectations on honesty, Integrity, accessibility, and QoS of the target node. It additionally reflects mutual relationships between the very trustworthy nodes by checking periodically whether a given node behaves during a trustworthy manner and maintains reliable communications. Trust is outlined as a firm belief among the ability of an agent to act dependably, securely, and dependable among such context.

1.4 Trust Management

Trust management provides a unified approach for specifying and decoding security policies, credentials, and relationships once collaborating nodes need to determine a network, with a suitable level of a trust relationship between the nodes. It's relevancy in many deciding things still as intrusion detection, authentication, access management, key management, analytic misbehaving nodes for effective routing. Trust management schemes are devised to find misbehaving nodes, every selfish nodes furthermore as malicious nodes. Trust management includes Trust establishment, Trust update, and Trust revocation.

2. Literature Survey

In [1], Ahmet Burak will and Bharat Bhargava represented distributed algorithms that modify a peer to reason related to the trustworthiness of various peers based on past interactions and proposals. Peers manufacture their own trust network in their proximity by using local knowledge available and do not try to learn global trust knowledge. Two contexts of trust, service, in providing services and giving recommendations. Interactions and proposals are evaluated based on importance, recentness, and peer satisfaction parameters. Additionally, recommender's

trustworthiness and confidence about a recommendation are considered. Simulation experiments on a file sharing application show that the projected model can mitigate attacks on 16 fully different malicious behavior models. Among the experiments, smart peers were able to form relationships of trust in their proximity and isolate malicious peer.

In [2], G. Bella et al represented a protocol to permit a node to evaluate the status of another one by means of each direct observation and suggestions received from numerous nodes. A global reputation Table (GRT), that contains the node's view on neighbours and far nodes, is sporadically modified with the others. Table data isn't broadcasts everywhere internet with a flooding technique, however once a node receives a table from one neighbor, it calculates new values, and then, with a prefixed schedule, it sends the new GRT to its neighbours. This sort of sharing limits the traffic among the net, avoiding the overload and limiting the utilization of energy.

In [3], Velloso et al. projected a human-based trust model that builds a trust relationship between each node in an ad-hoc network based on previous individual experiences. A Recommendation Exchange Protocol (REP) was planned to permit nodes to exchange recommendations regarding their neighbours. The REP only considers interactions with neighbors that produces the protocol scaling well for large networks. The recommendation is obtained by inflicting a Trust Request (TREQ) or by receiving a Trust advertising (TA) message from numerous neighbours. TAmessages are uninvited recommendations. A node solely sends a ta message once the recommendation several specific neighbours varies over a particular

3. Problem Definition

MANET is self-organized in nature due to, to which nodes within the network will behave selfishly and maliciously for individual interest. Thus trusting on malicious or misbehaved nodes will cause different types of attacks. Operation in ad hoc network continuously introduces new security issues. The mobile Adhoc networks are susceptible to physical security threats. The possibilities of eavesdropping, impersonation, denial-of-service attacks can increase. Identical as fixed networks, security of the ad hoc networks is taken under consideration from the attributes like accessibility, confidentiality, integrity, authentication and non-repudiation. However, security approaches used for the fixed networks are not potential due to the salient characteristics of the ad hoc networks. New threats, like attacks raised from internal malicious nodes, are exhausting to defend. New security mechanisms are needed to adapt the special characteristics of the ad hoc networks. In mobile ad-hoc networks, secure routing is the milestone. Routing is usually the foremost important element for any networks.

The planned paper tends to design a trust-based packet-forwarding theme for detection and analyze the malicious nodes using the routing layer knowledge. A key arrange of this planned paper is to develop a primarily trust based mostly secure routing methodology theme in MANETs while not using any centralized infrastructure. The paper

intends to develop a new data-monitoring theme for trust management on MANETs based on the s autonomic principles. The projected theme minimizes the overhead using transiting packets on the network to update the nodes related to the Trust status of the various nodes. This paper planned a secured routing path selected based on trust values of every node in a network.

4. Proposed Methodolgy

In this paper, an autonomic Trust monitoring theme with Secure Routing decision method to determine trust relations between nodes throughout a Manet is planned. This paper takes into account autonomic principles thus on possess protocol-independent and self-adaptive trust management theme ensures uniform distribution of trust values among nodes and secure routing between source and destination nodes. The employment of autonomic principles permits the observation mechanism to be self-adaptive so optimizing the network resources consistent with the underlying network's context. The planned approach depends on the autonomic MAPE-K model, as illustrate, comprising of five main components: monitor, knowledge, analyzing, planning and execution. Each network's node is provided by an instance of ATMS, ensuring the trust data observation in a very distributed manner. Each network's node is provided by an ATMS, making certain trust data observing in a very distributed manner and a secure routing technique.
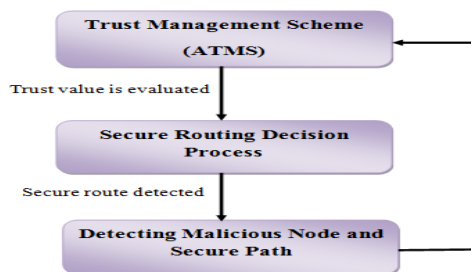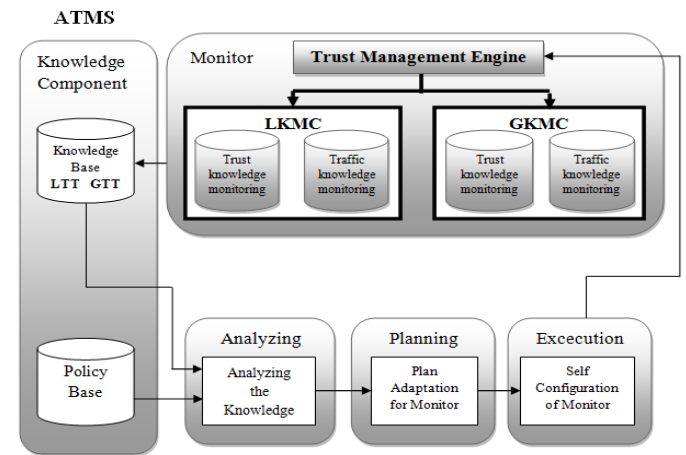

Fig.4.1. Proposed System

LIST OF MODULES IN PROPOSED SYSTEM
- Trust Management
- Secure Routing Process
- Detecting Malicious Nodes

4.1 TRUST MANAGEMENT SCHEME

It uses AUTONOMOUS KNOWLEDGE MONITORING SCHEME (ATMS) that consists the following five components:

1. Monitor

2. Knowledge

3. Analyzing

4. Planning

5. Execution

LKMC- Local Knowledge Monitoring Component
GKMC- Global Knowledge Monitoring Component

Fig. 4.1.1. Autonomic Trust Monitoring Scheme

4.1.1 Monitor component:
The monitor part is responsible for collection local and global data required to determine trust relationship among nodes. The monitor consists of a data management engine, a local and a global trust observation module.

Local monitoring Module

The local trust observance module performs a local observation of neighbor nodes. So on avoid an equivalent drawbacks of promiscuous mode, a node obtains information on trustworthiness of a neighbor based on an amount of traffic it receives from that neighbor.

1. Once a node 'i' receives a packet from a neighbor 'j', then it checks whether the packet was forwarded or generated by that neighbor 'j'.
2. The node 'i' will get this data simply by observation of the ip header that holds the source address of the packet.
3. A node 'i' evaluates the trustworthiness of a neighbor node 'j' and take into account the quantity of traffic it forwarded compared with the quantity of traffic it generated. From this purpose of node 'i', this ratio represents the degree of unselfishness in between the link j - i.

The basic set up is that a node reputation grows on condition that it forwards packets of another sender source. The node below analysis has no interest during this connection. On the contrary, it uses its energy alone to forward different packets. The knowledge acquired by local observation is kept in an exceedingly table, referred to as local Trust Table (LTT). This table contains one entry by the neighbor that it stores the data amount generated and forwarded by that neighbor similarly because the local trustworthiness calculable for that neighbor.

Global Monitoring Module

The global trust observance module is liable for exchanging data with different nodes. Based on the local table trust, each node of the network frames a global Trust Table (GTT) which step by step completed by trust values of all nodes present during a network. To populate the GTTs with data on all participants to the Manet, nodes

need to exchange their table GTT by some communication method. So as to avoid the various overhead generated by flooding procedure, we tend to propose a data management engine that uses data or signaling packets traveling inside the network to exchange such data. A packet can carry information on nodes, and update it often once visiting different nodes. The global views of each intermediate node are getting to be updated based on information carried by incoming packets. The data management technique decides on once it piggybacks trust data on transiting packets based on the network state. Indeed, once the network is not full, the data management engine activates the standard mode throughout that all transiting packets are used to distribute trust level data during a timely manner. However, once the network is full, the safe mode it activated that uses some transiting packets to carry trust information and reduce the trust distribution overhead. The state of a network is determined by the analyzing part represented based on local traffic rate. This latter is monitored by traffic data observation part and denotes the quantity of packets received over an interval of time. If the analyzing part detects congestion, it activates the design part that switches the knowledge management engine to the safe mode, process the rate of generating observance packets.

4.1.2. The knowledge component

The information part consists in two elements: a knowledge base, throughout that LTT and GTT tables are kept, and a policy base, during which a group of predefined condition-event rules are stocked. The policies allow the framework to investigate its current state and alter its observation rate consequently. For example, a policy is employed that reduces the generation rate of knowledge observation once the determined local traffic rate exceeds a congestion threshold (α). This adaptation reduces the overhead of observance and is important to avoid serious congestion collapse and increase the network performance.

4.1.3. The Analyzing component

The analyzing part periodically verifies if any predefined policies threshold is exceeded take into account the data provided by the monitor part. If these will often the case, it activates the planning component thus as to react to that event. Throughout this case, if the traffic rate exceeds a congestion threshold (α), the planning components are activated to adapt the generation rate of the monitor component constant with the network condition.

4.1.4. The planning component

The planning part executes the information observation optimization formula (KMO) once the traffic rate exceeds a congestion threshold (α). During this case, the global data observance strategies are executed with a certain probability pi, that specifies whether transiting packets should be piggybacked or not. This chance is reciprocally proportional to the average trust level of network retrieved from the node GTT table to verify that nodes get adequate data of nodes trustworthiness in an exceedingly case of poor network trustworthiness. That is, if the trust level of the network is low, the 'pi 'is discovered to a high value to

use most transiting packets and imposing trust information. Every time intervals of t seconds, if it detects that the congestion is finished then the KMO switches the information management engine to the conventional mode.

4.1.5. The Execution component
The execution part is liable for implementing choices taken by the planning component. That is, once the planning component decides a different value for observance generation rate 'pi', the execution component configures the information management engine with this new value.

4.2. Algorithm for Secure Routing Process Based On Trust
In this section, an associate algorithmic program for secure routing decision technique based on trust values of the node is elaborate below.

- Source node broadcasts routing request message to its neighbors thus as to find out a route to a destination node.
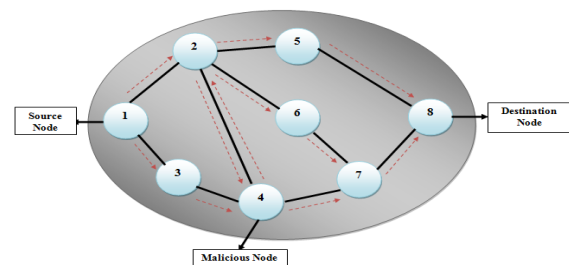
Fig.4.2.1. Routing Request

- The source node neighbors forward the request to their neighbors if the trust analysis on the source node passes its predefined threshold, and so on, until the destination or intermediate node with a "fresh comfortable satisfy" route to the destination is reached.
- If some nodes respond that require fresh enough route to the destination node and would really like to reserve a while slot for serving data transfer, the source node checks the trust analysis using ATM system on the responded nodes. Based on the analysis result and hop of the routes, the source node selects one preferred route, that it believes the foremost effective.
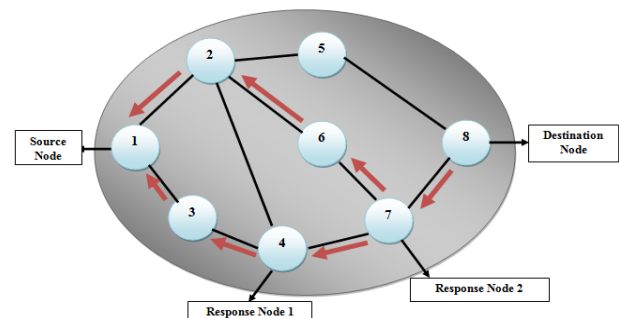
Fig.4.2.2. Routing Response

- The source node sends (test) data packages to the destination using the chosen route and set preferred interval awaiting the confirmation of destination node's and indicates that which package is required to reply confirmation of received packet.

- After receiving the knowledge packages, if the source node requests it then the destination node applies the same method above to reply the confirmation message. It's not necessary to use constant route because the source for higher security consideration.

Fig.4.2.3. Information Confirmation from destination node

- If, among the interval of time, the destination's confirmation arrives and might be verified as valid, the sending node will continue inflicting data packages via the chosen route. If the destination's confirmation isn't received among the preferred slot, the source node will update its trust analysis on the routing nodes by reducing the trust value of experience statistics.
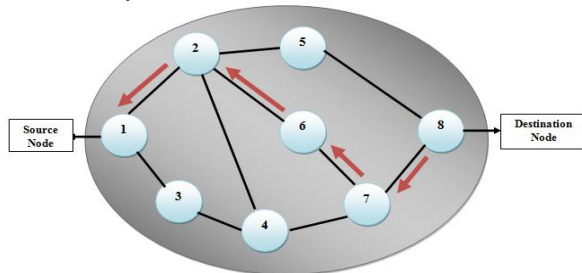- If the source node makes positive the response node of the underlying route is malicious, it'll place the node into the intrusion blacklist, set that value to zero.
- The source node in addition propagates the malicious node over the networks. This information is used for updating the reference of various node's trust analysis and, therefore, the update should additionally follow the trust analysis on the source node. Then process either jumps to the 1st step for higher security or goes to step seven for higher performance.
- The source node selects the second best route. Then move to step four.

The projected protocol are implemented based on any AODV routing protocol and by adding data accumulation and trust analysis mechanism.

5. Conclusion

These papers delineate an autonomic theme for observance trust information on MANETs, referred to as ATMS with secure routing decision technique. Its main goal is to provide uniform up-to-date trust data throughout the network with a minimum observance overhead. ATMS is characterized by its protocol simplicity and low process intensity. As future works, to reinforce the network performance, using the monitored data as an input of a routing decision technique. Further, it's often designed to analyze the utilization of lots of elaborate policies and their impact on this theme.

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Video Decoding for Mobile using Android Application

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ABSTRACT

To represent audiovisual information videos are the most useful and only approach. In all types of communication video information is very important factor. The problem with such kind of media is its large size. Data is required to be stored in the database or to be transferred over communication medium. The efficiency of communication means is affected by size of video. Video compression is required to save the storage space as well as time for transmission & reception. By using effective compression techniques video size is reduced thereby reduction in cost of data usage for mobile applications.

Keywords : Video compression, Discrete Cosine Transform, Discrete Wavelet Transform, PSNR.

I. Introduction

Videos are the most useful and only approach to represent audiovisual information. Today all the communication approaches are working with such kind of media. The problem with such kind of media is its large size. Data is required to be stored in the database or to be transferred over communication medium. Video transmission over wireless networks faces several challenges, such as time-varying error rate, bandwidth variation and limitation, battery power limitation. This in turn brings out the need for error resilient video transport, low power dissipation and high compression efficiency. Video compression is required to save the storage space as well as time for transmission and reception. By using effective compression techniques video size is reduced thereby reduction in cost of data usage for mobile applications.

II. Multimedia and mobile networks

The problems in making new video services accessible to the mobile handheld market are the limitations of bandwidth, screen size, resolution, and power.

A. WirelessNetwork Evolution

The impact of the wireless evolution on video to the handheld device is evaluated by considering traffic via communication channel. The bitrates for streaming video using various encoding schemes is given in Table1.

Table 0. Bit Rates for various encoded video streams

Encoding Type	H.263	H.264	HD720p	HD1080p
Resolution	175×144 @15 fps	352×288 @30 fps	1280×720 @ 60 fps	1920×108 0 @ 60 fps
Bit Rate	64 kbps	768 kbps	20 Mbps	50 Mbps

Table 1. Download speeds of different network technologies

Generation		Technology	Maximum Download Speed	Typical Download Speed
2G	G	GPRS	0.1Mbit/s	<0.1Mbit/s
	E	EDGE	0.3Mbit/s	0.1Mbit/s
3G	3G	3G (Basic)	0.3Mbit/s	0.1Mbit/s
	H	HSPA	7.2Mbit/s	1.5Mbit/s
	H+	HSPA+	21Mbit/s	4Mbit/s
	H+	DC-HSPA+	42Mbit/s	8Mbit/s
4G	4G	LTE	100Mbit/s	15Mbit/s

A. Screen Size & Resolution

The fundamental problems with screen size are power and the size of a person's hand. Screen size is constantly growing. And are available larger than 2.5 inches these days that are capable of displaying a CIF sized image with high clarity. At least one business handheld now boasts a four-inch screen size with 640×480 VGA resolution. This is nearly four times the resolution of a CIF image; however, it is more likely to be used with downloaded content (loaded into the handheld's memory via a USB interface to a PC). The products available in the market now allow a user to plug an external eight-inch monitor and keyboard into the USB or Bluetooth connections on a Windows® Mobile handheld, greatly increasing the viewable image area and providing a suitable keyboard for real content creation (as opposed to that used for SMS text messages and short emails).

B. Power

The next critical issue to solve is the need for power. Two things drive the need for power in the handheld:
• The processor
• The display

Processor

Processing power consumption would drop as function of the normal progression of silicon manufacturing technology, and would allow the processor to conserve battery power. In the video, a classic example of this is video conferencing. This paper addresses applications in the Usage Scenarios section; however, some recent attempts to run a conference using peer to-peer techniques with the application loaded in the handheld itself show a sizeable increase in power consumption, network bandwidth, and processor MIPS. Such applications are best run in the network equipment, where they can be work more efficiently and with less cost to the handheld's battery.

Display

There is with constant power drain of the display screen. The larger and higher resolution the screen, the more power it tends to use. Advances in LCD technology have greatly improved screen power consumption, but the constantly changing and always-on nature of a video call rapidly consumes the battery. And although battery technology is continually being improved, its advances thus far have lagged behind those of other technologies.

III. Compression Standrads

Compression is the science of reducing the amount of data used to convey information .Compression relies on the fact that information, by its nature, is not random but exhibits order and patterning. If that order and patterning can be extracted, the essence of the information can be represented and transmitted using less data then would be needed for the original. Then, at the receiving point the original can be fully or very closely reconstructed.

There are several families of compression techniques, fundamentally different in their approach to the problem. Sometimes, these techniques can even be used sequentially for good advantage. Today complex compression systems use one or more techniques from each family to achieve the greatest possible reduction of data.

A. Image and Video Compression Standards

The following compression standards are the most known nowadays. Each of them is suited for specific applications. Top entry is the lowest and last row is the most recent standard. The MPEG standards are the most widely used ones, which will be explained in more details in the following sections.

| Standard	Application	Bit Rate
JPEG	Still image compression	Variable
H.261	Video conferencing over ISDN	P x 64 kb/s
MPEG-1	Video on digital storage media (CD-ROM)	1.5Mb/s
MPEG-2	Digital Television	2-20 Mb/s
H.263	Video telephony over PSTN	33.6-? kb/s
MPEG-4	Object-based coding, synthetic content, interactivity	Variable
JPEG-2000	Improved still image compression	Variable
H.264/ MPEG-4 AVC	Improved video compression	10's to 100's kb/s

Figure 1. Compression Standards
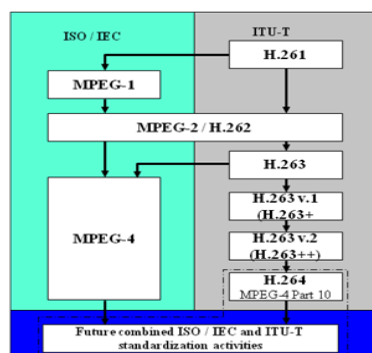
Figure 2. MPEG standards

MPEG stands for *Moving Picture Coding Exports Group* [4]. At the same time it describes a whole family of international standards for the compression of audio-visual digital data. The most known are *MPEG-1*, *MPEG-2* and *MPEG-4*, which are also formally known as ISO/IEC-11172, ISO/IEC-13818 and ISO/IEC-14496. More details about the MPEG standards can be found in [4],[5],[6]. The most important aspects are summarized as follows:

The MPEG-1 Standard was published 1992 and its aim was it to provide VHS quality with a bandwidth of 1,5 Mb/s, which allowed to play a video in real time from a 1x CD-ROM. The frame rate in MPEG-1 is locked at 25 (PAL) fps and 30 (NTSC) fps respectively. Further MPEG-1 was designed to allow a fast forward and backward search and a synchronization of audio and video. A stable behavior, in cases of data loss, as well as low computation times for encoding and decoding was reached, which is important for symmetric applications, like video telephony.

In 1994 MPEG-2 was released, which allowed a higher quality with a slightly higher bandwidth. MPEG-2 is compatible to MPEG-1. Later it was also used for *High Definition Television (HDTV)* and *DVD*, which made the MPEG-3 standard disappear completely. The frame rate is locked at 25 (PAL) fps and 30 (NTSC) fps respectively, just as in MPEG-1. MPEG-2 is more scalable than MPEG-1 and is able to play the same video in different resolutions and frame rates. MPEG-4 was released in 1998 and it provided lower bit rates (10Kb/s to 1Mb/s) with a good quality. It was a major development from MPEG-2 and was designed for the use in interactive environments, such as multimedia applications and video communication. It enhances the MPEG family with tools to lower the bit-rate individually for certain applications. It is therefore more adaptive to the specific area of the video usage. For multimedia producers, MPEG-4 offers a better reusability of the contents as well as a copyright protection. The content of a frame can be grouped into object, which can be accessed individually via the *MPEG-4 Syntactic Description Language (MSDL)*. Most of the tools require immense computational power (for encoding and decoding), which makes them impractical for most "normal, nonprofessional user" applications or real time applications. The real-time tools in MPEG-4 are already included in MPEG-1 and MPEG-2. More details about the MPEG-4 standard and its tool can be found in [7].

H.264/AVC - MPEG-4 Part 10

Advanced Video Coding (AVC), developed by Joint Video Group (JVT) and approved as Recommendation H.264 (by ITU-T) and as MPEG-4 Part 10 (by ISO/IEC) is originally intended to compress moving images that take the of eight-bit 4:2:0 coded pixel arrays. Although complex, AVC offers between two and two and half times the compression factor of MPEG-2 for the same picture quality.
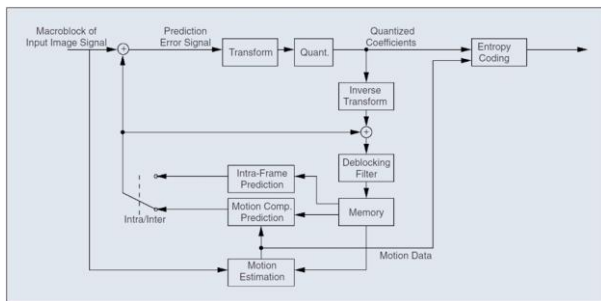
Figure 3 .AVC encoder with spatial (for I frames) and temporal (for P and B frames) predictors [7]
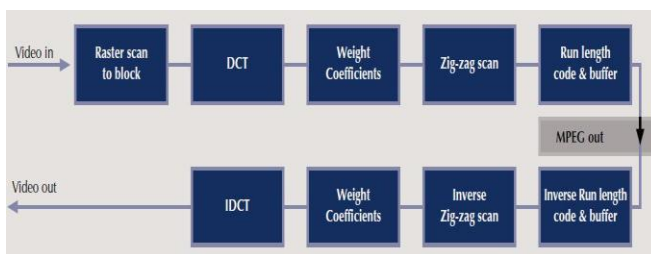
A. Intra frame Coding

Figure 4. Intra fame coding [8]

The figure 4. shows a complete intra-coding scheme which MPEG uses on the first picture in a Group. The input picture is converted from raster scan to blocks. The blocks are subject to a DCT. The coefficients are then zigzag scanned and weighted, prior to being re-quantized (word length shortening) and subject to run-length coding. Fig. also shows the corresponding decoder. The run length coding is decoded and then the coefficients are subject to an inverse weighting before being assembled into a coefficient block. The inverse transform produces a block of pixels which is stored in RAM with other blocks so that a raster scanned output can be produced.

B. Inter frame coding

For moving pictures, exploiting redundancy between pictures gives a higher compression factor. In a simple inter-coder, after starting with an intra-coded picture, the subsequent pictures are described only by the way in which they differ from the one before. The decoder adds the differences to the previous picture to produce the new one. The difference picture, produced by subtracting every pixel in one picture from the same pixel in the next, is an image in its own right and is compressed with a DCT process.
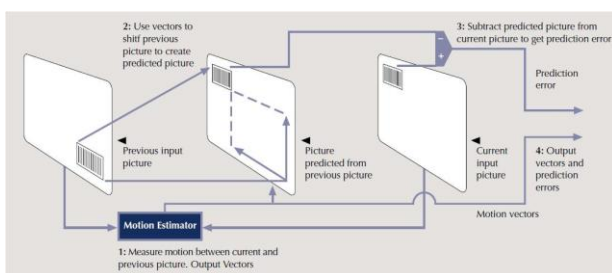
Figure 5. Inter frame Coding [8]

IV. Proposed Algorithm

The application initially works on the web server and when the application started by the user. The streaming process is shown in figure 6. The application checks for the internet connection is connected or not and if internet connection is there then app shows the main screen and on that app the list of video is shown which are present on the web server and user has the option to select the video which the user want to play and also one more option is there in which user can select which type of video wanted to play means compressed or uncompressed. If user selects the compressed video then the cost for seeing the video is less as compared to that required for uncompressed video.

Figure 6. Streaming process
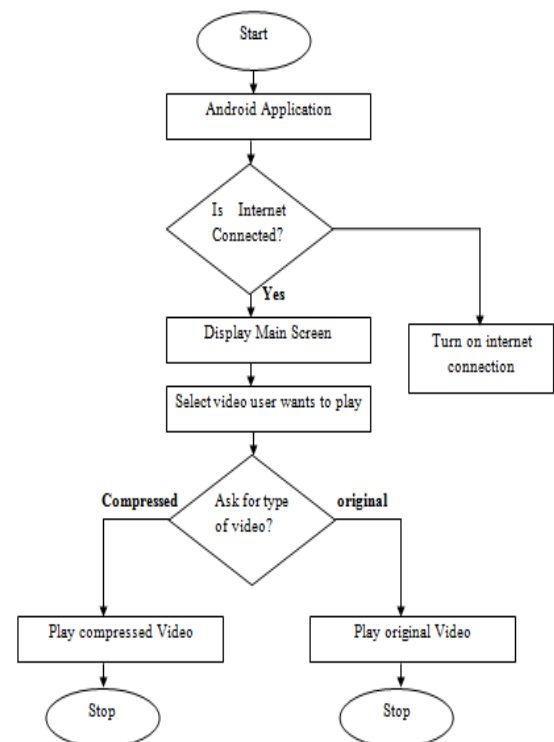
Figure 7. Application flow

The application flow chart is shown in figure 7.By developing this type of application compressed video can be downloaded directly in mobile phone and decmopressed it directly in mobile.By this method the amount of data required for downloading the normal videofile is reduced by 80 to 90%. So it is cost effective amd economical app for live streaming application point of view.

V. Result

The results are shown below based on DCT and DWT compression techniques and that are used to upload and download in mobile phone. The size of compressed video using DCT of 4sec duration each is 1.14mb and 974kb and that by DWT is 485kb and 524kb respectively.

Table 2 .Time required for uploading the compressed video to the proxy server

Video name	Approx. Time required for DCT video	Approx. Time required for DWT video
CLIP 1	1min	40sec
CLIP 2	1min	34sec

Table 3. Time required for uploading the compressed video to the proxy server

Video name	Approx. Time required for DCT video	Approx. Time required for DWT video
CLIP 1	20sec	5sec
CLIP 2	20sec	5sec

CLIP 1. Snap shot

CLIP 2. Snapshot

Figure 8. Snapshot of videos

VI. Conclusion

This study presents analysis of web based streaming using a mobile app tool by which user can save amount of data by 60 to 80% by which cost of internet usage through cell phone can be reduced. This concept can be applied to any live or web streaming applications for faster and seamless video streaming and also for video conferencing.

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Wireless Pro-Scanner

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ABSTRACT

We present an projector player system with wireless network. This paper gives the hardware and software architecture of the player system, and discusses the design in detail.

Today's projector is connected to any device like computer, laptop, etc. using HDMI cable. So it becomes difficult to connect or project data from a device at a distance more than the length of HDMI cable. And it is also difficult to connect multiple devices since only one HDMI port exists. Personal computers today have 802.11 (b/a/g) -based wireless connectivity. By connecting laptops to a projector wirelessly, multiple persons could connect to the projector and present the content on their laptops not simultaneously but one at a time as all the user data will be saved in player memory. This typically requires a receiver at the projector end that is wirelessly connected to the laptop/mobile and which receives, decodes the data and give input to the projector. Controller Raspberry PiB+ along with wireless module can be used to achieve the aim of Wireless Data Transmission and projection on projector.

Keywords : *Projector, Transmission, Processor, Wireless Network*

I. Introduction

Wired projection is an issue of concern as it uses HDMI cable which limits the distance and hence it becomes necessary to implement wireless technique. Since most of the devices use Wi-Fi or Bluetooth it can be used to project documents .Currently most of the projectors are used using HDMI cable or USB cable. A device or system which is connected to projector for receiving data wirelessly from different devices and which acts as an alternative medium to wired HDMI or USB cables between a projector and media or document device like laptops, etc. Thus will lead to distant projection.

With the rapid advances of modern technology, projectors are widely being adopted in many fields, such as school education, business conference and domestic entertainment. However, some common problems disturb the effective use of projector currently, these representative problems are as follows.

Projector depends on external computer device. In fact, an individual physical projector typically requires an image display device, so it must cooperate with a play device. The best common play device is Personal Computer (PC) or laptop. When a special PC is assigned to a projector, it has little efficiency, but the total setup costs of whole system which includes projector and PC will be more expensive. At last, PC station often has few stability and reliability.

Conventional Projector has trouble with complex cable layout. A common projector has a cable which carries image input signal, and the another end of cable is connected by play device such as PC station. A common scenario is as follows, in a business forum, everyone who will give a lecture or, it's too inconvenient. When we often pull out and plug the cable interface many times, the spins of cable interface will be broke likely, so the projector doesn't work no longer until the old cable interface is replaced. Though an advanced projector today has 802.11(b/a/g)-based wireless connectivity, the projector still require a PC as above said, and the usage of it is still complex and inconvenient.

Operating the physical projector and its player has many limited in space. A typical projector has a remote IR controller, but the controller cannot operate the player (i.e. PC) of projector. Some PC have wireless point device, but the device cannot operate the projector. Considering a familiar case, in multimedia education classroom, a teacher will go to PC when he want to run a program, and he has to go to projector screen when he want to explain the key knowledge, and he need to go to place of student when the student ask him to a single question. So the teacher has to beat up and down among PC, projector screen and students, it's too troublesome and has no efficiency. Today, there isn't a general solution available for both PC and projector.

Park [1] designs the SXGA network and multimedia projector system, and focuses on high-resolution large screen. Tsunashima [2] describes a compact display system which is capable of displaying multiple PC desktop screens from remote PCs connected through a network on a single projector screen. But they also receive video signals from an external server device such as a PC. Some papers [3,4,5] study on other new directions in the projector industry, such as multi-planar displays, multi-projector Displays and 3D projector.

This paper presents a framework of automatic embedded projector player system with wireless network. The new player system not only has no trouble with cable layout, but also has independence of PC or notebook. And we can operate the player system and physical projector by a new remote control handle with a uniform way.

The remainder of this paper is structured as follows. Section II discusses the principle of automatic player system for projector. The hardware architecture of automatic player system is given in section III. In section IV, we discuss the software architecture and implement in detail. A prototype and two experiments are shown in section V.

II. Overview of Automatic Player System

We have three key ideas to design an automatic projector player system, and the new player system will resolve above problems for general applied scenes of projector, which presents common files such as Word files, PowerPoint files, PDF files, JPG files, MPEG files and so on.

A. Key Ideas and Goals

1. Receiver System Independent of PC

In general applied scenes of projector, since we just present files belong to common types, so we do need not a costly and immovable PC to play these files. We choose embedded system to replace the PC, and the specified embedded system can do the playing work best than traditional PC in many aspects. It is also not necessary to continuously plug our PC to projector so anybody can attach a pen-drive to view files. Instead a less power consuming receiver system can resolve the problem

2. Projector with No Cable Layout

Conventional Projector has to be pulled and plugged from one PC to another PC continually. The new player system we recommended takes IEEE 802.11b wireless protocol, so PC can connect to the player system over wireless network.

3. Uniform Control Way

We also aim to design an app which will control device, which can operate both player system and projector remotely. Alternatively a keypad system can be used.

B. Solution of Automatic Embedded Player System

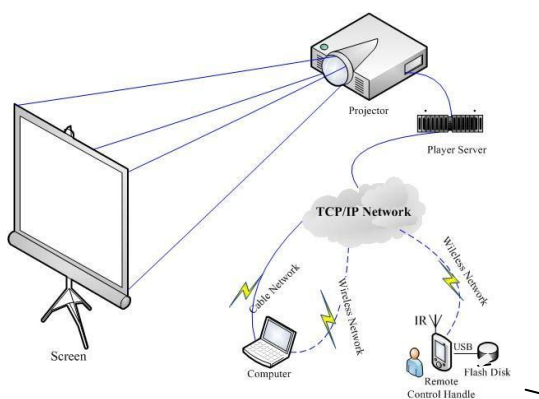The infrastructure of the embedded player system.

Figure 1. Physical Topology of Embedded Player System

The automatic embedded player system has four main parts, i.e. physical projector, projector player server, remote control handle(mobile/keypad), and network devices. The projector player server plays a core role; it charges the tasks of receiving and playing files. The remote control handle mainly charges reading files from removable storage, sending these files to projector player server over network, and remote controlling both the projector player server and physical projector. Because

IEEE 802.11b network protocol is taken, so conventional personal computer and notepad also access the projector player server and send files to it.

Mathematical Modeling:
The free space model is only an idealized model. However radio signals propagation within buildings can be really complex. The simplest wave propagation case is that of a direct propagation in free space which the Friis Transmission Equation addresses (Frii, 1946).

$$P_{rx} = P_{tx} G_{rx} G_{tx} \left(\frac{\lambda}{(4\pi d)} \right)^2 \text{ so } P_{rx} \propto P_{tx} \left(\frac{1}{(d)} \right)^2$$

Where λ = signal wavelength, d = distance from the transmitter, Gtx = Transmitter antenna gain, Grx = Receiver antenna gain, Ptx = Transmitter Power and Prx = Received Power.

Friss Transmission equation has been used for wireless transfer of data.

III. Hardware Architecture

A. Projector Player Server

The projector player server is composed of Raspberry Pi B+ processor,wireless module, power module, VGA output module.

The raspberry Pi having arm processor inside it is selected as main CPU,working on 700MHz.By providing a comprehensive set of common system peripherals, the raspberry pi minimizes the overall system costs and eliminates the need to configure additional components. The main features of it are: 512MB SDRAM, Ethernet support, camera interface support, and supporting up to 8GB SD card. These features can ensure the smooth running of the operating system and application software.

The development boardintegrates VGA/AV/S-VIDEO output ports, so it can send image signal to projector. The display resolution of VGA is 800*600, so it can meet the requirements of ordinary projector, it plays video files smoothly and no splash screen happened. If a LCD-VGA video transfer card is added to current development board, the display resolution can reach 1204*768 or higher.

Wireless USB Adapteris selected for transferring the files and command between the player server and remote device and PC. 802.11b/g/n wireless protocol 300Mbps Wireless USB Adapter supports IEEE 802.11b/g/n maximum speeds up to 300Mbps, file transfer speed and smooth playback. The network interface is attached to the USB interface.

B. Control

The mobile software can be used to control the player system or a keypad interface can be used to control the player system.

IV. Software Architecture and Design

A. *Software Architecture*

The system consist of the following software packages (see Fig.4), which mainly include player server packages, remote control handle packages, and software update center.
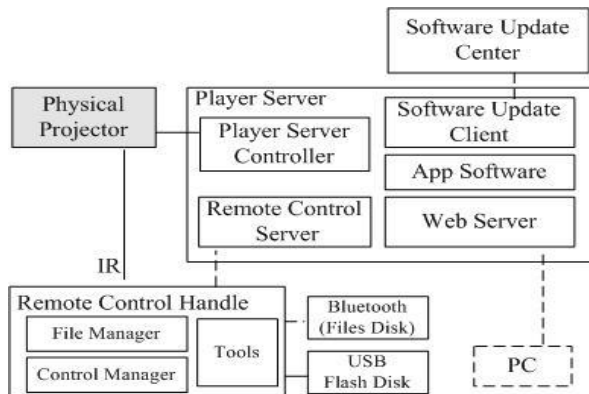

Figure 4. Logical View of Automaic Embedded Player System

B. *Embedded Operating System Enviroment*

We select Linux operating system, which has some characteristics such as: instant power up.The Linux open source operating system, or Linux OS, is a freely distributable, cross-platform operating system based on Unix that can be installed on PCs, laptops, netbooks, mobile and tablet devices, video game consoles, servers, supercomputers and more a lot of drivers for diversiform devices, especially supporting wireless protocols and USB, it becomes perfect to almost every industrial process. Linux has capabilities with advanced technologies, so the application developers can gain enhanced productivity and the cycle of development can be reduced evidently. We use the IDE Eclipse for Linux OS.

Eclipse
Free, open-source editor made for heavy Java development. Languages supported: Java, C, C++, PHP, Python, Perl, Ruby and more.

Features:

- Multi-language support
- Lot of plug-ins for extended capabilities
- Eclipse Java Development Tools
- Plugin Development Environment

To develop an OS design based on the Linux, the following tasks must be completed, i.e. customizing BSP (board support package), customizing device drivers, customizing additional projects and catalog items.

The BSP is middle software lied between Windows CE OS and hardware, which supports the boot loader, OEM adaptation layer (OAL), and device drivers for a specific hardware platform. We use the sample BSPs provided by Microsoft Windows CE for the SMDK2440A Samsung MCU Development Kit to quickly evaluate Windows CE OS features.

Firstly, we copy the files of SMDK2440A to the directory of WINCE500\PLATFORM, and modify the read-only attribute of all files. Secondly, we import the smdk2440a.cec file in platform builder environment. The SMDK2440A BSP is loaded successfully.

Secondly, some drivers are added into run-time image, such as SD card, USB mass storage, the former is in "Catalog\Device Drivers\SDIO\SD Memory", the latter is in "Catalog\Device Drivers\USB Function\USB Function Clients\Mass Storage".

Thirdly, we select a buddle of software packages from "Applications & Media" into the run-time image. These packages can support common file types (such as .txt, .doc, .pdf, .mp3, .mpg), which include Microsoft Excel Viewer, Image Viewer, PDF Viewer, PowerPoint Viewer, Word Viewer, and WordPad. These application packages canbe dynamically updated from software update center over network.

C. *Player System Softwares*

1) *Player Sever Software Packages*

The main function of player server is to run specified application with specified file on the embedded system.

The player server is composed of Remote Control Server, Web Server, Play Server Control, Application Software, and Software Update Client.

The remote control server can receive files which will be presented from remote control handle over wireless network, it also can receive command from control app/keypad, and these commands include mouse point action, keyboard event, and composed command. These commands are dealt by the default code of Linux or Play Server Control.

Web Server is supplied for the goal of uniform remote control. Any device can upload files to player server over wireless network. Any device can run the files in web server by the daemon play server control.

The software update client is to check and update software packages from software update center over network.

2) *Remote Control Handle Software Packages*
An android application preferably which may have team viewer app support.

Function of Control Manager is send operation command to remote control server of player server and physical projector.

Control Manager controls player server using basic commands, which include mouse point action, keyboard event. Auxiliary Tools include some composed commands based on two former managers to simplify operations.

In our solution, there are two ways to control the player system and projector, one is application and another is Keypad.

V. CONCLUSIONS

We have described the embedded player system for projector. The recommended player system is controlled by uniform way, and it doesn't depend on PCs and digital signal cables. We present the hardware and software architecture of the player system, we also give the design and implement details.

The main limitation of our current solution is that all of application software packages are required to run on LINUX OS. We will continue to improve the automatic embedded projector player system to support more software of mainstream OS platform in one single embedded hardware system.

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Analysis of Routing in Wireless Sensor Networks Using Markov Model and its Validation Using Regression Analysis

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ABSTRACT

This paper attempts to analyze routing and re-linking in the route from source to destination in a wireless sensor network (WSN). Re-linking is the process of selecting the best alternate link for uninterrupted data transmission from the source to the destination, on the event of failure of an existing link in the route. Minimal packet loss is expected during the process of re-linking in the resource constrained environment of WSNs. The route from the source to the destination is modeled as a Discrete Time Markov Chain. Mathematical validation of the proposed route model employing re-linking based on node battery threshold monitoring is carried out. Regression analysis is carried out to formulate the relation between the number of nodes between the source and the destination, the improved packet delivery ratio and the average energy consumption of the network.

Keywords : Routing; re-linking; Markov chain; regression analysis; packet delivery ratio

I. Introduction

The process of routing establishes the path between the source and the destination. Most of the existing energy efficient routing protocols forward the packets through the minimum energy cost based optimal route to the destination to minimize energy consumption [1, 2, 3, 4]. One of the major reasons for route break-up is depletion of node energy. The death of a node in a routing path breaks the link and the connection between the source and the destination is severed [5,6]. This necessitates re-linking to complete the data transmission task. Therefore a routing protocol must be able to dynamically update the status of its links and re-configure itself in order to maintain strong connectivity to support communication among the nodes. A survey of a number of routing protocols [7,8,9,10,11] has shown that re-linking is initiated only after the termination of an existing link between the nodes in a route.

It is observed that when a link breaks, some packets may be dropped and hence loss of information occurs. Re-transmission of data on discovery of a new route leads to an increase in the energy consumption. It is of utmost importance to carry out the re-linking procedure ensuring that energy efficiency is maintained and packet loss is minimized. Although the node battery energy has been previously exploited in routing protocols, there is a need to explore its efficient usage in re-linking techniques [12,13,14,15].

We have made an attempt to discern the relationship between the average network energy consumption, packet delivery ratio and the number of nodes between the source and the destination using regression analysis. Existing work based on regression analysis primarily focuses on routing reliability and path loss estimation [16,17]. The paper is organized as follows. Section II introduces the Markov routing model and the re-linking principle. Section III validates the proposed Markov model. Section IV focuses on the regression analysis carried out to justify the correctness of the proposed model. Finally section V concludes and discusses future scope of work.

II. The Markov Routing Model

A. The Re-linking Principle

We have proposed a technique based on node battery energy to reduce the packet loss during the process of re-linking and hence enable for successful dynamic re-linking [18]. As the technique proposed is generic, it can be implemented for any routing protocol to improve its performance metrics.
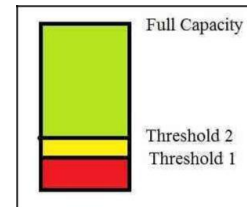

Figure 1. Node Battery Energy Levels

The node battery capacity is defined at three levels as Full capacity (EFull), Threshold 1 (ET1) and Threshold 2 (ET2) (Figure 1). Threshold 1 (ET1) defines the percentage residual energy level below which a node is unable to transmit or receive packets. It can be said that a node is dead when the residual energy falls below threshold 1. Threshold 2 (ET2) defines the percentage residual energy level at which a node can perform a pre-defined number of transmissions and receptions before reaching threshold 1.

We define two new terms.

Re-linking time TR: The time required by the previous node in a route to execute the re-linking process and establish a new route to the destination node.

Critical energy EC: The energy required by a node to successfully execute packet transmission and reception till a new route is discovered and established.

$$EC = ET2 - ET1$$
$$= ETX * \text{Number of packets transmitted}$$
$$+ ERX * \text{Number of packets received.} \quad \ldots \text{(1)}$$

Where,
ETX is the transmit energy of a node ERX is the receive energy of a node.

During the re-linking process, node continues to transmit the packets present in its buffer. The critical energy *EC* is used for these packet transmissions. At the same time, a delay is given to the packets present in the previous node buffer. This delay is intentionally introduced to prevent packets being dropped due to impending route breakage or non-availability of route. The delay should be greater than the re-linking time *TR* to avoid packet loss. Packets queue up in the previous node buffer for the given delay and will be forwarded through the newly discovered route.

The proposed re-linking technique is executed in two stages.

Stage I: Node battery energy monitoring
- Define node battery energy threshold levels.
- Real time monitoring of node battery energy.
- Comparing node battery energy with pre-defined threshold levels.
- Informing the node battery status to the neighboring nodes in the route.

Stage II: Dynamic re-linking
- On verifying impending battery failure status, initiate re-linking procedure.
- Discovery of new route to destination by the previous node in the route.
- Simultaneous successful completion of the existing packets transmission by the soon-to-die node.
- Forwarding of incoming packets through the newly discovered route.

The re-linking technique being generic in nature, it can be incorporated in any existing routing protocol. New route discovery process is executed as per the existing routing protocols.

B. Mathematical Modeling

We have represented the path between the source node and the destination node as an N-element discrete time Markov chain (DTMC). A DTMC is a Markov process X= {X_n, n $\geq$ 0} having a countable number of states S_i. A Markov chain is specified in terms of its state probabilities P(X_{n+1} = j │ X_n = i) for all i, j $\in$ S and n $\geq$ 0. Let every node in the path from the source node to the destination node represent a state of the DTMC. We assume that the property of interest is over states satisfying the Markov property, and that every node of the WSN is independent and identical.

We have defined the WSN as a 2-tuple system (S,K), s $\in$ S, k $\in$ K. Let s $\in$ S = {0,1} denote a binary value that indicates whether the system follows the initial path or the re-routed path from source to destination. Let s=1 represent the initial path and s=0 represent the re-routed path. Let k $\in$ K = {0, 1, 2, …, N} denote the number of active nodes in a route. Let (1, N) be the source node and (1, 0) be the destination node. Then (1, N-1) to (1, 1) represents the N-1 intermediate relay nodes. Nodes (0, N-1) to (0, 1) represent the nodes in the re-routed path. The Markov technique can be extended to represent a

multi-path system. However for simplicity of implementation we have restricted ourselves to one re-routed path. Let an active node make a transition to a dead state (D) when the residual energy of the node battery falls below threshold 1. The destination node state (1, 0) and the dead state (D) are absorbing states. An absorbing state is a state from which there is zero probability of exiting. Hence a routing system can be said to be analogous to an absorbing Markov system that contains at least one absorbing state, and is such that it is possible to get from each non absorbing state to some absorbing state in one or more steps. We use the stationarity assumption that the "State transition probabilities are independent of the actual time at which transitions take place".

Let P be the probability of successful transmission of a packet to an intermediate node in the path from source to destination. By virtue of the analogy between a routing system and a DTMC, the transition probability from state N to state N-1 can then be said to be $e^{(-P)}$. We define the *re-linking factor* c.

$$c = cb * cn \qquad\qquad\qquad ……..\ (2)$$

where,
c : Probability that the active node gets discharged below the threshold level and is replaced by a neighboring active node during the process of re-linking.

cb : Probability of accurately detecting the node battery threshold levels

cn : Probability of active nodes as neighbors

Since re-linking is initiated after a node in the path is dead, the probability of selecting an alternative path will be [$1-e^{(-P(1-c))}$]. We are interested in studying the effect of re-linking on packet delivery. Hence let a node in the newly discovered path forward the packet to the next node in the path with the same initial probability $e^{(-P)}$. Thus a node in the initial path will transition to the D-state with a probability Q = $e^{(-P(1-c))}- exp(-P)$. A node in the newly discovered path will transition to the D-state with a probability [$1-e^{(-P)}$]. The state transition diagram representing the routing process is depicted in Figure 2.

In the proposed Markov model representing routing, re-linking is initiated prior to the failure of a node in the route from source to destination. Hence the probability of selecting an alternative path is [$1- e^{(-Pc)}$]. In this case a node in the initial path will transition to the D-state with a probability Q' = [$e^{(-Pc)} - e^{(-P)}$].
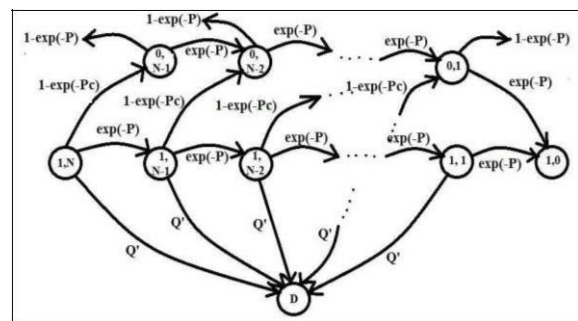

Figure 2. State Transition Diagram for Routing Process

The transition probability matrix Q is constructed for both the routing and re-linking processes. Each non-zero block corresponds to the transition probability among states. A Markov chain that has 'r' absorbing states and 't' transition states can be expressed in the canonical form.

$$P = \begin{bmatrix} Q & R \\ 0 & I \end{bmatrix} \qquad \dots \ (3)$$

where matrix [Q] represents the transition probabilities between the transient states. Matrix [R] represents the transition probabilities from the non-absorbing states to the absorbing states [19]. The initial path from source node to destination node contains N+1 nodes and the re-routed path contains N-1 nodes. Hence the transition probability matrix [Q] is a (2N-1) x (2N-1) matrix.

The computation of absorbing state probabilities requires the determination of the fundamental matrix $N = [I-Q]^{-1}$. The product of fundamental matrix N and the absorbing matrix R gives the probability of eventually moving from each non-absorbing state to each absorbing state.

Multiplying any vector of the initial non-absorbing state probabilities by NR gives the vector of probabilities for the process to eventually reach each of the absorbing states. The absorbing probability from state (1,N) to state (1,0) can be correlated to the probability of packets reaching the destination node from source node.

III. Validation of the Markov Routing Model

A. Mathematical Validation

The probability of being absorbed in state (1,0) has been calculated using Matlab for a varying hop count between the source node and the destination node. We have assumed the probability P of successful transmission of a packet to an intermediate node as 0.7 and the re-linking factor c is also assumed to be equal to 0.7 [20]. It is assumed that 1000 packets are transmitted by the source node in a burst. Probability of packets reaching from source node to destination node is calculated for both existing routing techniques and the proposed re-linking technique. Difference of probabilities in both cases is calculated in terms of percentage. This increase in percentage PDR on implementing the re-linking technique for varying hop count (N) is depicted in Figure 3.
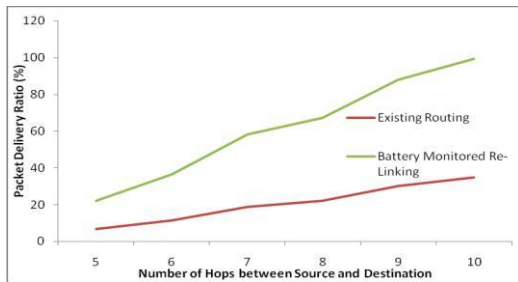

Figure 3. Percentage Improvement in Packet Delivery Ratio

Results show an appreciable improvement in the absorption probability when re-linking is initiated prior to the failure of a node in the path from source to destination. Percentage increase in packets reaching from source node to destination node on implementation of proposed re-linking technique is significant. This supports our belief

that initiation of re-linking prior to node failure, based on node battery energy monitoring appreciably increases the number of packets delivered to the destination node.
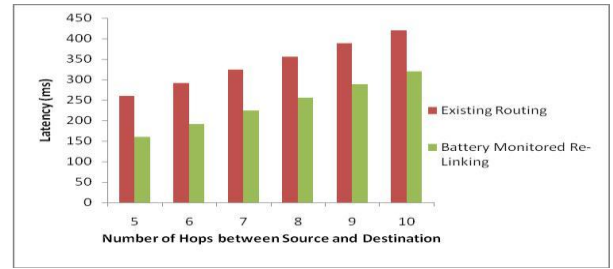

Figure 4. Percentage Improvement in Latency

IV. Regression analysis of the Markov routing Model

Regression analysis is a statistical tool for the investigation of relationships between variables. Regression analysis generates an equation to describe the statistical relationship between one or more predictor variables and response variables. The functional equation is of the form

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots + \epsilon \qquad \dots \ (4)$$

Y is the dependent variable and X_i (i = 1 to n) are the independent explanatory variables. β_i (i = 1 to n) represents the regression coefficients. They represent the strength and type of relationship the independent variables have with the dependent variable. β_0 is the regression intercept. It represents the expected value for the dependent variable if all the independent variables are zero. ϵ, the random error term, represents the unexplained portion in the regression equation. Based on the data obtained from simulation incorporating the re-linking technique, a multiple regression technique is formulated. A functional relationship between average network energy consumption (E), packet delivery ratio (P) and the number of nodes (N) between the source and the destination is predicted. However parameters influencing the network performance that are not accounted for like non-linear node battery discharge, node power consumption during idle and sleep states and signal processing etc. are accounted for by the regression intercept.

The proposed Markov routing model is analyzed for adhoc on-demand distance vector (AODV) protocol as well as for battery-monitored AODV (BM-AODV) employing the re-linking technique. [5].

Analysis of variation and regression analysis statistics obtained after incorporating the Markov based re-linking technique in BM-AODV and AODV routing protocols is depicted in Table 4.

TABLE 4. REGRESSION ANALYSIS AND ANOVA

	BM-AODV	AODV
R Square	0.8487	0.8495
Standard Error	0.5775	0.4625
Significance F	0.0588	0.0584
Functional Relation	E=19.5 − 0.033N − 0.14P	E=11.2 − 0.02N − 0.069P

The coefficient of regression R^2 obtained on implementing the proposed re-linking technique in BM-AODV and AODV routing protocols is very near to 1 implying that the proposed Markov model for analyzing routing and the re-linking technique is fairly accurate and acceptable. Variance in the average network energy consumption depends on the number of nodes in the route from source to destination and the expected PDR to an extent of almost 84%. A conspicuous lower value of 'Significance F' further enhances the trustworthiness of the proposed Markov routing model. The functional relation obtained is decisive in predicting the average network energy consumption for desired expected PDR and number of nodes in the route from source to destination.

V. Conclusion

This paper has analyzed the concept of initiation of re-linking just prior to the failure of a node in the path from source node to destination node. Routing in a wireless sensor network and the re-linking technique is represented using a Markov model and has been validated mathematically. The mathematical analysis indicates a substantial increase in the percentage of packets reaching from source node to destination node. Latency is observed to decrease by an average of almost 50 %. Multiple regression analysis performed has helped to quantify the impact of multiple causal variables i.e. Number of nodes N and the corresponding PDR, on the energy consumption of the wireless sensor network. Results are indicative that the node battery energy is more efficiently utilized along with an appreciative improvement in PDR on implementation of the generic re-linking technique. Further work is in progress regarding optimization of the relation between energy consumption, PDR and number of nodes between the source and destination in a WSN.

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Client Server Based Wireless Sensor Network

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ABSTRACT

Recently, client server have been proposed for efficient data dissemination in sensor networks. In the traditional client/server-based computing architecture, data at multiple sources are transferred to a destination; whereas this project is based computing paradigm, a tasks specific executable code traverses the relevant sources to gather data. Most existing geographic routing protocols on sensor networks concentrates on finding ways to guarantee data forwarding from the source to the destination, and not many protocols have been done on gathering and aggregating data of sources in a local and adjacent region. However, data generated from the sources in the region are often redundant and highly correlated. Accordingly, gathering and aggregating data from the region in the sensor networks is important and necessary to save the energy and wireless resources of sensor nodes. These networks can be used to greatly reduce the communication cost, especially over low bandwidth links, by moving the processing function to the data rather than bringing the data to a central processor. This paper proposes to use this paradigm for reducing and aggregating data in a planar sensor network architecture. The proposed architecture is called as client server based wireless sensor network (CLWSN).

I. Introduction

Recent years have witnessed a growing interest in deploying large numbers of micro-sensors that collaborate in a distributed manner on data gathering and processing. Sensors are expected to be inexpensive and can be deployed in a large scale in harsh environments, which implies that sensors are typically operating unattended. Energy-efficient data delivery is crucial because sensor nodes operate with limited battery power. Currently, most energy-efficient proposals [1] in wireless sensor network (WSN) are based on the client/server computing model, where each sensor node sends its sensory data to a back-end processing center or a sink node. Because the link bandwidth of a WSN is typically much lower than that of a wired network, a sensor network's data traffic may exceed the network capacity.

II. The Architecture

The sensing electronics measure ambient conditions related to the environment surrounding the sensor and transforms them into an electric signal. Processing such a signal reveals some properties about objects located and/or events happening in the vicinity of the sensor. A large number of these disposable sensors can be networked in many applications that require unattended operations. A Wireless Sensor Network (WSN) contain hundreds or thousands of these sensor nodes. These sensors have the ability to communicate either among each other or directly to an external base-station (BS). A greater number of sensors allows for sensing over larger geographical regions with greater accuracy. Figure 1 shows the schematic diagram of sensor node components of a single unit. Basically, each sensor node comprises sensing, processing, transmission, mobilizer, position finding system, and power units (some of these components are optional like the mobilizer). The same figure shows the communication architecture of a WSN. Sensor nodes are usually scattered in a sensor field, which is an area where the sensor nodes are deployed. Sensor nodes coordinate among themselves to produce high-quality information about the physical environment. Each sensor node bases its decisions on its mission, the information it currently has, and its knowledge of its computing, communication, and energy resources. Each of these scattered sensor nodes has the capability to collect and route data either to other sensors or back to an external base stations [1]. A base-station may be a fixed node or a mobile node capable of connecting the sensor network to an existing communications infrastructure or to the Internet where a user can have access to the reported data.
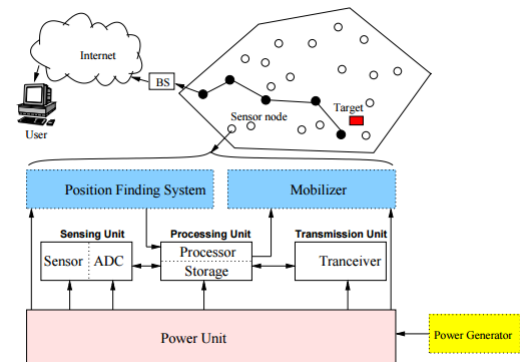

Figure 1 : Implementation of a single unit.

III. Proposed Algorithm

Kwan-Wu Chin and RaadRaad presented a dynamic framed slotted Aloha (DFSA) protocol that was energy efficient and more importantly was the first protocol capable of monitoring tags. This protocol uses 3 separate frames: *Reservation, Body, Monitor*. The *Reservation* and *Body* frame were used to identify tags whereas the *Monitor* frame was used to keep track of indentified tags. They have performed extensive simulation studies on all 3 frames and compared proposed protocol with existing framed Aloha protocols. Got results which confirmed that proposed protocol was suitable for use in RFID-enhanced Wireless Sensor Network. Simulation results show that presented protocol was significantly more energy efficient than existing FSA protocols, primarily because it uses small reservation and monitor slots and it removes idle slots quickly. Moreover, it resolves collisions promptly.

IV. Developments and Applications

- The first "wired homes" were built by American hobbyists during the 1960's, but were limited by the technology of the times. The term "smart homes" was first coined by the American Association of House builders in 1984 with the invention of the microcontroller, the cost of electronic control fell rap0idly and during the 1990's home automation rose to prominence. Since the early 20th century, a lot of work has been done to develop the Smart Home System. Basically, a Smart Home refers to a home with intelligent to 7 control, monitoring and automate the home system. The Smart Home's degree of intelligence depends on the complexity of the system.

- If the designated Smart Home System is to be powerful, the complexity of the system will increase. However, if only a simple system is desired, the complexity will be less. e.g. if the Smart Home System is used only for temperature monitoring, we will be requiring only receive information about the home temperature from the sensor nodes but it could not send any order to it. however, if the system is needed a more monitor, control and automate the house, the system will be needed a more complex design to enable a duplex communication between the Android devices and the sensor nodes. After a duplex communication has been established. only then the Android device could only send and received information to the sensor nodes[3].

- An application was developed related to monitoring system for coal mine safety based on Zigbee wireless sensor network. The underground system collects temperature, humidity and methane values of coal mine through sensor nodes in the mine; it also collects the number of personnel inside the mine with help of an IR sensor, and then transmits the data to information processing terminal based on ARM. the terminal sent data to the ground section through Zigbee, and in the ground section, the processing terminal monitors the data and sends the data to the PC to save them and for remote users to inquire. An SMS sent to the corresponding member through GSM modem which was connected to the controller. If any data was received, the received data was compared with the predefined threshold values. if the received values were more than that of threshold values then buzzer will be ON. So that warning to the personnel should occur.

- A theory was proposed that aZigbee monitoring and protection system for building electrical safety. The proposed system was constructed with protection mechanisms in order to enhance the functions of traditional distributed systems. The system can dynamically set the overload limit of outlets

disconnects the power. In addition. a self-protection function with temperature control was built in the outlets for fire prevention. This paper provides a detailed description of the proposed system from design to implementation, as well as the results of the demonstration experiments. A proposed system structure offers the building power-consumption security me1chanisms with Zigbee. A cost-effective Zigbee-based monitoring and protection system for building electrical safety was proposed. This system could improve the functions lacking in traditional NFB system and enhance the electrical safety of building. In addition, the extended functions, such as power saving strategies and building energy management, can be easily implemented based on the proposed system[4].

- Kwan-Wu Chin and Darryn Lowe (2008) discussed various challenge to creating RFID-enhanced wireless sensor network , and described their research on energy efficient RFID tag reading protocols. They have developed a new energy efficient tag reading protocol that was capable of reading and monitoring tags quickly with implementation of WSN[5].

- Ajay Jangra and Richa(2010) developed an analytical view on WSN architecture design issues, its objectives and implementation challenge. It elaborates the deploy node characteristics and functioning of each module of WSN architecture. Security issues and design challenge were analyzed and enlisted. Although a great work had been done in relation with wireless sensor networks, till date and still many efforts are needed in the direction and security of WSN[6].

NiuZhigang and Wang Lu (2011), developed system for coal mine safety that uses different modules such as Zigbeee (Tx,Rx), LPC2148 as controller, Gas sensor (MQ-6), Buzzer to detect the presence of gas and display the presence of gas wirelessly on 16X2 LCD on the transmitter side. The project uses sensors such as Gas sensors(MQ-6), temperature (LM35) . Whenever hazardous gas is detected, a buzzer is connected to produce audible alert signal and sensor values are given to ADC to get processed by LPC2148 controller. The temperature sensor LM35 senses the temperature and converts it into an electrical (analog) signal, which is applied to the microcontroller through ADC. The analog signal is converted into digital format by the ADC[7]

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Recovery of Detected Node Failure in Wireless Sensor Network

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Figure 1.1. Wireless sensor Network.

ABSTRACT

A wireless sensor network (WSN) contains a set of sensor nodes that are able to collect data and communicate with each other by radio links. Wireless sensor Networks (WSN) sometimes suffers from an interrupted link caused by several aspects like unattended operation prone to unfriendly interference. The interference in connection is usually named as network cut, results from a data loss, and improper routing choice and waste precious energy of nodes. A wireless sensor networks usually divided into multiple connected components owing to the failure of number of its nodes, which referred to as a "cut". A key thought of this paper is detection the node failure in wireless sensor network. Therefore, this paper projected a formula that permits (1) one or many nodes (that are connected to the special node once the cut) to monitor the happening of the cut, and (2) every node monitor at once the connection to a specially selected node has lost. The formula is asynchronous and distributed: every node should be communicated with solely those nodes that are within its communication area. Once the cut is detected, a separation of network drawbacks happening. Predicting those positioning from wherever the network get separated into the various partition can be a really useful feature which is able to be provided throughout a wireless sensors network. This paper describes a method among that neighbor information and rerouting Mechanism are used for rerouting information for node failure in wireless sensor networks surroundings.

Keywords : Wireless Sensor Network, Cut, Distributed Cut Detection, Rerouting Mechanism.

1. Introduction

A wireless sensor network (WSN) contains compact nodes with sensing, computation nodes, and wireless communications capabilities. Numerous routing, power management, and data dissemination protocols are specifically designed for WSNs wherever energy awareness may be an important design issue.
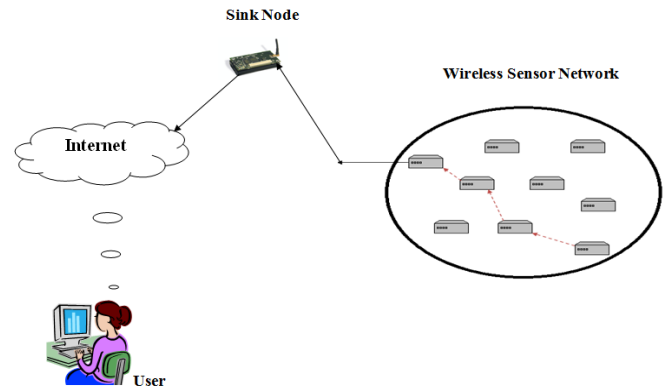

Sensor Nodes

WSNs have a good advantage many applications in our real world. As an example, a field of battle police investigation, monitoring, intelligent agriculture, home automation is widely used as real world applications. The sensor node, within the WSN systems, detects the data, processes it with the help of an in-built microcontroller and communicates results to as into station.

By establishing lots of sensor nodes' interconnection to each alternative, a wireless sensor networks sensor. A sensor node is an embedded device that integrates amount of microprocessor components onto one chip. Although a sensor node is capable of sensing, process and communication, their restricted memory capability, restricted battery power, low bandwidth and low method power produce it vulnerable to many kinds of attacks.

Wireless sensor networks (WSNs) are a promising technology for observation huge regions at high structural and physical resolution. In fact, failure of node is expected to be quite common owing to the usually restricted energy allocation of the nodes that are powered by tiny batteries. Failure of a set of nodes will reduce the amount of multi-hop ways among the network. Such failures can cause a collection of nodes – that have not unsuccessful – to become disconnected from the remaining nodes, resulting in a "cut". Two nodes are said to be disconnected if there is not any path between them.

A wireless sensor network (WSN) consists of a assemblage of sensor nodes that are able to collect data and communicate with one another by radio links, and it should be seen as a connected and undirected graph among that the vertices refer to the sensor nodes and additionally the edges signify the links between the nodes. Wireless networks (WSN) have seem as a vital new technology for incrementing and observant the physical world. The basic

conception of those networks may be a small chip integrated with one or several MEMS (micro-electromechanical system) sensors, actuators, and a wireless transceiver. These devices is embedded during a huge amount of a physical space, wherever they self-organize into an ad-hoc multi-hop wireless network, allowing us to observe and monitor the globe at an unprecedented structural and physical resolution.

Wireless sensor networks (WSNs), consisting of big numbers of inexpensive and low-power wireless nodes, have recently been utilized in many applications: disaster response, military police investigation, and medical care among others. The inherent nature of WSNs like unattended operation, powered nodes, and harsh environments cause major challenges. One of the challenges is to form certain that the network is connected. The connection of the network will merely is noncontiguous owing to unpredictable wireless channels and physical tampering by unfriendly users. Network disconnection usually referred as a network cut, might cause many of problems. For instance, ill-informed decisions to route data to a node Placed during a disconnected section of the network may cause data loss, wasted power consumption, and congestion within the network.

Distributed Cut Detection in WSN:

The algorithmic program projected that distributed and asynchronous: it involves solely local communication between neighboring nodes within the network, and is strong to temporary communication failure between node combine. A key component of the DCD algorithmic a distributed unvarying method step through that the nodes compute their (fictitious) electrical potential. The computation convergence rate is freelance of the dimensions also as a structure of the network.

CUT: The node failure is predicted to be a typical owing to the sometimes-restricted energy budget of nodes that are powered by small batteries. A set of nodes failure will reduce the many of multi-hop strategies among the network. Such will cause a collection of nodes- that have not failed- to become disconnected from the remaining nodes, resulting in a "cut". Two nodes are said to be disconnected if there is not any path between them.

SOURCE NODE: Here considers the problem of detection cuts by the nodes of a wireless network. Assume that there is a specially selected node among the network that we tend to call the source node. The source node may even be a base station that is an interface between the network and its users. A source node and alternative nodes may or may not be disconnected by cut; we tend to differentiate between two different outcomes of a cut for a specific node.

CCOS AND DOS: If a node u is disconnected from the source, Thus we can say its DOS(disconnected from source) event has occurred for u. once a cut happens among the network that doesn't separate a node, Therefore, Thus we can say that CCOS(connected, however a cut occurred

somewhere) event has occurred for 'u'. By detection of cut it mean (1) detection by every node of a DOS event once it happens, and(2) detection of CCOS event by the node close to a cut, and conjointly the approximate location of the cut.

FAILURE NODE: The failure of nodes is predicted to be a standard in WSN; because of their very restricted energy budget and environmental degradation. This situation is mostly true for the sensor networks that are deployed in harsh and dangerous environments for like fire observance. Once amount of sensors fail for no matter could also be the reason the ensuing topology is also disconnected that is taken into account as a failure of a collection of nodes. The topology changes resulted by the node mobility and node state transitions due to the use of power management or energy efficient schemes is also detected as node failures. An extremely dynamic network greatly will increase the complexity of failure management. Surprising node failure is handled through redundancy among the network and backup tips to switch broken links. Once a node failure occur the set of nodes get disconnected from the network which results throughout a "cut". The cut occurred prevents the data from reaching the destination, the nodes set that gets disconnected from the source kind of cut area that is referred to as a hole.
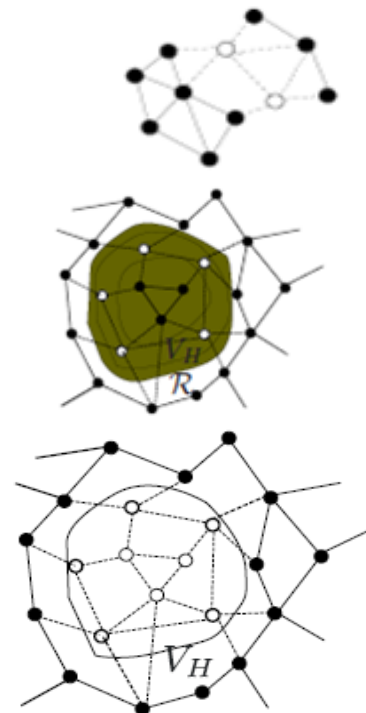

Figure 1.2. Examples of cuts and holes.

In the above-given figure, filled circles represent active nodes and empty filled circles represent unsuccessful nodes. Solid lines represent edges, and broken lines represent edges that existed before the failure of the nodes.

2. Literature Survey
In paper [1], Jagdish Pimple, Prof.Yogadhar Pandey planned a cut distributed an algorithm to seek out "cuts" in device networks, i.e., the failure of a set of nodes that separates the networks into two or additional parts. The

rule consists of an easy repetitious theme among that each node updates a scalar state by communication with its nearest neighbors. Among the absence of cuts, the states converge to values that are capable potentials in a very fictitious electrical network. Once a set of nodes is separated from a special node, that call an "origin node", their states converge to zero because the results of "current is extracted" from the element, however, none is injected.

In paper [2,]P. Barooah planned the DSSD rule planned isn't restricted to ǫ-linear cuts; it will notice cuts that separate the network into multiple elements of absolute shapes. Moreover, the DSSD formula is not restricted to networks deployed in second, it does not need deploying look out nodes, and it permits each node to search out if a cut happens. The DSSD rule involves solely nearest neighbor communication that eliminates the need of routing messages to the origin node. This feature makes the rule applicable to mobile nodes additionally. Since the computation that a node ought to do involves alone averaging, it compatible to wireless device networks with nodes that have restricted method capability

In paper [3], Myounggyu Won planned solutions for an extra general cut detection problem-- the destination-based cut detection disadvantage. In distinction to the traditional cut detection disadvantage, we tend to attempt to perceive a network cut between a sender and any node in a particularly set of given destinations. We've an inclination to initial propose Point-to-Point Cut Detection protocol (P2P-CD). P2P-CD permits a source node to identify a cut with reference to any destination node. Throughout this protocol, the boundary of a cut is compactly depicted as a set of linear segments. The compact illustration of a cut permits the knowledge on existing cuts (i.e., the shape and location of the cut) to be efficiently distributed throughout the network with little overheads.

3. Problem Definition

A canonical downside caused by separation of the network is partitioning caused owing to node failures. Failure of a group of nodes will reduce the amount of multi-hop ways among the network. Owing to this reason, a group of nodes that have not unsuccessful will be detached from the rest inflicting a cut. Once the device must send data to the source node, it has been disconnected from the source node. Without the knowledge of the network's disconnected state, it is progressing to simply forward the knowledge to making sure node among the routing tree, which might do the same to its next node. However, this message passing merely wastes precious energy of the nodes; the cut prevents the knowledge from reaching the destination.

The paper projected a Mechanism to discover cut occur in wireless sensor network. If a source node is prepared to be repaired and eventually reconnected, which saves energy of multiple nodes and prolongs their lives. The flexibleness of the source node to search out the incident and position of a cut will allow it to undertake network repair. Thus, considering the proficiency to search out cuts by every the

disconnected nodes and therefore the source node can lead to an increase among the operational amount of the network and also the flexibility to repair the network by considering the neighboring data of node and commutation the node with the cut node can improve the performance in wireless sensor network. Here this paper projected a Mechanism accustomed repair the network by rerouting data in wireless sensor network.

4. Proposed Methodolgy

Past decade has seen a surge of study activities among the field of wireless Communication. Rising from this analysis are new points of view on the way to communicate effectively over wireless channels. We are able to divide our complete mechanism into the foremost necessary domain.

1. Wireless channel
2. Routing algorithm
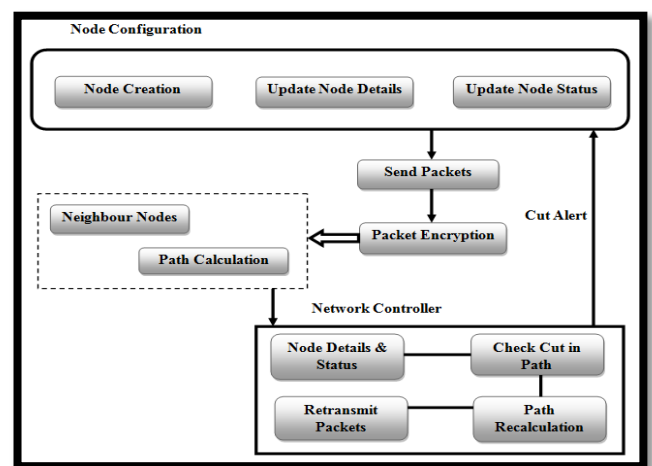3. Cut Detection
4. Rerouting transmission.

Fig.4.1.Block Diagram of Proposed Method

Route Discovery

The selection of a path for data transmission is completed based on the supply of the nodes among the region using AODV routing protocol. By using the ad hoc on Demand Distance Vector routing protocol, it creates routes on demand that is only if a route is needed that there is no "fresh" record among the routing table. So as to produce the determination of the freshness of routing data, AODV maintains the time since last utilized. A routing table entry is "expired" once a selected planned threshold of time. Taking into account all the nodes to be among the position.

Currently, the shortest path is to be determined by implementing the unplanned on Demand Distance Vector routing protocol among the wireless simulation environment for sporadically sending the messages to the neighbors and conjointly the shortest path.

Route Maintenance

The consequent step is that the maintenance of those routes that is equally very important. The source ought to endlessly monitor the position of the nodes to create sure enough the data is being carried through the pathway to the target without any loss. Suppose, if the position of the nodes is changed and additionally the source node does not produce a node of it then the packets are going to be lost and eventually essential to be present.

Data Transmission

The path choice, maintenance, and data transmission consecutive technique that happen in split seconds in period of time transmission. Therefore, the ways allocated previous is utilized for information transmission. The first path assigned previously is presently used for information transmission. The data is transferred through the underlying path. The second path chosen is presently used for data transmission. The data is transferred through the chosen path. The third path chosen is utilized for data transmission. The data is transferred through the suggested path.

When a node u is disconnected from the source, we tend to saying that a DOS (Disconnected from Source) event has occurred for u. once a cut happens inside the network that does not separate a node u from the source node, then we can say that CCOS (Connected, however, a Cut occurred Somewhere) event has occurred for u. By cut detection, we tend to mean 1) detection by each node of a DOS event once it happens, and 2) detection of CCOS events by the nodes close to a cut, and additionally the approximate location of the cut. Throughout this paper, we tend to propose a distributed algorithmic program to find cuts, named the Distributed Cut Detection (DCD) algorithmic program. The algorithmic program permits every node to search out DOS events and a group of nodes to search out CCOS events. The algorithmic program tend to propose is distributed and asynchronous: it involves only local communication between neighboring nodes and is powerful for communication failure between node pairs the convergence rate of the computation is freelance of the dimensions and structure of the network. All cut nodes information is been updated and created into a log file of the system and filtered log record of cut nodes is maintained.

Once the cut is detected in wireless sensing element network and if a source node is prepared to be repaired and eventually reconnected, which saves on-board energy of multiple nodes and prolongs their lives. The flexibleness of the source node to search out the incident and position of a cut will allow it to undertake network repair. Thus, considering the proficiency to search out cuts by each the disconnected nodes source node can lead to an increase among the operational period of the network and the ability to repair the network by considering the neighboring information of node and exchanging the node with the cut node can improve the performance in wireless sensor network.

5. CONCLUSION

During this paper, an efficient and recovery of fault node in wireless sensor network is projected. Distributed cut detection algorithmic rule permits every node to find DOS events and a group of nodes to search out CCOS events. The algorithmic rule proposes distributed and asynchronous: it involves solely local conversation between close nodes and is robust to temporary communication failure between node pairs. When a cut is detected in wireless sensor network, a source node is ready to be repaired and eventually reconnected, which saves on-board energy of multiple nodes. The flexibleness of the source node to search out the incident and position of a cut will allow it to undertake network repair. Thus, considering the proficiency to search out cuts by every the disconnected nodes source node can lead to an increase inside the operational amount of the network and also the power to repair the network by considering the neighbor information of node and exchanging the node with the cut node can improve the performance in wireless sensor network. Here this paper projected a Mechanism used to repair the network by rerouting data in wireless sensor network

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