Elevator Controller Using Wireless System

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***Abstract*—This Project presents the interface of an elevator controller with a wireless controller using RF Module. The elevator car movements can be controlled with the help of this wireless controller within a specified range programmed. In addition to the wireless technology, the user is able to see the location of the elevator car in the handling unit. Along with the new remote technology, the new specification of power saving mode is introduced. Thus, the overall arrangement is to reduce the average waiting time of the user.**

Keywords—elevator, main and handling unit, RF Module, transmitter, receiver, power saver mode

I. INTRODUCTION

In today's modern world, skyscrapers, towers are increasing and so is the demand of elevators. Hence, the need of highly efficient and modernized elevators arises, which led to the introduction of new technologies in elevator system. These technologies include Spiral escalators, Hydraulic cargo lifts, magnetic elevators and wireless technologies. Wireless technology elevators were based on Bluetooth, Global System for Mobile communication (GSM), Global Positioning Satellite(GPS), Radio Frequency Identification (RFID), Radio Frequency Module etc. Here we have made an attempt to design a Wireless controller using a cost effective RF Module.

Every wireless mode has a certain drawback or limitations. Such as in Bluetooth based system the range of connectivity is limited. In GSM based system, the network error may delay the transmission of signals. In GPS, as well the network, error can create delay in locating the elevator car in time. RFID Tag requires a separate tag for every individual. This increases the cost of the system. Taking all these factors into consideration, the elevator system using RF Module was opted for the project. There are two units : a Handling unit and a Main unit. They both act as trans-receivers on either sides one at a time. The main unit is interfaced with the elevator controller. And the handling unit is controlled by the user. Whenever the user calls for the elevator using the handling unit, it transmits a signal to the main unit acting as a receiver. The main unit responses to this call by blinking a led of that particular floor.

The RF module used in this project has the range of 1km ideally or within line of sight. But when implemented it can access an area of about 100m without line of sight.

Handling unit : This unit consists of a 5×7 dot matrix display, micro controller PIC18F46K22, 4 push buttons for call purposes, LED's, 12MHz oscillator crystal Frequency, 1 RF Module as trans-receiver. This unit is battery powered as it is portable, hence, requires constant DC supply. Serial communication is used during interfacing of various devices in this system at the baud rate of 9600.

The micro controller IC used is of package DIP40 which has 40pins in all. At a time 8 bits are transmitted, followed with one bit parity. Asynchronous mode of transmission is used for serial communication. An additional feature included in this project is the Power Saver. Whenever the elevator stands idle, the displays will go off as it is not being used currently. Thus saving energy consumed by the constant display in general elevators.

This unit also works as a trans-receiver and is interfaced with the elevator controller. This unit also includes 1 RF Module, 1 micro controller PIC18F46K22, 8 opto-couplers, LEDs. This unit is given AC supply as it is not portable unit. Out of these op to couplers, 1st two are functioned to denote the floors , 3rd&4th are used to detect the direction of elevator car, whereas rest of the couplers are used to perform trans-receiver function with the LED's on this unit.

For floors GROUND floor -00
FIRST floor -01
SECOND floor -10
THIRD floor -11

Another IC which is used apart from the main IC is IC-

ULN2003. This IC includes 7 Darlington transistors. The main purpose of using this IC is the presence of these Darlington transistors. The Darlington transistor (often called a Darlington pair) is a compound structure consisting of two bipolar transistors (either integrated or separated devices) connected in such a way that the current amplified by the first transistor is amplified further by the second one.[1] This configuration gives a much higher current gain than each transistor taken separately and, in the case of integrated devices, can take less space than two individual transistors because they can use a shared collector. Hence, the purpose of achieving high speed usage is completed. These pairs function on the negative switching(npn) configuration in this project.

Power regulators :
Two types of regulators are used in this project ie. Fixed power supply regulator (7805) and a adjustable output positive voltage regulator(LM117K). Between these regulators, capacitors are connected. The main purpose of these capacitors is to filter noise which tends to creep in along with the input supply provided.
This filtering is necessary as noise can deflect the output of the system. The micro controller used in this system is of 5V. Hence, these power regulators are necessary to control the voltage applied to the micro controller. If not regulated efficiently, micro controller can get damaged.

7805:IC 7805 PROVIDES +5V REGULATED POWER SUPPLY WITH PROVISIONS TO ADD HEAT SINK AS WELL IC 7805 RATING

Input voltage range 7V-35V
Current rating I=1A
Output voltage range Vmax=5.2V ,Vmin=4.8V
Pin Details of IC 7805

TABLE I PIN DESCRIPTION OF IC7805

Pin No	**Pin**	**Function**	**Description**
1	INPUT	Input voltage (7V-35V)	In this pin of the IC positive unregulated voltage is given in regulation.
2	GROUND	Ground (0V)	In this pin where the ground is given. This pin is neutral for equally the input and output.
3	OUTPUT	Regulated output; 5V (4.8V-5.2V)	The output of the regulated 5V volt is taken out at this pin of the IC regulator.

[4]

LM117K **:** SOT223 plastic package form of this IC is used.
LT117A - Positive Adjustable Regulator Features
Guaranteed 1% Output Voltage Tolerance
Guaranteed max. 0.01%/V Line Regulation
Guaranteed max. 0.3% Load Regulation
Min. 1.5A Output Current
100% Burn-in in Thermal Overload
3.3 voltage output[2]

these regulators are used for constant output voltage.
LM2576 : A DC-DC converter is used in main unit. The main function of this converter is that input voltage which is given , it gives out the desired output voltage but does not drop the extra voltage. Thus, conserving energy supplied unlike the fixed voltage regulators. LM2576 is a simple buck convertor. It is used only in the main unit as replacement of 7805 in the handling unit.

Bridge rectifier is denoted in the schematic for denotation purpose, but a IN4007 Diode is used for constant DC supply. This Diode acts as a unidirectional current source. Only positive voltage is allowed through this Diode whereas when a negative voltage passes through this Diode the Diode acts as a open path.

OPTO-COUPLERS : In this project,isolation is necessary because there is no physical connection present between the two units used. These opto-couplers increase the safety of our project. A PC817 opto-coupler is used here. The LED provides light that activates the photo-transistor BASE (sort of). The output can be configured as common-emitter (most common) or common-collector. If the LED is turned off, the transistor turns off.[3]
Features : 1.4pin DIP package
2. Double transfer mold package (Ideal for Flow Solder-ing)
3. High collector-emitter voltage (VCEO:80V(*))

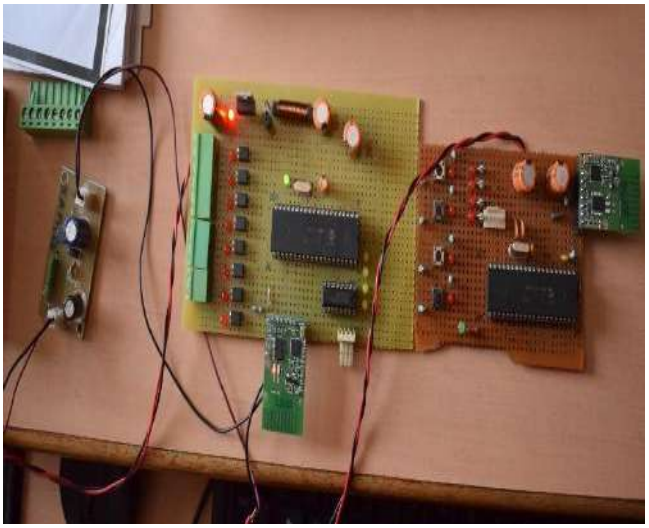

Figure 1. Main unit and Handling unit

4. Current transfer ratio (CTR : MIN. 50% at IF=5 mA, VCE=5V)
5. Several CTR ranks available
6. High isolation voltage between input and output (Viso(rms) : 5.0 kV)[5]

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ARM Based Cruise Control System

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***Abstract*—In times when over a million people die every year solely due to road accidents, ITS or Intelligent transport systems aim to make the roads safer. One major example of ITS is Cruise Control, it lets the user to automatically maintain a particular speed which can be predefined. It is primarily made for ease of the driver on highways, to avoid speeding tickets or fatigue from driving for long. However, in this communication, we aim to present a system wherein a governmental entity can use this exact technology to enforce speed limits on vehicles in high risk areas, and therefore, efficiently preventing accidents due to speeding. This system is based on Radio Frequency Identification (RFID) for identification of areas where the speed limit is essential. An ARM microcontroller is used to demonstrate a model vehicle passing through the said area. It is interfaced with an RFID receiver and also with a contactless tachometer to calculate and display the speed of the vehicle at all times.**

Keywords—RFID; Cruise control; lpc2148; tachometer;

INTRODUCTION

A primary concern for the modern world is road fatalities. According to recent studies [1], one third of fatal accidents are caused due to excessive speeding. For authorities, the mitigation of this issue, and lowering the total number of casualties due to road accidents, is a priority. One way of tackling this issue is the use of intelligent transport systems (ITS). ITS is defined as "advanced applications which, without embodying intelligence as such, aim to provide innovative services relating to different modes of transport and traffic management, and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks" [2]. Specifically, Vehicular Cruise Control (CC) is the prime candidate. However, in this paper we have tried to demonstrate a system wherein the focus is on the RFID receiver and transmitter arrangement which does not require a database or any GPS positioning system to effectively reach the said goal. We have demonstrated the following on a model vehicle built using ARM microcontroller namely lpc2148.

EXISTING TECHNOLOGIES

RFID in highway toll collection

This system uses the radio frequency identification technology by assigning every car with a unique identification key, which is embedded in an RFID transmitter tag on the vehicle. The RFID receiver is installed on the toll booth which activates the passive tags as they approach the booth. The receiver picks up on the identification number and the details of the particular user is automatically pulled up from the database.

Fig 1. Example of automatic toll collection [6]

Then the toll rate is automatically debited from the car owner's prepaid account.

The simplistic algorithm as shown in Fig. 2 displays clearly how the RFID sensors are used for toll collection. [3]

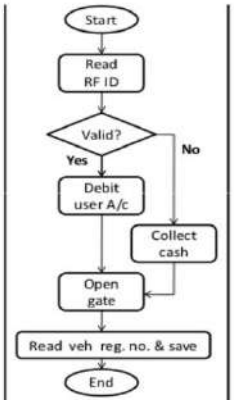

Fig 2. Algorithm of automatic toll collection [6]

Adaptive Cruise Control System

A safe and highly reliable system, that allows driving by automatically adapting the velocity of the vehicle in front by means of certain velocity set points and distance between the two vehicles. The prediction model makes use of sinusoidal functions as commonly traffic signals show periodic behavior. It is adapted in every sample instant with respect to the predecessor's velocity. Further, the vehicle is forced to stay within a specific inter-vehicle distance to avoid collisions and ensure safe driving. The primary advantage of the proposed approach in this system is a simple and fast real time implementation, for a wide range of engines and not specific types of engines. [4]

SENSOR SYSTEMS

In this section of the paper, we describe the microcontroller and sensors installed in or used for the formation of the vehicle in order to achieve speed control. The sensor subsystems are RFID sensors for detection and identification of the sensitive areas, Contactless tachometer to calculate real time speed of the vehicle, lpc2148 microcontroller on which the entire system in built upon, DTMF decoder for controlling the vehicle wirelessly.

Microcontroller

LPC2148 is an ARM7TDMI-S based high-performance 32-bit RISC Microcontroller which has Thumb extensions 512KB on-chip Flash ROM along with In-System Programming (ISP) and also In-Application Programming (IAP), 32KB RAM, Vectored Interrupt Controller and Two 10bit ADCs with 14 channels, USB 2.0 Full Speed Device Controller, Two UARTs, one with full modem interface. It has Two I2C serial interfaces, Two SPI serial interfaces, another Two 32-bit timers, Watchdog Timer, PWM unit, Real Time Clock along with optional battery backup, Brown out detect circuit General purpose I/O pins. The CPU clock that is up to 60 MHz, an On-chip crystal oscillator and an On-chip PLL [5].

Radio Frequency Identification (RFID) sensors

An RFID system is usually comprised of emitters or tags which, transmit a short digital radiofrequency message that contains a unique identification code as well as some data stored in the tag's memory. These data can be obtained with the help of an RFID reader. The reader needs to be interfaced to a computer or a microcontroller to read the data. The RFID reader also reads the received signal strength (RSSI) of the RF signal, which indicates the range from tag to reader. It also receives the tag ID, which within the detecting range of the reader, confirms the presence of the tag.

RFID systems operate in three frequency bands namely, low frequency (LF), high frequency (HF) and ultra-high frequency (UHF) bands.

- The LF band covers frequencies from 30 KHz to 300 KHz. A Typical LF RFID system operates at 125 KHz, but there are some that operate at 134 KHz as well. This frequency band provides a read range of 10 cm, which is comparatively short, and it has slower read speed than all the higher frequencies, but it is not very sensitive to radio wave interference.
- The HF band has a range from 3 to 30 MHz. Here most of HF RFID systems operate at 13.56 MHz with the read range somewhere between 10 cm and 1 m. HF systems have moderate sensitivity to interference.
- The UHF frequency band has the range from 300 MHz to 3 GHz. All the systems that follow the UHF Gen2 standard use the 860 to 960 MHz band. While there is some difference in frequency from region to region, UHF Gen2 RFID systems in almost all countries operate in 900 and 915 MHz.

There are two types of RFID systems namely Active RFID systems and passive RFID systems.

An active RFID tag has its own transmitter and power supply. The power supply is typically a battery so as to make it portable. It is bulkier but can transmit to a longer distance. It is used in UHF.A passive RFID tag has no power supply, it is powered on the signal transmitted by the reader and reflects the information back to the reader. Passive RFIDs are cheaper, smaller and easier to manufacture.

In our project we make use of a passive RFID system that operates in LHF mainly due to its smaller size and cost effectiveness which makes it a perfect candidate for this particular problem.

Contactless Tachometer

The device which is used to measure the rotational speed of shaft or disc is called tachometer. Contactless tachometer is based on the refection mechanism. Infrared light emitting diode and photo diode are the two key components of contactless tachometer. Infrared light are reflected from the white portion and is absorbed by black or irregular portion. So in order to measure the number of rotation, a small portion of the wheel is glued with a white paper and the remaining portion is left as it is or covered with black paper. Infrared light emitted from Infrared light emitting diode gets reflected from this white potion and falls on the photo diode which is connected to a circuit to generate trigger pulse for microcontroller constituting one rotation of the wheel.

In our project, we are using contactless tachometer to measure speed of car. The tachometer circuit is interfaced to microcontroller which is programmed accordingly to measure the number of trigger pulse in one minute which is then multiplied to radius of wheel and constant factor (0.10472) to get linear speed. Contactless tachometer is robust and accurate which gives more precision to this project.

Dual Tone Multi Frequency (DTMF) Decoder

DTMF is a technology which is used to convert Analogue signal to digital signal. This conversion is achieved using a DTMF decoder. DTMF decoder is mainly used in mobile communication system wherein it recognizes the tones from the standard mobile phone keypad. For each key pressed two tones are generated for a specific frequency. This tone is then converted into a 4 bit digital output using DTMF decoder. The output can be interfaced to any micro-controller and can be used as per the requirement.

In our project, DTMF decoder is interfaced to LPC2148 microcontroller to control the movement of car. DTMF working principle is simple and it is easy to interface which simplifies this project.

WORKING

The project uses DTMF decoder as it is a cheaper alternative to other modules and we had prior experience in handling a vehicle wirelessly using it. Having said that, any wireless module like WiFi module, Bluetooth module or Zigbee module can be used. Since the focus of the project is using RFIDs, the technology used to control the vehicle is irrelevant.

The concept of enforcing the speed limit on the vehicle is as follows. The RFID receiver is installed on the vehicle itself, it could be made mandatory like seatbelts. The tags are embedded on the roads where the speed is to be limited. Preferably use of passive RFID tags as they do not require power supply hence cutting down majority of maintenance costs. As soon as the vehicle passes over these tags on the road, the receiver on the car picks up on the identification number on the tag. Depending on the identification number a particular speed limit can be identified by the microcontroller onboard of the vehicle. This speed can be set by the adaptive cruise control on the vehicle (ACC).

Initially the idea was to embed a tag containing the speed set value on the road where the vehicle enters the area. As soon as the driver exits the area, the other tag containing the tag reset value i.e. the identification number the controller receives which maps to the ACC giving it the command to remove the cruising speed set on the vehicle. This would ensure a speed limit on a flexible area or space. This had a huge drawback that was that it would work on unidirectional lanes only. In case of normal roads, the system would fail. To counter this, a new model was developed as shown in Fig. 3.

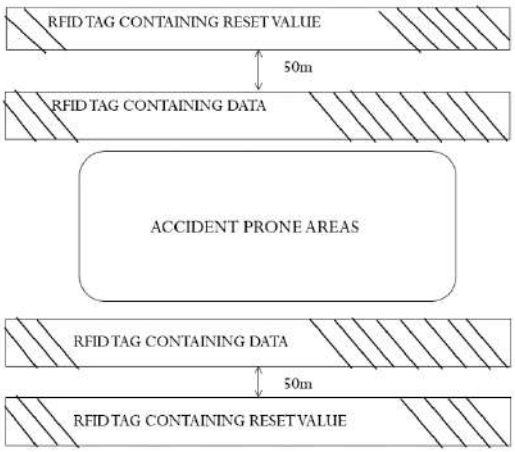

Fig 3. Final model for embedding RFID tags

As observed, in this model, the outer two layers contain value reset tags and the inner two layers have the value set tags. This means that when the vehicle enters the said area from either side, the controller first receives the reset tag value and resets the cruising speed to none. Then it passes over the value set tag which sets the cruising speed. While exiting the area, the vehicle first passes over the speed set tag which will have no effect as the vehicle is already in the cruising speed and then it passes over the speed reset tag which will make the controller switch off the ACC.

Our aim is to demonstrate the following on a small scale model using a microcontroller. This is achieved as follows

Block Diagram

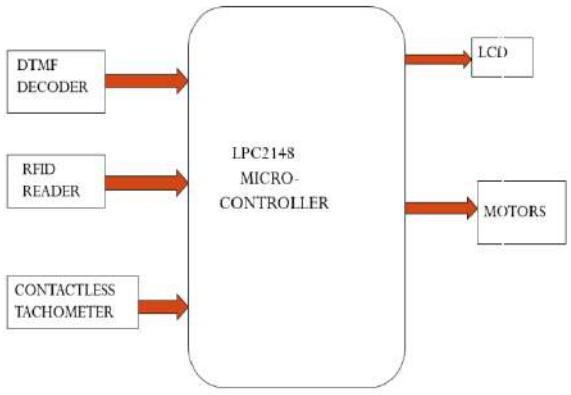

Fig 4. Block diagram of experimental model

Algorithm

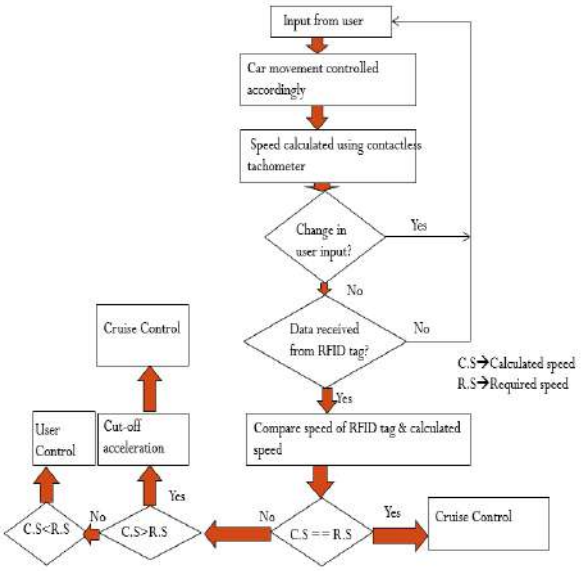

Fig 5. Algorithm/flow diagram for RFID cruise control

Phase 1:

- Use the WIFI module or DTMF module or Bluetooth module i.e. any wireless module to control the vehicle.
- Take the input from the user and with the help of the installed module, run the motors connected.

Phase 2:

- Use of a contact or contactless tachometer to find the speed of the car
- Interface the tachometer such that it delivers the output to the input pins of the microcontroller.

Phase 3:

- Install and interface an RFID receiver to the microcontroller.
- Install an RFID tag such that it carries the value of speed till which the speed of the car is to be controlled.
- When RFID tag information is received by the receiver, compare the value with that of the tachometer

Phase 4:

- Check if calculated speed of the vehicle is equal to that of the RFID stored value.
- If no, check whether the calculated speed is greater than the required speed OR if the calculated speed is less than the required speed.

Phase 5:

- If the speed is greater than the required speed then cut off the throttle and let the car run on inertia i.e. only breaking allowed form that point on.
- Check continuously whether the new speed is equal to that of the required speed.

Phase 6:

- If the speed is less than the required speed then let the user have control over the acceleration and deceleration if the vehicle.
- Check continuously whether the new speed is equal to that of the required speed.

Phase 7:

- If the speed is equal to the required speed then let the user enter cruise control mode which can be disabled with the application of continuous breaking.
- Check continuously whether the new speed is equal to that of the required speed.

CONCLUSION

The system shows promising results as RFID receiver detects the presence of the tag as soon as it reaches a fair vicinity. Through testing it was concluded that the bottom of the vehicle was the best place to install the receiver as it will be closest to ground. The use of passive tags are cheaper and efficient. In normal driving conditions to avoid attenuation due to other vehicles entering the area, use of more redundant tags along the line will prove to be effective.

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Automatic Notification To Garbage Collecting Van Using GSM And GPS

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***Abstract*— The problem of waste generation and management has become a serious issue nowadays, because in times when around thousands of people die every year solely due to diseases like malaria and dengue. This death rate is high only because of unhygienic conditions, and this unhygienic conditions mostly occur due to overflowing of garbage bins in our city, which creates ugliness to that place as well as spread bad smell. However, in this communication we aim to present a system, wherein a governmental entity can use this exact technology to control overflowing of garbage, and even this will help to reduce the death rates, ugliness to the place and even the bad smell. This system is based on Global Positioning System(GPS) for identification of areas where the garbage bins are overflowing. It is interfaced with an Arduino, MAX232 and Global System for Mobile(GSM) Modem which will help in sending the message of overflowing of garbage bin to the government authorities as well as to the truck driver.**

Keywords—GSM; Garbagecontrol; Arduino; GPS;

INTRODUCTION

We have observed that the municipal officer or the government authorized person will monitor the status of dustbin. Or generally, we see that they have a regular schedule of picking up these garbage bins or dustbins. This schedule varies as per the population of that place. It can be once in a day or twice in a day or in some cases once in two days. However we see that in case there is some festival or some function, lots of garbage material is generated by people in that particular area. In such cases ,the garbage dustbin gets immediately full, and then it overflows which creates many problems. So in situations, with the help of our project, the government authority person can get SMS immediately. So they will get SMS before their periodic interval visit of picking up the dustbin.[1]

SENSOR SYSTEMS

In this section of the paper, we describe the microcontroller and sensors installed in or used for the information of the garbage level. The sensor used is HC SR04 sensor for detection and identification for the level of the garbage, GPS is used to calculate the position of the garbage bin, an Arduino uno R3 on which the entire system is built upon, GSM is used for sending the message wirelessly.

Arduino UNO R3

The **Arduino Uno** is a microcontroller board based on the ATmega328. Arduino is an open-source, prototyping platform and its simplicity makes it ideal for professionals. The Arduino Uno has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. Operating Voltage is 5V, Input Voltage (recommended) is 7-12V, Input Voltage (limits): 6-20V, DC Current per I/O Pin is 40 mA ,DC Current for 3.3V Pin is50 mA ,Flash Memory is 32 KB of which 0.5 KB used by bootloader, SRAM is 2 KB (ATmega328), EEPROM is1 KB (ATmega328)[2]

Ultrasonic HC-SR04 Sensor

The HC-SR04 ultrasonic sensor uses sonar to determine distance of an object. It provides excellent

non-contact range detection with high accuracy from 2cm to 400 cm or 1" to 13 feet. Ultrasonic HC-SR04 sensor operation is not at all affected by sunlight or black material like Sharp rangefinders etc. Sometimes, if there is a soft material like clothes as a garbage in the garbage bin , then acoustically soft material like cloth can be difficult to detect. This sensor comprises complete ultrasonic transmitter and receiver which helps us to detect the garbage level of the bin. This sensor consists of only four main important pins, they are:

1. 5V voltage supply
2. Trigger pulse input
3. Echo pulse output
4. 0V Ground

Power supply given to the HC-SR04 is 5V, measuring angle is of 30 degree, working current of the sensor is 15mA and quiescent current is less than 2mA, the trigger input pulse given on the trigger pin has a width or can say have a gap of 10usecs. In our project, after transmission when the ray is reflected back from the obstacle ,or in our case, obstacle is the level of the garbage an echo is generated which is received by echo pulse pin. This pulse helps us to detect the garbage level. In our project, this sensor is interfaced with the arduino.

Global Positioning System (GPS)

The GLOBAL POSITIONING SYSTEM is a space-based radio navigation system, that provides geo location and time information to the GPS receiver, anywhere on or near the earth. In our project, this GPS receiver module is interfaced with the arduino which helps us to locate the place where the garbage bin is overflowing.
Initially, the idea behind GPS tracking is nothing but determining and tracking the précised location of the garbage bin which is overflowing, by receiving the longitude and latitude value from the recorded location data which will be stored in the GPS tracking unit.

GLOBAL SYSTEM FOR MOBILE(GSM)

GSM modules have made it easy for embedded developers to add hardware capable of connecting to cellular networks to their projects. These modules communicate via AT commands. In our project, we have used SIM800L GSM module. It is a nice and inexpensive module. We will set it up with arduino and send simple text messages. The module uses 3.8v to 4.2v so we will be needing a voltage regulator to make sure we are not overtaking the voltage or the module will be damaged. [3]

Liquid Crstal Display(Lcd)

In the project, 16X2 LCD is used for displaying the initialization of GSM and GPS module. Even it displays the level of the garbage whether it is low, middle or high level. It is interfaced with the arduino which also indicates whether the message is sent or not to the government authorities and to the truck driver.

WORKING

The project uses GSM and GPS module for sending messages, and tracking precise location of garbage bin. Since the focus of the project is using ultrasonic sensor which uses the technology of sonar for detecting the garbage level.

In our project, we will be using step down transformer of 0V-9V which will be given to bridge rectifier and voltage regulator of 7805. This regulator will provide 5V to arduino, ultrasonic sensor, max232.

The concept of detecting the garbage level is as follows. First the ultrasonic sensor is given a 5V supply using voltage regulator 7805. This sensor consists of transmitter and receiver after reflection of the transmitted ray and an echo is produced which helps in detection of the garbage level. Garbage levels are indicated by 3 LEDs.

1st LED indicate low level, 2nd LED indicate middle level and 3rd LED indicate high level and high level is a sign of overflowing of garbage. As soon as 3rd LED glows, GPS will receive the tracked data from the satellite. Then this tracked data will be sending to the max232 and this max 232 will send to GSM module.

This GSM module will send the message to the government authorities as well as to the truck driver. In this message the values of latitude and longitude would be sent so that the truck driver can go to the precise location and collect the garbage.

BLOCK DIAGRAM:

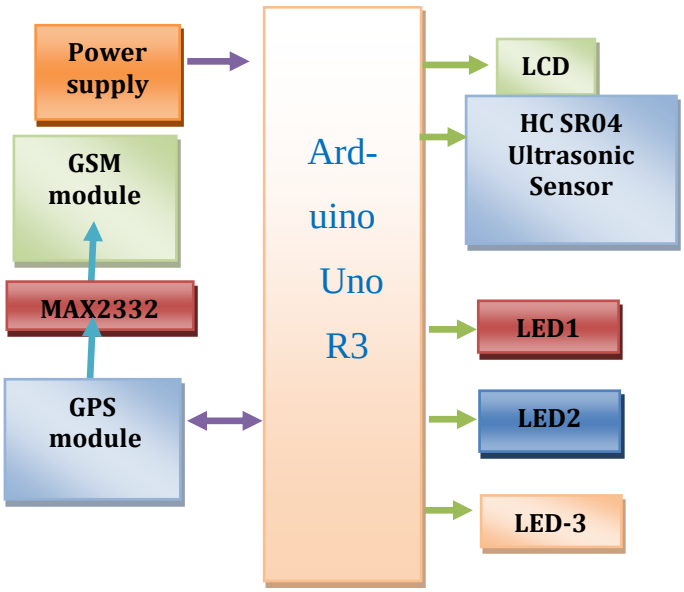

Fig 1.Block diagram of experimental model

ALGORITHM

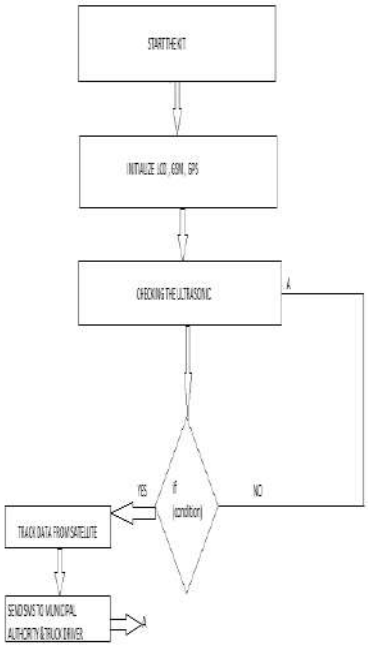

Fig 6. Algorithm/flow diagram for RFID cruise control

Phase 1:

- Use the ultrasonic sensor or weight sensor i.e. any sensor to detect the garbage level of the bin.
- Place this sensor on the top of the bin.

Phase 2:

- Use of a LEDs to keep a track on overflowing of the bin.
- These LEDs are interfaced with the Arduino.

Phase 3:

- Power supply is given to Arduino, GSM and GPS.

Phase 4:

- Initialization of LCD, GSM and GPS is done as soon as power supply is given.

Phase 5:

- After initialization checking of garbage level is done by the sensor.

CONCLUSION

With the help of this system, we will be able to keep a track on almost all the government service vehicles, to ensure that they carry out their services faithfully. This will help in proper functioning of the service sectors of the government that will contribute for a healthy environment to the citizens of the nation. Rapid advances in technologies provide ample opportunities for bringing in innovations in waste management. It fulfills the objective of "SWACH BHARAT ABHIYAN". One of the famous proverbs is "Cleanliness is Next to Godliness". A healthy society and a healthy country need its citizens to be healthy and clean in every walk (stage) of life.

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Compliant Legged Automated Semi-Humanoid Robot (C.L.A.S.H)

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***Abstract*-C.L.A.S.H. is a Robot that works on the two basic principles i.e. the base robot that works on the principle of RHex[1])robot of Boston Dynamics, and the Semi-Humanoid part which is also equipped with weapons. Aside from the basic traditional roles, It is designed as a solution to for specific Military application and as an Personal Assistant Robot. The robot also measures the pulse/heart rate continuously throughout its operation time. The face provided at the upper body could express their emotions which provide an entertainment that adds on to the application of C.L.A.S.H. The Semi-Humanoid part and the base robot can move together or independently. It is also capable of capturing real time images of the surroundings with present location. This feature can be used for the purpose of surveillance. An IP camera is mounted on the robot to record and transmit the image it captures through a specific communication module. This can be brought down to a simple discussion about the robot that is, it is a machine vision robot.**

INTRODUCTION

Fig. 1. C.L.A.S.H Working Model

In this paper, we describe a semi-humanoid legged robot that easily traverses terrain and regions, and also the robot is equipped with attack, defence, rescue and interactive features, Fig. 1. The base of the robot [1]-[2] is designed to easily cross obstacles, step hurdles and rocky regions. The base can also move smoothly in sand areas like desert. All the wheels in the robot are individually controlled , and this makes the controlling of the robot easy. The base robot is currently powered by SMPS. The entire robot will function efficiently with a 12V battery which provides current of 10A.

The semi-humanoid part above the base is an added feature over the base region. The upper part can mainly be used for interactive purposes. It also has features of attack, defence and rescue. Weapons can be provided in the hands of the robot for attack and defence purposes. Sensors are provided on the robot to get the information about the temperature of the surrounding environment. It can also detect heartbeat of the soldiers on the war field which will be helpful in rescuing the injured soldiers. The features can be easily understood by referring the below block diagram, Figure 1.

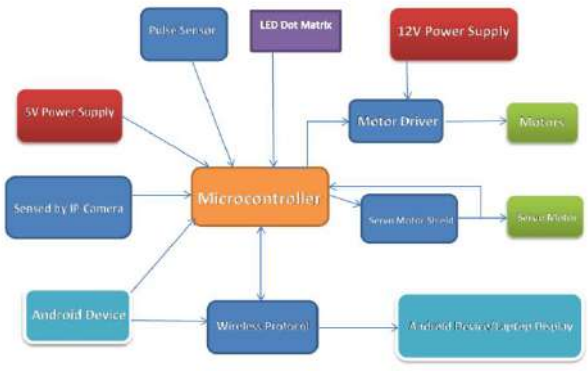

Fig. 2. Block diagram of the robot

DESIGNING AND MODELING

Design Concept and Modeling

Mechanical complexity is a major issue in almost all robotic applications, and is also one of the causes for the failure of the design. This also increases the cost of the robot , and still the desired design is not achieved. Our design emphasizes on the simplicity of the design and robustness of the robot [1]. This, in turn, reduces the cost and provides a better output. Some robots which are autonomous require strict design [2] constraints on hardware and software components, depending on the environment, and this we have achieved with the simplicity providing robustness to the robot. The basic locomotions provided are forward, backward, left, right. Other behaviours like leaping and stair climbing can also be achieved by this design. Further details are provided in later sections.

The upper body stabilization over the base has been achieved by the design as seen in Figure 1. The upper body consists of two hands and a head. The design of the semi-humanoid is complex as we do in the traditional method. The mechanical complexity increases with the conventional humanoid design and in turn increases the cost. The traditional humanoid consists of mechanical actuators and pneumatics which is expensive. The design we implemented has reduced the mechanical complexity and also reduced cost. The basic movements provided are hands up, hands down. Other behaviours can also be achieved. The head provides an expression which is achieved with the help of software.

Compliant Hexapod and Semi-Humanoid Model

In this section, we present a dynamic model of the morphology described in the previous section[3]. Prior to construction of the prototype, a lot simulation and trial and error methods were implemented to get the desired design constraint. The six legs of the robot are controlled by DC motors of high torque with speed of 300rpm. Our base design consists of six compliant legs possessing of one degree of freedom.

The upper part[4]-[6] or we call it the semi-humanoid part replicates human being consists of two hands and face. The
hands and face are controlled using servo motor. The face is expressive and the eyes are implemented using LED dot matrix. The design of the humanoid part comparatively easy to that of the base.

CONTROL STRATEGIES

The entire robot is controlled by wireless communication via Bluetooth. The Bluetooth module we used here is HC-05. The base robot and semi-humanoid robot are controlled via this Bluetooth protocol. The robot is controlled by an android device and can also be controlled by IOS and Windows by later software support.

The base robot is controlled by six individual DC motors , with an appropriate motor driver to provide enough power and current required for the operation. The six motors are individually controlled so as to easily go past through the obstacles. The base part does not contain any kind of sensor so we can say it is sensor-less body. The microcontroller used for base robot is Arduino Mega 25600. The microcontroller is programmed to control all the six motors and all six motors operate on a single microcontroller. It does not detect obstacles rather removes or gets rid of it. The stability of the base is achieved by the design constraints discussed in the previous section.

The upper body is controlled by another microcontroller Arduino Uno and has most of interactive functions programmed in it. The upper body consists of various sensors discussed in later chapters and all of them have their own individual capabilities. The head consists of dot matrix to provide expressions.

EXPERIMENTAL PLATFORM

Hardware Description

Being a hardware project involving embedded systems, various integrated circuits (ICs) were used which includes microcontrollers, a motor driver IC. Other hardware includes SMPS power supply, batteries ranging from 5V-12V. Bluetooth module has been used for wireless communication. Other components include robot chassi, PVC pipes, DC Johnson Motors, Breadboards and wires. The hardware used are listed in Table I.

TABLE I

HARDWARE AND COMPONENTS USED IN BUILDING THE ROBOT

Sr No.	**Hardware Details** ***Components used for the robot***
1.	Arduino Uno
2.	Arduino Mega
3.	Bluetooth Module HC-05
4.	Pulse Sensor
5.	Temperature Sensor LM35
6.	Johnson Motor
7.	Servo Motor
8.	Servo Shield
9.	Aluminium Sheet (18 guage)
10.	Wires, BreadBoard
11.	IP Camera

Sr No.	Hardware Details *Components used for the robot*
12.	LED Dot Matrix

The robot is powered by using SMPS as external power supply. SMPS provides different voltage levels and also high current. Since six Johnson motors are being used each motor requires 12V,2A current. The overall current requirement eventually turns out to be approximately 10A-12A. Such high current is provided by SMPS for temporary period. SMPS is primarily used for the base robot. The upper body is provided by a 5V external power supply.

The pulse sensor provided on the upper body detects pulses on the field and provides acknowledgement to the remote area from where it is being controlled. This feature has been added as the robot can also work as a rescue robot. When finger comes in contact with the pulse sensor, it will send the pulse rate over the Bluetooth communication protocol.

Software Description

With a lot of hardware involved in the project, we also used software tools for running the hardware like Arduino IDE, Processing P3, MATLAB. All these are discussed in detail below.

B.1 Arduino

Arduino is an open-source prototyping platform, Figure 2, based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online [13]. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so ,you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

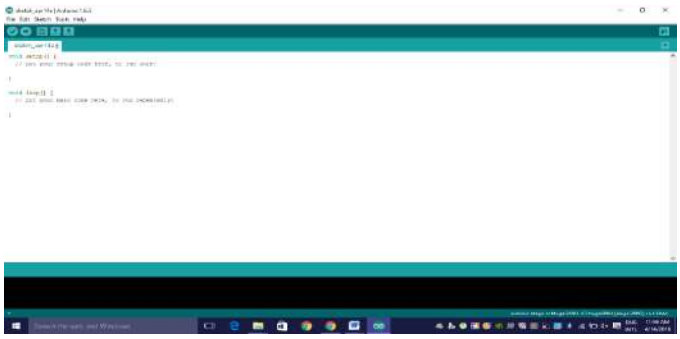

Fig. 3. Arduino IDE Software

The Arduino IDE supports the languages C and C++ using special rules to organize code. The Arduino IDE supplies a software library called Wiring from the Wiring project, which provides many common input and output procedures. A typical Arduino C/C++ sketch consist of two functions that are compiled and linked with a program stub main into an executable cyclic executive program.

B.2 Processing

Fig. 4. Processing IDE Software

Processing is a flexible software sketchbook, Figure 3, and a language for learning how to code within the context of the visual arts. Since 2001, Processing has promoted software literacy within the visual arts and visual literacy within technology. There are tens of thousands of students, artists, designers, researchers, and hobbyists who use Processing for learning and prototyping. Processing is an open source programming language and integrated development environment (IDE) built for the electronic arts, new, and visual design communities with the purpose of teaching the fundamentals of computer programming in a visual context, and to serve as the foundation for electronic sketchbooks[12]. The project was initiated in 2001 by Casey Reas and Benjamin Fry, both formerly of the Aesthetics and Computation Group at the MIT Media Lab. One of the stated aims of processing is to act as a tool to get non-programmers started with programming through the instant gratification of visual feedback. Processing includes a sketchbook, a minimal alternative to an integrated development environment (IDE) for organizing projects.

B.3 MATLAB

MATLAB is a multi-paradigm numerical computing environment and fourth generation programming language[7]. A proprietary programming language developed by MathWorks. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces and interfacing with programs written in other languages, including C, C++, C#, Java, Fortran and Python. Although MATLAB is intended primarily for numerical

computing, an optional toolbox uses the MuPAD symbolic engine allowing access to symbolic computing abilities. Additional package, Simulink, adds graphical multi-domain simulation and model-based design for dynamic and embedded systems.

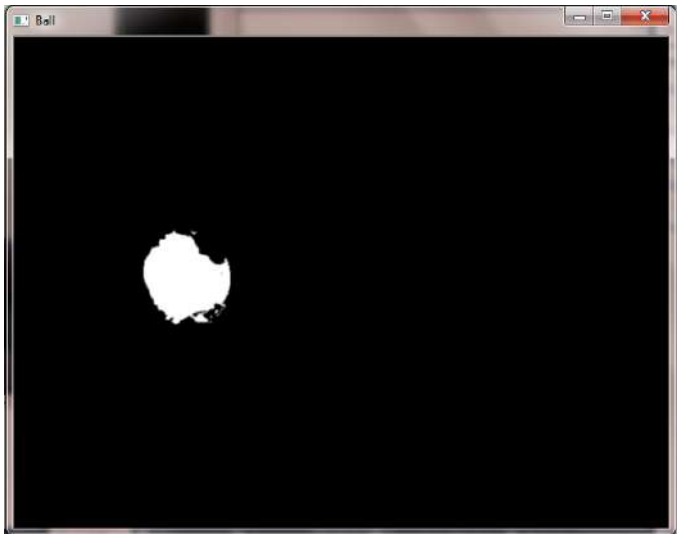

Fig. 5. Object tracking in MATLAB via Image Processing

We have used image processing technique to detect objects, Figure 4, and this automates the process of controlling the robot as the robot will detect objects and move accordingly. In imaging science, image processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, a series of images[8]-[10]. or a video, such as a photograph or video frame: the output of image processing may be either an image or a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. Images are also processed as three-dimensional sip/flak with the third-dimension being time or the z-axis. Image processing usually refers to digital image processing, but optical and analog image processing also are possible. This article is about general techniques that apply to all of them. The acquisition of images is referred to as imaging.

B.4 MIT App Inventor

Since we are using an android device to control the robot, we have developed an android application through an online app development tool called MIT app inventor[11], Figure 5.

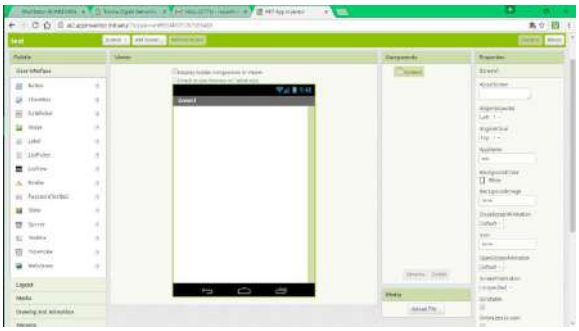

Fig. 6. App development screen

App Inventor for Android is an open source web application originally provided by Google and now maintained by Massachusetts Institute of Technology. It allows users new at programming to develop software on Android operating systems. The schematic of the project is as in Figure 6.App Inventor comes along with a companion tool where we can test the android application in real time.

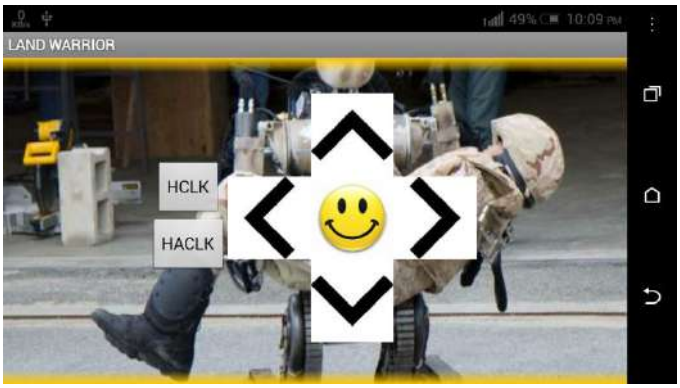

Fig. 7. Schematic of the Android application

C. Experimental Results

Results obtained have shown us the capability of the robot to survive in almost any condition without altering any of its functions. The power consumed by robot is fairly minimal and can withstand up to an hour (if using a battery instead of an external power source) performing all the desired functions without altering any of the functions. On road testing was implemented of the robot and the results have been summarized in Table II. However, using a battery is an issue as extending its life becomes complex even though it is rechargeable.

The upper body has all the capabilities to perform activities nearly of a soldier with some constraints and it has wide future scope. The inbuilt camera on the robot provides real time images of the environment where it is located, and also the environmental temperature. The robot also checks the condition of the injured soldiers and informs the controller in the

remote about the conditions around its environment.

TABLE II

EXPERIMENTAL RESULTS OBTAINED IN REAL ENVIRONMENT

Sr.No.	Results in real environment		
	Parameters	***No.of Runs***	***Successful Runs***
1.	On Road	10	10
2.	On Rock	10	7
3.	On Slope (at 45^0)	10	7

CONCLUSION

People have missed how robotics have been sneaking up on the world. It is a revolution whose time has come. Most people don't realize how frequently robots already are used, from painting cars on assembly lines to operating missions in space. Robots have been developed that can do anything from helping to clean up hazardous waste sites to acting as autonomous tour guides.

The enabling technologies of robotics will see an increased adoption into Military roles. Robotics in military applications may have a more far reaching effect to our personal safety, and have greater global impact that any other type of robotics being used. They are currently used by the military in land mine detection, surveillance, reconnaissance operations, and for daily mundane duties, but to name a few.

As the price of computers decrease, the use and applications of robotics increase, and robots become more intelligent. Future research will continue to focus on the perception and control of robotic mechanisms and to increase the level of autonomy and utility for military applications.

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Single Axis Open Loop Sun Tracking System Using Sun Position Algorithm

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***Abstract*: Single-Axis Trackers are the devices which rotate only in one axis (one degree of freedom) moving forward and backward compared to dual axis trackers which rotate along two axis moving forward, backward, left and right.[3] There are different types of Single Axis Trackers which include Horizontal, Vertical, Tilted and Polar aligned which rotate as their names imply[3]. Single Axis Trackers are considerably cheaper and easier to construct compared to Dual Axis Trackers. The trackers are the devices which direct the solar panel or the module towards the sun. These devices orient themselves throughout the day to follow the sun's path to capture maximum energy from the sun[4].**

Keywords: Single-Axis Trackers, Dual Axis Trackers, Solar panel.

1. INTRODUCTION

A Sun tracker is a device on to which solar panels are fitted which tracks the sun's motion across sky, which ensures maximum amount of sunlight strikes the solar panels, providing more throughput than a normal solar panel. The tracker will try to navigate the best angle of exposure of sunlight towards the panels. It is a device that orients a payload towards sun.[5]

The Payloads that are usually employed include solar panels, parabolic troughs, reflectors, lenses. For flat-panel photovoltaic systems, trackers are employed to reduce the incidence angle between incoming sunlight and the panel. This increases the amount of energy or throughout produced from a fixed amount of installed power generating capacity. The system produces 35-45% more power each day than a fixed array. The selection of the tracker type depends upon many parameters including size of installation, electric rates, gov. incentives, land constraints, latitude and local weather. Several tracking techniques has been surveyed and evaluated to keep the photovoltaic cells normal /perpendicular to the incident beam of sunlight. [5]

2. DESIGN OF PROPOSED TRACKING SYSTEM

The proposed Tracking system should satisfy certain technical requirements specific to the studied application as follows:-

(i)Minimum energy consumption for maximization of global efficiency of the installation and optimum performance cost ratio.

(ii)Reliability in operation under different perturbation condition (wind, dust, rain, temperature variations)

(iii)Simplicity of movement solutions (motor ,gears) to diminish the cost and viability.

(iv)Possibility of system integration in a monitoring and control centralized structure, which means a digital control solution.[5]

TIME	VOLTAGE	I(mA)	P(mW)
8:00	16.8	1.2	20.664
9:00	17	2.34	39.78
10:00	17.6	2.53	44.2
11:00	19.4	3.64	70.64
12:00	19.7	4.5	88.11
1:00	20.6	5.13	104.96
2:00	21.3	5.96	125.45
3:00	19.3	5.46	105.34
4:00	17.1	5.01	86.17
5:00	16.6	4.3	70.6
6:00	16.2	2.91	46.49

The sun's status is determined based on the angles of Zenith and azimuth.
Angle Specification

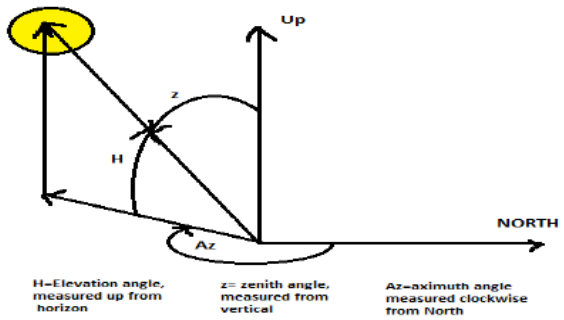

Fig 1.Angles required for the calculation of different parameters [1]

The Zenith angle is the angle between the sun's direction and the axis perpendicular to the desired area. Azimuth angle is the angle between the North Pole and the direction of the sun's position on the earth in clockwise direction.[2]

3. BLOCK DIAGRAM

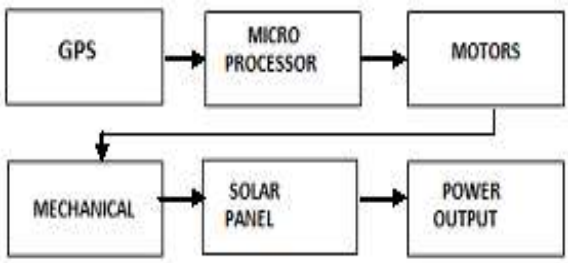

Fig 2. Block Diagram Of Single Axis Tracking System [5]

An open loop system is employed in this project rather than a closed loop system which depends upon the sensors. Due to the open loop nature offline calculations can be accomplished easily which are useful for solar tracking trajectories. The calculations of these trajectories are based on the relative position of the sun which can be precisely calculated for any time and location on the earth.[3]

The control system includes components such as GPS, Microprocessor, Motors, panels and support circuitry as well.

GPS helps us to give the longitude and latitude of the current location. These parameters are taken as input while calculating the best angle of exposure of incident light.[3]

In order to compute the sun's position, the following data must be provided:-

1. TIME: Year, Month, Day and Universal Hour must be given. The Universal Hour is defined as the standard universal time at Green wich meridian.
2. Difference between Terrestrial time (TT) and the universal time (UT).
3. POSITION: Geographical Longitude and Latitude must be given.
4. Pressure P and Temperature T : It is the data required for the computation of the Refraction correction.[1]

The Microprocessor is the heart of the control system because it takes input parameters from the GPS as well as the user input (date, time, month, year, longitude, latitude) and performs calculations of the required angles. It also controls the movement of the motors which helps in orienting the panels. It uses formulae to predict the movement of the sun. The servo motor will rotate the panel at an angle based on the microcontroller PWM signal. The controller used is an ARM Microcontroller. Using flash magic and microvision , we burn the program into the controller.

The servo motors are normally used due to their precise movements and consume the input power only when moving.[4]

The below Table shows the data of voltage, current and power received from static solar panel and solar

tracker for a day on a 150 mW solar panel.
For static solar panel, maximum voltage, current and power is 21.3 V, 5.96 mA and 125.45mW respectively.
Meanwhile for the solar tracker, maximum voltage, current and power is 21.3 V, 6.3 mA and 137.60mW respectively.[4]

READING DATA FROM SOLAR PANEL

Table 1.Readings calculated for a static solar panel for 12 hr duration [6]

TIME	VOLTAGE	I(mA)	P(mW)
8:00	18.3	3.41	62.403
9:00	18.9	3.57	67.47
10:00	19.4	3.98	77.21
11:00	19.7	4.76	93.772
12:00	20.4	5.4	110.43
1:00	21.6	6.35	137.16
2:00	21.4	6.11	130.754
3:00	20.5	5.87	120.335
4:00	19.6	5.86	103.096
5:00	18.5	4.86	89.91
6:00	17.5	3.75	65.625

Table 2. Readings calculated for solar tracker for 12 hr duration[6]

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Real Time Health Monitoring System

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***Abstract*—Some severe diseases and disorders e.g. Heart failure needs close and continual monitoring procedure after diagnosis, in order to prevent mortality or further damage. The body temperature is also a prime importance for various diseases. Monitoring these types of patients, usually, occur at hospitals or healthcare centers. Sometimes, the patients are given early discharge owing to less number of beds in the hospitals. This paper provides a healthcare system, which will help the authorities to monitor the patient easily and increase the quality of service. The modern technology is the only aspect which has given a wider scope to the development of many other systems providing financial benefits.**

***Index Terms*—ARM7 LPC2148, Heart rate sensor, Temperature sensor, ECG module, ZigBee wireless communication**

I. INTRODUCTION

HEALTH IS WEALTH is a proverb learnt from childhood but failed to imply as age increases. In modern world, monetary benefits and profits are given importance, ignoring the wealth of health. At present, there are many intelligent systems that are designed so as to monitor our health. Today's technology allows health care providers to collect, store, retrieve, and transfer information electronically. In home health, the technology allows patients to monitor their own vital signs from their home and communicate results to the doctor wirelessly [1]. This increases the ability to address a problem before a patient requires immediate treatment.

It uses various wireless communication modules like ZigBee, Bluetooth and many more. Wireless devices have some limitations. For example, Bluetooth limits the number of nodes that can communicate with each other at any given time. With contrast to Wi-Fi, wireless sensors work even in low frequency bandwidth and very low energy consumption for long battery lives. ZigBee technology is a good alternative. It works with low power and it is able to connect a large number of devices into a single network. ZigBee technology uses 2.4GHz frequency bandwidth and enables wireless applications to use a standard communication protocols based on the IEEE 802.15.4 for wireless personal area networks. It offers low latency communication between devices.

Systems which are compact, low power consumption and energy efficient are desired by many practitioners. This paper presents a wireless system and describes in details the heart rate, body temperature sensors and ECG. The system is designed using temperature sensors, heart rate sensor and ECG module, and the data was transmitted using ZigBee module.

II. SYSTEM DESCRIPTION

The conceptual view of the system is shown in fig1

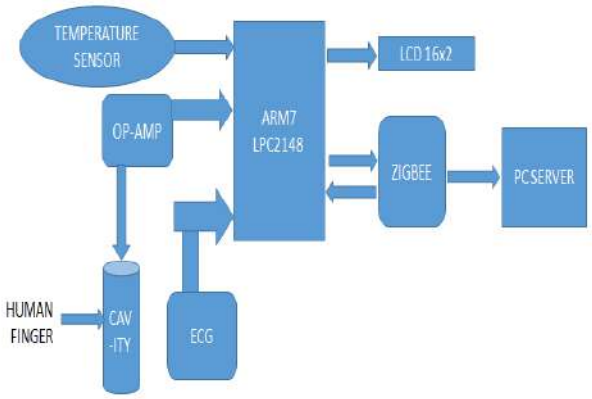

Fig. 1 Conceptual view

The major components include ARM 7, XBee, Temperature sensors, the heart rate sensor, and the ECG module. The temperature sensor will be held by the patient. The ECG module has 3 nodes which are placed on the left arm, right arm and below your heart. Also the heart rate sensor will operate on inserting your finger inside the cavity made for the same. The entire data is then processed by ARM7 which is displayed on the LCD and transmitted via XBee to the PC server.

A. ARM7 LPC 2148

The ARM7TDMI-S is a general purpose 32-bit microprocessor, offers high performance and very low power consumption. ARM architecture is based on RISC principles, instruction set and the related decode mechanism are simpler than CISC Pipeline techniques employed [2]. ARM Processor supports both 32-bit and 16-bit instructions via the ARM and Thumb instruction sets. The 3 parameters to be monitored are sensed using the respective sensors and data is fed to ARM7. Traditionally, embedded devices include two types of processors: a Microcontroller and a DSP to process signals. However, with the development of ARM processors, the last two can be replaced by one single processor. This unit is the heart of the complete system. It is actually responsible for all the process being executed. In this project ARM7 LPC2148 is used. LPC2148 is a 32 bit processor having a RISC machine with a Von-Neumann architecture. 8kB-40kB on-chip SRAM and 32kB-512kB of on-chip flash memory. It is capable of 130MIPS. It works on a 3.3V power supply and has a high speed operation of 60 MHz This processor will monitor & control all the peripheral devices or components connected in the system. In short, we can say that the complete intelligence of the project resides in the software code embedded in the ARM 7. The code will be written in Embedded C and will be burned or programmed into the code memory using a programmer.

ARM7 pin configuration shown in fig 2

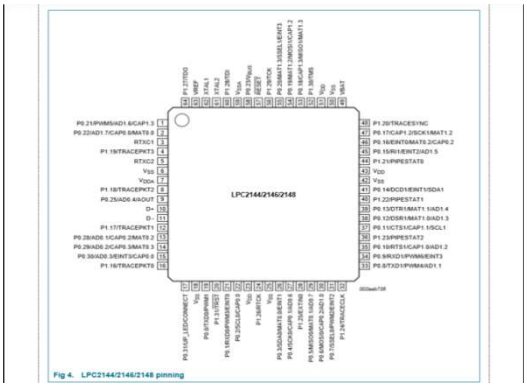

Fig 2: ARM7 LPC 2148

B. ECG Sensor

ECG is primarily a tool for examination of cardiac diseases. An ECG sensing device commonly consists of a group of electrodes to detect electrical events of a heart [3]. The ECG is the electrical manifestation of the contractile activity of the heart, and can be recorded fairly easily with the surface electrodes on the limbs or chest. The rhythm of the heart in terms of beats per minute (bpm) may be easily estimated by counting the readily identifiable waves. The amplifier takes the input from 3 electrodes which are connected to the patient. In this project, we are using AD624 ECG module. AD624 is a high precision, low noise, instrumentation amplifier designed primarily for use with the low level transducers, including load cells, strain gauges and pressure transducers. An outstanding combination of low noise, high gain accuracy, low gain temperature coefficient and high linearity make the AD624 ideal for the use in high resolution data acquisition systems. The AD624C has an input offset voltage drift of less than 0.25 µV/°C, output offset voltage drift of less than 10 µV/°C, CMRR above 80 dB at unity gain (130 dB at G = 500) and a maximum nonlinearity of 0.001% at G = 1. In addition to these outstanding dc specifications, the AD624 exhibits superior ac performance as well. A 25 MHz gain bandwidth product, 5 V/µs slew rate and 15 µs settling time permit the use of the AD624 in high speed data acquisition applications.

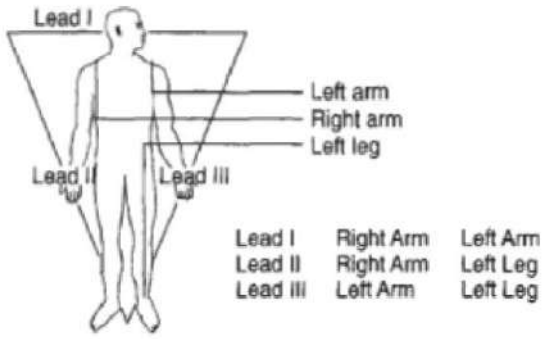

Fig. 3 Three Lead ECG Measuring system.

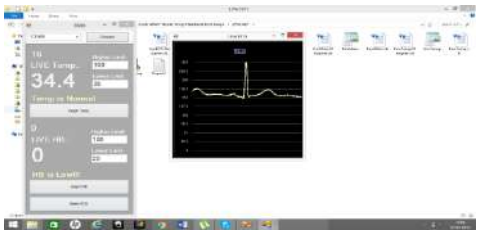

Fig 4: Graphical representation

C. Temperature Sensor LM35

LM35 series are precision integration-circuit temperature sensors whose output voltage is linearly proportional to the Celsius temperature [4]. This is 3 legs IC that directly gives analog output. This unit requires +5VDC for it proper operation. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4˚C at room temperature and ±3⁄4˚C over a full −55 to +150˚C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low

self-heating, less than 0.1˚C in still air. The LM35 is rated to operate over a −55˚ to +150˚C temperature range, while the LM35C is rated for a −40˚ to +110˚C range. Suitable for the remote applications and 0.5˚C accuracy guarantee able (at +25˚C).
As shown in the fig 5, the pin connections and fig 6 shows the graphical representation

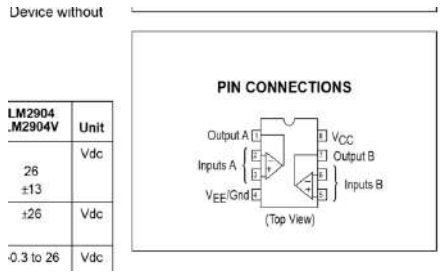

Fig .5. Temperature Sensor LM35

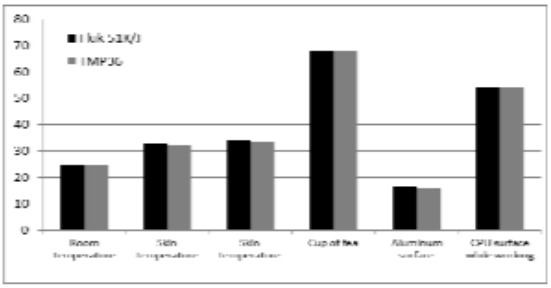
Fig. 6. Temperature graphical demo

D. Heart Beat Sensor

Heart beat sensor is designed to give the digital output of heart beat when a finger is placed inside it. This digital output can be connected to ARM directly to measure the Beats per Minute (BPM) rate [5]. It works on the principle of light modulation by blood flow through finger at each pulse. IC LM358 is used for Heart Beat Sensor. Its dual low power operational amplifier consists of a super bright red LED and light detector. One will act as amplifiers and another will be used as comparator. LED needs to be super bright as the light must pass through finger and detected at other end. When the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque so less light reached at the detector. With each heart pulse, the detector signal varies this variation is converted to electrical pulse. It has Short Circuit Protected Outputs, True Differential Input Stage, and Single Supply Operation: 3.0 V to 32 V, Low Input Bias Currents and Internally Compensated Common Mode Range Extends to Negative Supply.

The Fig 7 shows the concept of Cavity and LDR.

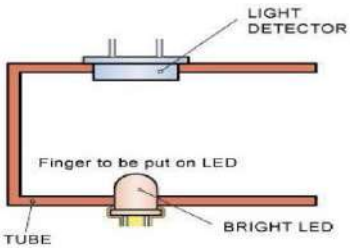

Fig. 7. Heart Beat Cavity Measurement System

E: ZIGBEE

ZigBee is 'Wireless Networking Technology' and is an established set of specifications for wireless personal area networking (WPAN), i.e., digital radio connections between computers and the related devices. This kind of network eliminates the use of physical data buses like USB and Ethernet cables [6]. ZIGBEE is a low power, low cost, wireless PAN based IEEE 802.15.4 standard. It basically provides the reliability and security in communication with operating range of 100m. ZigBee acts as a trans-receiver hence it is a full duplex communication.

III. CALCULATION FOR RESET CIRCUIT

T=RC

In this case T= 8.2K * 0.1uF = 0.82ms
Where,
T= Temperature co-efficient
R= Resistance
C= Capacitance

F. Softwares

Embedded C is a set of language extensions for the C programming language by the C standards committee, to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed point arithmetic, multiple distinct memory banks, and basic I/O operations.

Visual Basic .NET (VB.NET) is a multi-paradigm, object-oriented programming language, implemented on the .NET Framework. Microsoft launched VB.NET in 2002 as the successor to its original Visual Basic language.

Along with Visual C#, it is one of the two main languages targeting the .NET framework. Microsoft's integrated development environment (IDE) for developing in Visual Basic .NET language is Visual Studio. Most of Visual Studio editions are commercial; the only exceptions are Visual Studio Express and Visual Studio Community, which

are freeware. In addition, .NET Framework SDK includes a freeware command-line compiler called vbc.exe. Mono also includes a command-line VB.NET compiler.

IV. WORKING AND EXPERIMENTAL RESULTS

The ARM7 is the main processor required for the transmission. The data from temperature sensor is sensed and passed via XBee to the server. Also the similar approach is followed for the Heartbeat where the cavity prepare does the work for it. The cavity LDR wold sense the pulses and accordingly the data is transmitted. More importantly, the ECG electrodes are configured on the body and the data is graphically observed in the form of PQRST wave. These are recorded in the server by the use of VB.net which acts as a visual terminal and allows in analysing the entire data graphically and the healthcare practitioner is on aide for the required patient.

V. FUTURE WORK

This paper gives a thorough idea of how the current healthcare system involving important monitoring of health parameters. Although the use of XBee and ARM7 is involved, it can also improve to more extent.
As the future development is concerned, involving GSM would be a greater accomplishment.
The GSM service is nothing but that the Doctor would get live updates of the patient even if he was not present in the hospital. This is nothing but a greater help to Doctor as well as the patient.
Moreover we can also focus on the fact that, the GSM service enabling can also lead to a new breakthrough. The medication can also be given via module. If the focus is put on the further perspective, it can be seen that the practitioner under emergency conditions can instruct the device connected to the saline of the patient to give necessary medications.
A system with long life, power efficiency and moreover medicating facilities is a greater and bigger accomplishment.

VI. CONCLUSION

This research and experiment was carried out in order to develop a wireless system treating important health parameters.
The researched and involved sensors as well as method helps in identifying the temperature, heart beat and ECG of the human body. Through XBee a wireless network, live transmission of data is carried out. Moreover the PC involved gets real time updates of the parameters.
More features like blood sugar detector, pressure detector can be included in the same prototype. This system thus would give a great opportunity for the betterment of healthcare field.

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Design Of Quad-Copter For Surveillance And Environment Monitoring

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***Abstract*— The goal of our project is to design a quad-copter which will be able to fly via wireless communication , and monitor the surrounding and gather information about environmental conditions. The scheduler program makes the following tasks: controllers input, sensor data received from flight controller, also another sensor data received for gathering environmental conditions. The wireless transceivers use SPI to send control signals to the microcontroller on the quadcopter from the handheld controller unit. The accelerometer/gyroscope and magnetometer both use I2C to send the amount of acceleration, stabilization, and the direction vector. The motors are being controlled by the PWM ports on the flight controller. To achieve flight, to turn and to ascend or descend, motors need to apply particular forces. The sensors for weather monitoring collect information in analog form and that data is processed by the microcontroller. The main use of this project is for surveillance and monitoring the environment where the human interference is least possible.**

INTRODUCTION

A quad-copter is an aerial vehicle that uses four motors for lift, steering, and stabilization. Unlike other aerial vehicles, the quad-copter can achieve vertical flight in a more stable condition. The quad-copter is unaffected by the torque issues that a helicopter experiences because of the main rotor. Moreover, due to the quad-copter's cyclic design, it is easier to construct and maintain. As the technology becomes more advanced and more accessible to the public, many engineers and researchers have started designing and implementing quad-copters for different uses[1].

Various groups such as the military, engineers, researchers, and hobbyists have been developing quad-copters to understand different technical areas. For example, quad-copters can be used for research and collecting data. This could range from searching for survival victims in a disaster area to checking the state of electrical power lines. Many radio operators have designed and built their own multi-copters. Universities, such as MIT, have been studying and doing research for the quad-copter over the past couple of years[1].

This project is a great learning opportunity for us to apply our engineering knowledge. The thesis addresses the difficulties our group faced throughout the project. Choosing the quad-copter parts was not a simple process. Each component has to be interfaced, tested, and verified to be working properly. This is a long process, because three different PID control systems for pitch, roll, and yaw had to be tuned carefully for a proper stabilization. A secondary goal of this project is to use this platform for future innovative projects that could include stabilization, image processing and artificial intelligence

SCOPE

There are many advantages to quad-copters compared to other aircrafts. A quad-copter does not require a large area to obtain lift, like a fixed wing aircraft does. The quad-copter creates thrust with four evenly distributed motors along its frame. A helicopter suffers from torque issue due to its main rotor. The design of the quad-copter does not suffer from the same torque issues as the helicopter. The counter balancing forces of the spinning motors cancel out the torque forces caused by each motor causing the quad-copter to balance itself [3]. Because the quad-copter uses four rotors instead of one main rotor, it requires less kinetic energy per rotor for the same amount of thrust when compared to the helicopter. Due to this and its symmetrical design, quad-copter maintenance and

manufacturing costs are relatively lower than other aircrafts.

.

PROBLEM DEFINITION

Design and control of unmanned quad copter such that it should be able to take stable flight. Quad-copter should be able to move in forward, backward, right, left, up and down direction according to the signal applied by the user. Frame should be rigid enough to retain its shape in case of collision or inappropriate landing.

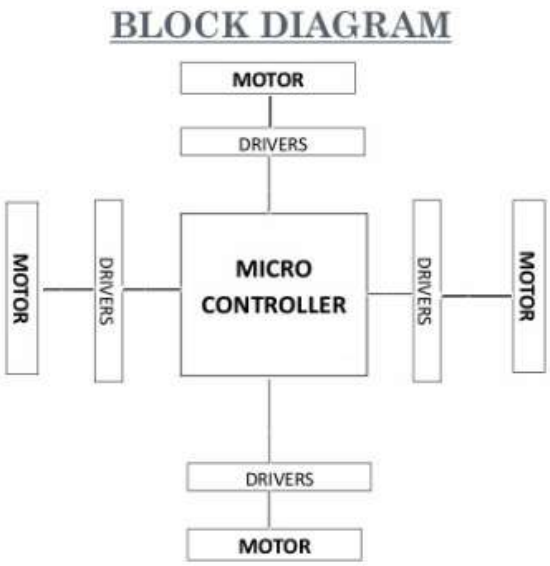

Fig. 1. Basic block diagram of a Quad-copter

To achieve flight, two of the motors must apply downward force and the other two motors have to apply an upward force. To turn, one pair (left or right side) of motors slows down to turn the copter. To ascend, all motors will increase in speed, and will all decrease in order to descend. To move forward, the front two motors will decrease while the back two motors will increase. And vice versa in order to move in a backwards direction[2].

FLYING MECHANISM OF QUADCOPTER

A quad-copter consists of four motors evenly distributed along the quad-copter frame as can be seen in Fig. 2 below. The circles represent the spinning rotors of the quad-copter and the arrows represent the rotation direction. Motors one and three rotate in a clockwise direction using pusher rotors. Motor two and four rotate in a counter-clockwise direction using puller rotors. Each motor produces a thrust and torque about the center of the quad-copter. Due to the opposite spinning directions of the motors, the net torque about the center of the quad-copter ideally zero, producing zero angular acceleration. This eliminates the need for yaw stabilization. A vertical force is created by increasing the speed of all the motors by the same amount of throttle. As the vertical forces overcome the gravitational forces of the earth, the quad-copter begins to rise in altitude.

Fig. 2 shows the vertical movement of the quad-copter. As above, the circles represent the spinning rotors, the larger arrows represent the direction the rotors are spinning, and the black arrows represent the forces caused by the spinning rotors. Pitch is provided by increasing (or decreasing) the speed of the front or rear motors. This causes the quad-copter to turn along the x axis. The overall vertical thrust is the same as hovering due to the left and right motors; hence only pitch angle acceleration is changed.

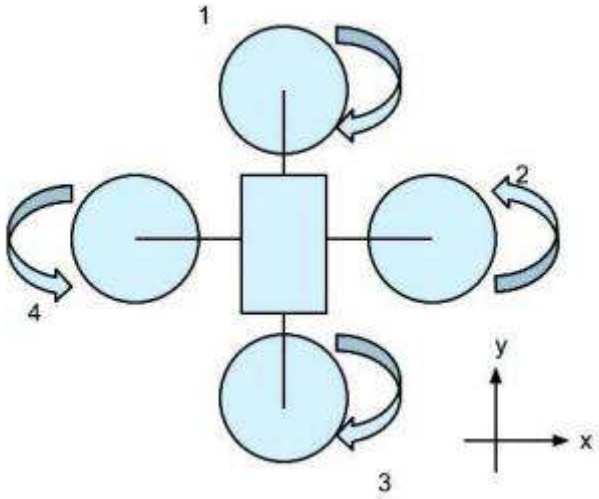

Fig. 2. Quad-copter: Motor rotation directions

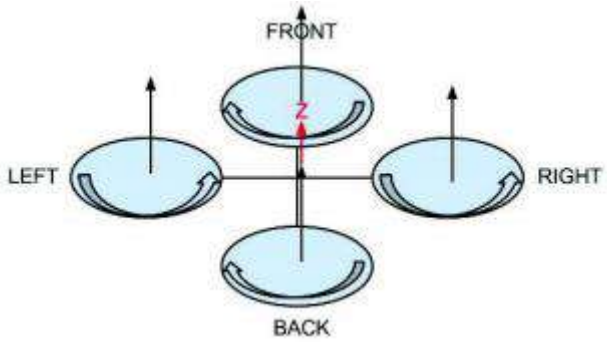

Fig. 3. Quad-copter: Vertical thrust movement.

Fig. 3 shows an example of pitch movement of a quad-copter. As the front motor slows down, the forces

created by the corresponding rotor are less than the forces created by the back rotor. These forces are represented by the blue arrows. These forces cause the quad-copter to tip forward and this movement is represented by the red arrow. Roll is provided by increasing (or decreasing) the speed of the left rotor speed and right motors. This causes the quad-copter to turn along the y axis. The overall vertical thrust is the same as hovering due to the front and back motors; hence only roll angle acceleration is changed.

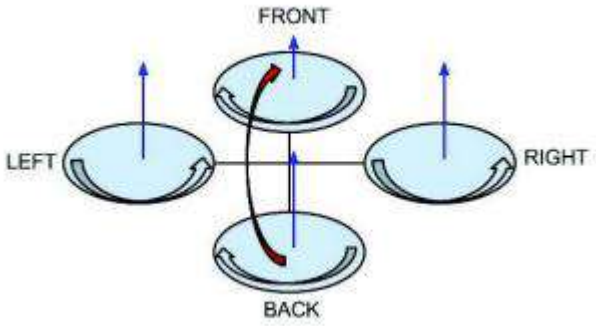

Fig. 4. Quad-copter: Pitch movement

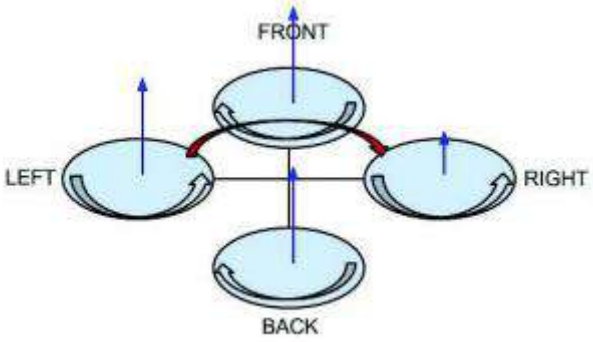

Fig. 5. Quad-copter: Roll movement

Fig. 4 shows an example of roll movement of a quad-copter. As the right motor slows down, the forces created by the corresponding rotor are less then the forces created by the left rotor. These forces are represented by the blue arrows. This causes the quad-copter to tip to the right and this movement is represented by the red arrow.

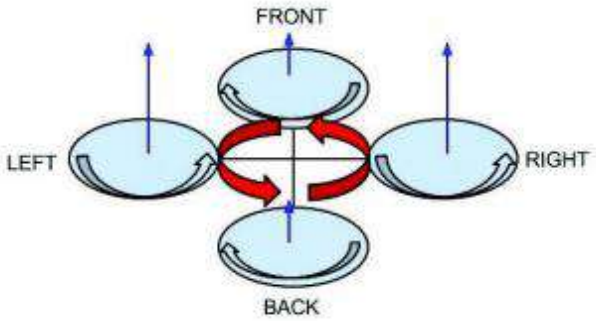

Fig. 6: Quad-copter: Yaw movement

Yaw is provided by increasing (or decreasing) the speed of the front and rear motors or by increasing (or decreasing) the speed of the left and right motors. This causes the quad-copter to turn along its vertical axis in the direction of the stronger spinning rotors. As the front and back motor slows down, the forces created by the corresponding rotors are less than the forces created by the left and right rotors. The quad-copter will begin to rotate in the same direction as the faster spinning rotors due to the difference in torque forces. This movement is represented by the red arrow.

MONITORING ENVIRONMENTAL CONDITIONS

There is an increased focus on control of site-specific environmental resources and discharges through real time and online sensor data which generates large amounts of data. So far there has been little focus on how data can be used for decision support. The proposed delivery of the JIP is recommended practices for relevant environmental and operational indicators, and data collection, analytics and aggregation describing environmental resources and discharges[2].

Challenge

There is an increasing focus on control of site specific environmental resources and discharges. Systems for collection of Real time and online sensor data are and these systems generate large amounts of data. So far little focus has been on how data from these systems actually can be used for decision support[4].

Delivery

Enabling operations in compliance with environmental acceptance criteria leading to more efficient, smarter and greener operations[4].

Benefits

- Development of recommended practices for relevant environmental and operational indicators.
- In addition recommended practices for sensor types, data collection, risk analytic and aggregation of

data for site specific monitoring of environmental resources and discharges[4].

TABLE I. SUMMARY OF FIGURES

Fig, no	Figures	
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Fig. 1	Basic block diagram of a Quad-copter	III
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Fig. 3	Quad-copter: Vertical thrust movement.	IV
Fig. 4	Quad-copter: Pitch movement	IV
Fig. 5	Quad-copter: Roll movement	IV
Fig. 6	Quad-copter: Yaw movement	IV

CONCLUSION

The project is presently in the initial design stages and we have completed a lot of research part. We have studied on the issues that we would encounter in this project, and we continue to work on outstanding issues. Although a lot of work remains, we continue to be optimistic that we will complete the project on schedule. When the basics are complete, the Quad-copter will be ready to get assembled. At that point the project could go in a variety of directions since the platform seems to be as flexible as we initially intended. As a team, we can completely change what function it performs, and we are able to integrate any technology that would prove to be useful. This project will clearly demonstrate the goals of proving that small scale UAVs are useful across a broad range of applications.

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Optimization Of Water Distribution System For Improving Water Quality Standards

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***Abstract*—This paper concentrates on overcoming the drawbacks of the current water distribution system implemented by the Municipal Corporation of Greater Mumbai (MCGM). The whole network is currently under manual operation and also there is no provision for determining contamination and leakages. As a reason, of the trial and error methods used for determining contamination and leakages, there is a huge loss of the available resources also leading to major inconvenience to the traffic and civilians. The MCGM is also not able to detect partial flow in pipes at high altitude areas leading to water shortages. The proposed system ensures equitable distribution of water, maintains the quality, quantity, flow and pressure of water. The continuity of water supply can be maintained. The quality of the water supply would be maintained and contamination would be quickly detected. The grievances of the public would be quickly solved.**

Keywords—Automation in Water Distribution System; automatic valve operation; flow meter using Flex Sensor

I. INTRODUCTION

The implementation of modern solutions in an efficient functioning of the public water supply services implies the existence of proper systems based on computer technology. In this way, to obtain this information based on analysis of the technological process, there is a proposed an analytical informatics system which allows an optimum drive of this process. This also ensures greater safety regarding the drinkable water distribution with the sole purpose of continuously improving the quality of the services offered to people. [1], [2]

In the making of the architectural model for the proposed system, the following principles have been considered:

- Distributed processing systems;
- Principle of Autonomous and integrated working on equipment;
- Principle of mutual installation of the equipments to provide the essential working of the system;
- Principle of transparency in using and working;
- Principle of best cost/performance ratio;
- Principles destined to provide effective monitoring, control and management of real-time and extended time installations are based on the data acquisition from installations.
- Principle destined to provide the required information for analyzing the behavior in operation and working out the statistics related to the working of the existing networks, installations and equipments, for establishing the technical and economic solutions for improving the technical conditions of various installations, equipments and development strategies.

The proposed system uses a distributed architecture, in which there are two distinguished levels:

- A local area level corresponding to the water distribution stations;
- A central level corresponding to the main monitoring station

The local area level system is based on the usage of microcontroller subsystems, and the central level contains high speed computers for the supervision or operative drive of remote processes. The communication between the main monitoring, the local monitoring and control systems is done by the help of some data sending techniques, depending upon the type of the communication environment between these points (cable, optical fiber, telephone line, radio channel/wireless, GSM). The basic characteristics of this system are long time analysis and continuous analysis of the supply network, interoperability and flexibility of the system. [3], [4], [5]

II. ARCHITECTURE OF THE SYSTEM

The information tracking in real time and the range enlargement of this information, the tracking of the working parameters comparatively with the accepted limits, storing the data from the process and its continuous processing and automatic providing of the parameters settings, and last but not least, providing the linking the central level system for possibilities of two-sided data and controls transmission making it necessary for large-scale introducing and distribution of the digital technologies. [6], [7].From an architectural point of view, the system is developed on distributed, network model based on the present standard level of computational technique, in order to fulfill the requests for fast processing of an important quantity of information, the requests for high viability and the necessity of open access to the informatics system

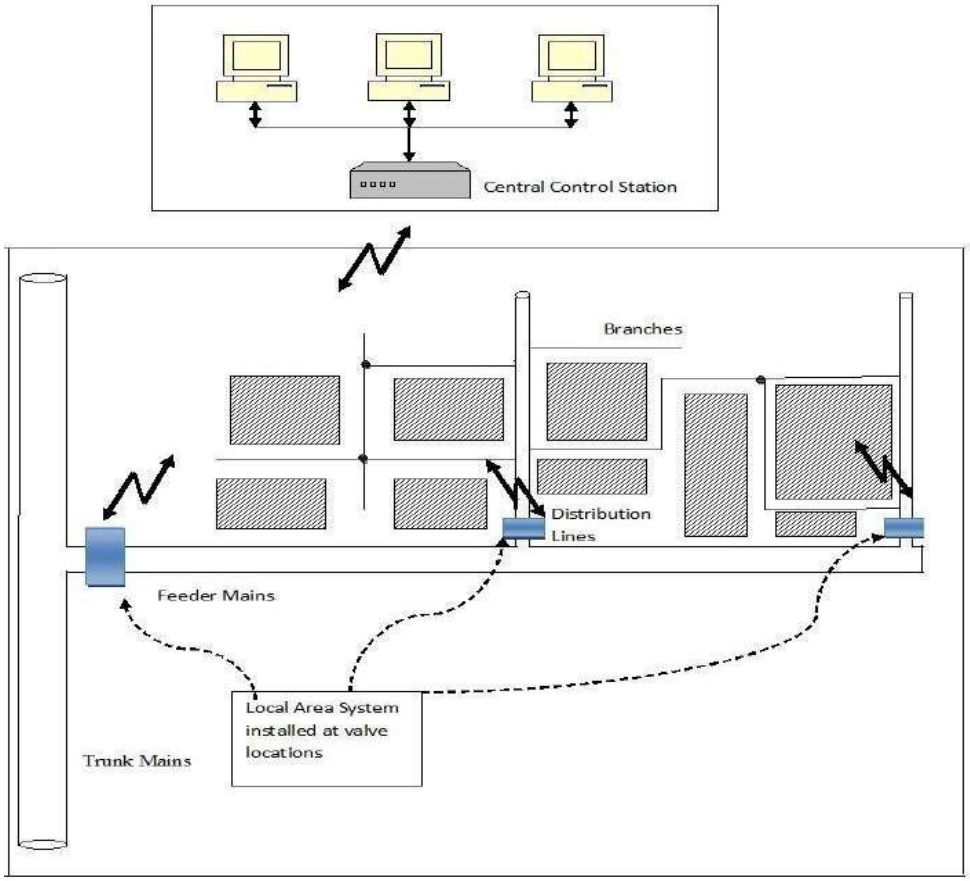

Fig. 1. Architecture of the proposed system

The proposed system uses a distributed architecture hierarchical which contains the following blocks:

A. Local Area System

The local area system is located at feeder and distribution level. This system comprises the following components:

1) Transducers signals adapting block: This block realizes the bringing of the signals taken from the process through the transducers in the unified signals range , compatible with the inputs of the computing system interfaces. The parameters measured are:

- pH
- Turbidity
- Flow
- Pressure.
- Dissolved Oxygen
- Salinity
- Oxidation Reduction Potential (ORP)

3) Motor Operated Valves: The Motor Operated Valves (MOV) serve to be important ingredients of the piping system. They are often referred to as on-off valves, as the motors serve the purpose of opening/closing of valves either fully or partially. An electric motor is mounted on the valve and geared to the valve stem so that when the motor operates the valve will open or close.

Fig. 2. Motor Operated Valve

Applications of Motor Operated Valves:

- Whenever a frequent operation is required.
- Valves located in remote, inaccessible or hazardous areas.

2) Local data acquisition and command equipment-

Programmable Logic Controller (PLC): Each local water distribution system is provided with a data acquisition and command equipment (PLC) associated with a PC which does:

- Automation, acquisition of the specific parameters;
- Primary processes (filtering, validation of the values from the transducers, framing between limits);
- Warning in case of crossing the limits;
- Communication with the superior hierarchical level.

B. Central System

At the Water Staging level, there is the Central System which does:

- Supervising the entire system;
- Displaying the system's scheme;
- Displaying the synoptic schemes with real time supervision for each local equipment;
- Elaborating the general monitoring bulletin.

The communication between the central and the local systems is done through telephone modems or radio.

Fig. 3. Central Control Room

III. FUNCTIONING OF THE SYSTEM

The proposed system assures the acquisition from the transducers of the characteristic parameters of the functioning of the installations within the water distribution networks, the monitoring and command of the valves at the local area level, the recording of acquired data, sending the data to the central system, elaborating the stations balance sheets, sending the results to the decision factors. In this way, each local area has its own data acquisition and command local equipment which communicates with the Central System.

The local data acquisition and command equipment realizes the following functions:

- Data register in the local database;
- Generating states of warning/pre-warning;
- Communication with the superior hierarchical;
- Access to the general database within the central system for obtaining reports and statistic

In case the data acquisition unit detects the warning/pre-warning state. It generates a special message which is sent to the Central System in order to inform about the special state. The warning/pre-warning state refers to the crossing of some limits. The general and special data (warning/pre-warning) are used by the central system to generate different functioning reports or for generating of evolutions in time of some parameters requested by the user. Water quality measures, flow, level and pressure are packed in the local station at a fixed period of time. The goal of the central system is to assure the management of a station network composed of local area system and industrial programmable logic controllers. Various information collected by the local area systems are sent to the supervision centres installed in the water treatment station and to the central water management area, the place where there is supervised the entire network of the city. The information is packed in a database, making it possible to generate reports [7].

TABLE I. MCGM WATER QUALITY STANDARDS

MCGM Water Quality Standards			
Parameter	***Units***	***MCGM Drinking Water Standards***	***MCGM Instream Aquatic Life Standard***
Cadmium	mg/L	0.005	0.00008
Chloride	mg/L	250	230
Chromium, Dissolved Hexavalent	mg/L	-	0.011
Chromium, Dissolved Trivalent	mg/L	-	0.27253
Chromium, Total	mg/L	0.1	-
Copper, Dissolved	mg/L	1.3	0.52955
Cyanide	mg/L	0.2	0.005
Iron	mg/L	0.3	1.5
Lead, Dissolved	mg/L	0.015	2.41176
pH	s.u.	6 -8.5	6.0 - 9.0
Selenium	mg/L	0.05	0.005
Silver Hardness	mg/L	0.1	-
0-50	mg/L		0.001
51-100	mg/L		0.004
101-200	mg/L		0.012
201-400	mg/L		0.024
401-500	mg/L		0.03
501-600	mg/L		0.043
Zinc	mg/L	5	0.59138

IV. TRANSDUCERS USED AT LOCAL LEVEL SYSTEM

A. *Quanta G*

Hydrolab's Quanta G monitors up to eight different water quality parameters simultaneously. The Quanta G is equipped with a heavy duty 1.75" diameter 316 stainless steel housing (or optional PVC)for easy cleaning, minimizing the potential for cross-contamination. SDI-12 output allows the Quanta G to connect directly to third-party data loggers without custom software. Backed with Hydrolab's three-year warranty, the Quanta G is designed for many years of use in the field. It is designed for exceptional reliability and durability in a field environment.

B. *DTS-12 Turbidity Sensor*

The DTS-12 is a turbidity and temperature sensor designed specifically to deliver high accuracy results from a sensor that can be easily field-deployed and requires very little maintenance. The sensor features a 12-month recalibration interval and a built-in silicon wiper blade which helps minimize bio-fouling, helping to ensure accurate sampling from 0 to 1,600 NTU. The DTS-12 meets the quality standards of the USGS and has received their approval for in-situ turbidity monitoring.

- High-accuracy turbidity measurement
- Quick setup and deployment
- Low maintenance requirements

C. *Flow and Pressure Measurement using Flex Sensors*

Flex sensors can be employed for the measurement of flow and pressure. Flex Sensor is a single-layer flexible material that changes resistance based on a deflection. As a result, it can accurately measure movement or flow in multiple directions. A layer of the material coated on a substrate produces a sensor, and the material can be applied to uneven, angled or curved surfaces. This flexible sensing technique used in a flow meter provides a direct inferential reading of flow rate without incurring any significant pressure drop. The technique does not use rotating components that could easily fail and is reasonably priced. Depending upon the flow level and the pressure of water inside the pipes, the sensor generates a particular electrical resistance. An algorithm is designed to convert this resistance value into the flow and pressure measurements. Flex sensors are placed in the pipes in vertical position. But in case of large pipes, a problem of fluttering occurs which can be avoided by using the sensor with mechanical structure.

V. CONCLUSION

The system result is obtained by integrating the data acquired from all transducers at local area level. These results are then compared with the predefined standards to maintain the water quality. In this way, the system is designed to meet the following benchmarks with respect to water distribution network.

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Face Recognition System Based On IOT With Live Video Surveillance

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***Abstract*-Even though there are various security systems consuming large power are available in market nowadays, robbery rate, terrorist attacks, crimes etc. are very high. This paper focuses on a real time security system which detects the human faces, compares with previously stored database & gives an alarm according to the requirement. The alarm as spoken is about a GSM module, which generates a text message from a particular system number. With an additional feature of Live Video Surveillance, we will be having a live video going on, through that we will be detecting faces & matching or recognizing it with previously stored database.**

Keywords: Face recognition, Live Video Surveillance, GSM Module.

I. INTRODUCTION

We design a security entrance to allow an authorized personnel un-interruptedly walking into the entrance. The user's face
image was taken during the early stage in the one's entering. The one's facial information is analysed and identified from
the authorized personnel database. Currently, there exist security systems designed with the combination of the password and the face recognition. For human intelligence, the face detection is an easy task; but for the artificial intelligence, it takes quite a while to do the computing to detect a face. Robbery, terrorism, bomb attacks have become common in our day to day life. Security systems with an IP camera are commercially available. These systems are powered the entire time and they capture video throughout the day, hence consuming the large amount of electricity. In most of the places, remote surveillance is needed. These systems, capture video, transmit it through the internet to the server, and from the server it is transmitted to the client. For this, the large amount of bandwidth is consumed and there available for longer time. Even in tight security areas, these drawbacks are present. For any smart security system, the two elements that ensure perfect security are the Video monitoring system and the access granting system.

II. HARDWARE DESIGN OF THE SYSTEM

Architecture of the System

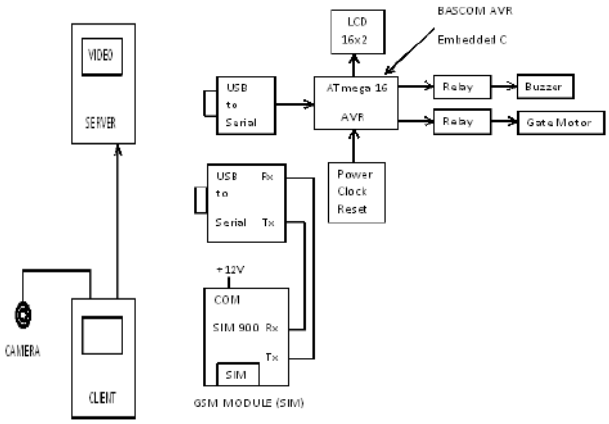


Fig.1. Architecture of the system

Here we are using a Computer(PC) to which a camera is connected, through which we are sending the captured video to the server. One more client Computer(PC) we are using ,through which the data was acquired sends to the server; basically the server is used for Internet of things(IoT).We can have any number of this section which introduces the overall architecture of the proposed system, and describes the components in detail. The overall system consists of two sub-systems. They are the Internal Sub-system (ISS) and the External Sub-system (ESS). The ISS consists of a GSM module

and a control module for controlling the ISS. The ESS consists of the Face-recognition module and a control module for controlling the ESS and for triggering the ISS. In ESS, the face recognition is done and the control is done by using two 8-bit micro-controllers with one serially communicating with the face-recognition module and other
for triggering the ISS and its operations. There is a single primary camera which captures the image of the person who is waiting by the door for access and sends it to the face-recognition module for computation. In order to save power, an external sensor is used for sensing movement
outside the secure area, and if any movement is present just near the door, say a person walking in just before the door for access, the external sensor senses motion and triggers the microcontroller which, in turn , triggers the face recognition module. Hence the Primary camera is just turned on when it needs to take the picture, and it is turned off otherwise internal sensors for sensing motion inside the room. The GSM module is used to sending SMS alert to the client or the registered numbers stored in the EEPROM of the micro-controller.

Circuit Diagram of the System

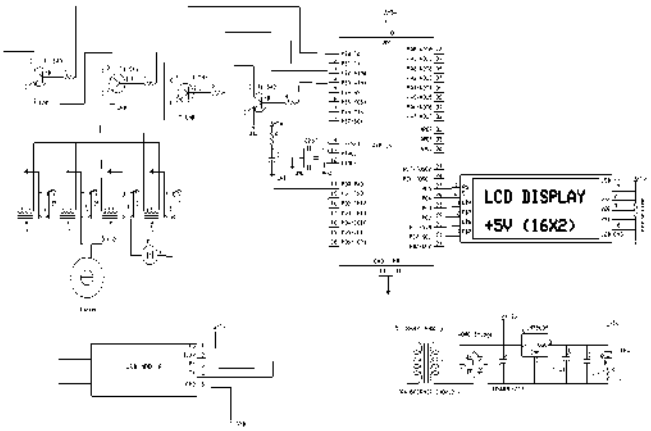


Fig 2 Circuit Diagram

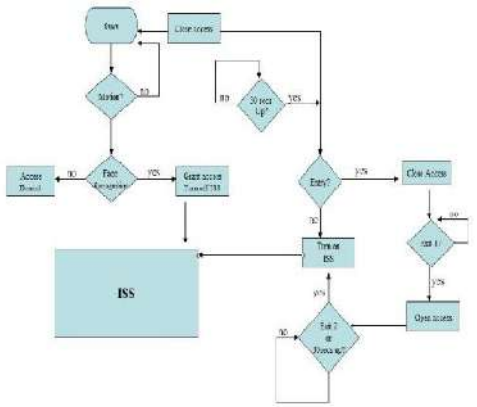
The above diagram shown is the block diagram of the system where we are capturing an image from another source ie. At airports or from a mall entrance.
Highly powerful PC we can't place over there to process high amount of data. Data can be from various places such as whole Maharshtra such as railway stations(Data which is stored like criminals database records). Thereafter, this data goes to the central server room and cn be shown through the internet. So,to justify the concept of IoT, we are capturing the data from the client& sending it to the server via internet. Data will be acquired from one node. Client will be low power device & server will be high power device. High power device will acquire the data first whereas we have to take frame & design it. For that, we are using C#.net (which is an advance language than C or C++)because nowadays they are used in industries.
In C#.net, graphical user interface will be designed like how it will look & how it will be operated. As the frame is captured then we convert it into black and white images, after that we find out the edges. After detecting the edge of a face, we detect the face in a farme. Then the detected face is matched with the database & find out the matching face from the database. This is going to be a part of the face recognisation for standard worth for eigen faces is widely used. We can use algorithm of Eigen faces or Har algorithm can also be used. In that when we pick up an object, its properties are found out & on that basis we match the properties of the standrad images. Therefore, the face which is there in the database is matched & will get a result.
In C#.net, we design GUI but for image specific part or image processing, there is no such specific function in that. For that we will write everything for the frame, black &white images & edge etc. So we have found readymade files for this, hence we are using the Open CV.
Open CV is an image processing library function. In C#.net; the Open CV in that will fucntion such as the image processing library function works in such a way that the person is found from the live video and the recognised person is matched with the database. Therafter, if the indentified person is found then we will take an action on him; this process will be done in malls, airports as specified earlier , and as well as where the high system is truly needed. So if the person is not matched with the given database, then the door will get opened and he will get the system entry. The door will not be a normal type door which we use in our home. As we can see doors such as in malls, airports, metro stations etc; the doors there will be a revolver type mechanism & will rotate at a 90^{o} angel & at a time it gives a system entry to only one person. If the person is standing at the door whose image gets captured & if the image is matched with the suspicious person then the local level alarm will ring & it will send the message to the main police station that the suspicious person is been detetcted in a particular area. The image which has been sensed will have an ID number that the particular ID number will be sent to the police station indicating that the suspicious person is detected in a particular area.

III. SOFTWARE IMPLEMENTATION OF THE SYSTEM

The over software design of the system consists of three parts. They are the programming of the micro-controller & the Face-recognition module also the GSM Module.

Microcontroller Control Program

The micro-controller are responsible for the system initialization, interrupt handling and the hardware control. The software implementation of the in these micro-controllers is shown in Figure 3 and Figure 4.



Fig, 3. Software Implementation of the System

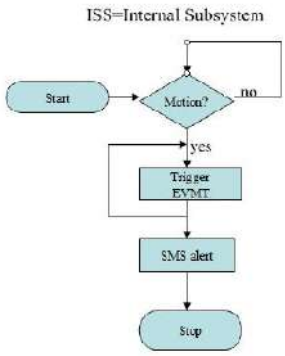


Fig. 4. Software Implementation of ISS

The working of the ISS is explained in the latter half of the section .When the system is started, the external sensor keeps sensing motion outside the door and the ISS is turned on as well. If the external sensor detects motion, it triggers the face-recognition module, which in turn , makes the camera take a picture of the person in front of the door. The face-recognition module replies the micro-controller with a binary result whether the person is recognized or not. If he/she is recognized, then the access is granted else simply the access is denied, and the ESS after a few seconds, it resets itself. If the access is granted, then the ISS is turned off and the access door is opened for 30 seconds. The timing can be adjusted depending on the need. The person should enter the room and press the entry push button to notify the system that the person has entered the room and if he/she fails to do that, then the access door will be closed and the ISS will be turned. On which would lead to the false alarm. When the person wants to leave the room, he/she should press the exit 1 push button inside the door for the door to open and on exiting the room he/she should press the exit 2 push button outside the room to notify the system that the person has left the room or the system will automatically close the door in 30 seconds which is also changeable and the ISS will be turned On.

Video Capture Module

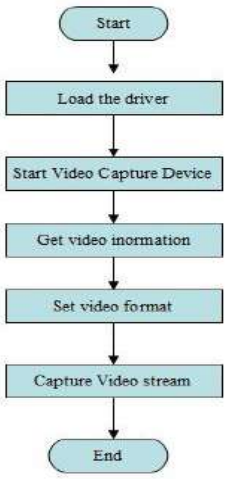


Fig. 5. Flowchart, Video Capture Module

Camera captures video frames and sends them to video compression module. It is shown in the Fig 5

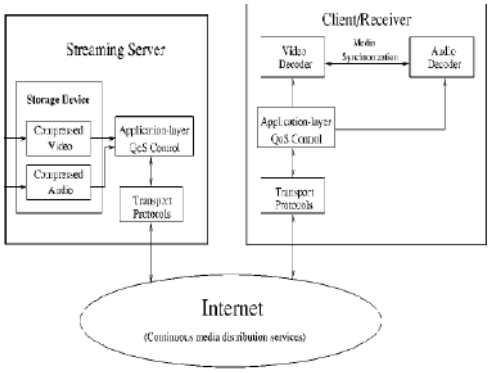


Fig. 6. Working

The compressed video data is stored in a buffer and the *application-layer QoS control* module adapts the video bit-streams according to the network status and QoS requirements. After the adaptation, the transport *protocols* packetize the compressed bit-streams and send the video packets to the Internet. The complete explanation is given in "Streaming video over internet: Approaches and Directions" (Dapeng Wu *at el*, 2001).

Face Recognisation Module

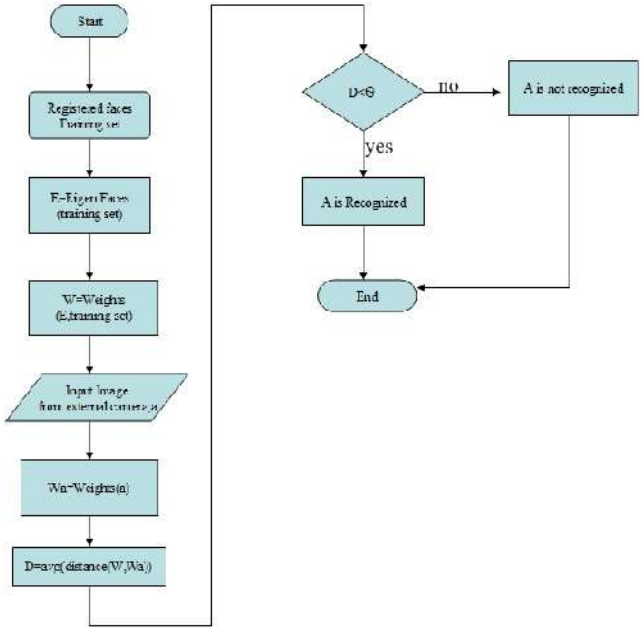


Fig. 7. Flowchart, Face Recognisation Module

The Face-recognition module is based on Eigen faces and it is programmed using Open CV.

The number of components can be less than or equal to the number of original variables. The first principal component has the highest possible variance, and each of the

succeeding components has the highest possible variance under the restriction that it has to be orthogonal to the previous component. We want to find the principal components, in this case eigenvectors of the covariance matrix of facial images. The set of images that are stored in the database are taken as the training set. These set of images are the pictures of the people for whom the access should be granted. From this training set, the mean is calculated and subtracted to get the average vectors from which we can get our covariance matrix and hence the Eigen vectors which are the Eigen faces, E. The weighted matrix (W) is calculated for the training set using the Eigen faces. When an image a is obtained from the external camera, the weighted matrix (Wa) for the image a is calculated. Then the weighted matrices are compared to get the distance (D). In this case, the Euclidean distance is calculated. The distance D is compared with the threshold value Θ. If the value is lesser than the threshold value, then the image is recognized, else not recognized. The mathematical formulas for calculating the Eigen vectors, weighted matrix, Euclidean distance is explained in the paper (Marijeta*at el*, 2012).

IV. SYSTEM TESTING

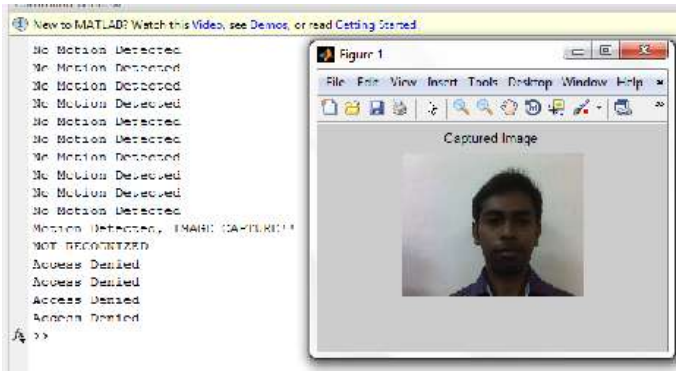


Fig. 8(a).

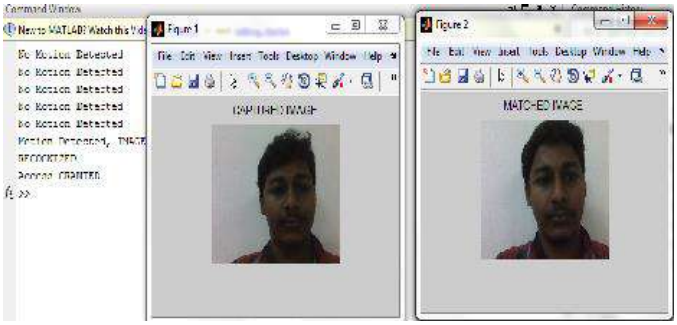


Fig. 8(b).

Fig. 8. ESS Results: (a) Access denied since person not recognized (b) Access granted to authorized personal.

The External sensor scans for movement around the access door. And detecting motion, it triggers the face-recognition module to capture the image and gives the processed result (Fig 9 (a)and (b)). If access is granted, the ISS is turned Off and then the person may enter the room and press the entry push1 button and on leaving press the exit push button 1 and after exiting press the exit push button 2, or the system overrides after 30 seconds.

The ISS detects motion inside the room, and SMS alert; When ISS Internal sensor Fig 10 is send to the registered phone numbers (clients) and the client can log in from the client log-in page and watch the real-time live video streaming from the web page.

From the above results shown, we can see that our system has completed all its main functions such as detecting motion, triggering the face recognition module and its processing, granting and denying access, SMS alert and real time video monitoring.

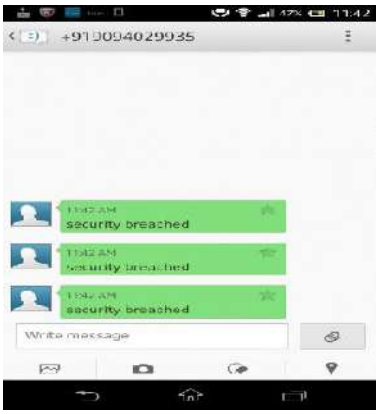


Fig. 9. SMS Alert

V. CONCLUSION

Hence, a security system with Face recognition, SMS alert and video monitoring terminal has been built which has two sub systems. The External sub-system which can sense motion near the door, capture image of the person, process the image and can grant or deny access to pass through the door (Face Recognition). The Internal sub-system which can sense motion inside the room, send SMS alert.

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Calculation Of Television Rating Points (TRP's) Using Watermarking Technology

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***Abstract*—In this paper, calculation of Television Rating Points (TRP's) using watermarking technology is presented. TRP indicates the how popular a TV channel or a programme is. These points are calculated using electronic systems and are important as it enables the advertisers and investors to understand the mood of people. Broadcast Audience Research Council (BARC) uses watermarking technology for audience measurement. Audio watermarks are embedded in video content prior to upload and broadcast in audio watermarking technology. These watermarks are not audible to the human ear, but can easily be detected and decoded using dedicated hardware or software. The watermark is broadcasted along with the content. As viewing details are recorded by the BAR-O-meters, so are the watermarks. The raw data is cleaned, merged with the channel, program, language and broadcast schedule details. To get viewership data universe estimates are then applied.**

Keywords—TRP, People-meter, BAR-O-meters.

I. Introduction

Television Rating Point (TRP) is a tool provided to judge which programmes are viewed the most. This gives an index of the choice of the people and also the popularity of a particular channel. Television Audience Measurement (TAM) runs a neutral TV viewership cell for the Indian TV Broadcast & Marketing Industry. This panel has one of the largest TV audience measurement panels in the world comprising of 45,287 individual sample respondents from across 225 cities and towns with 12,200 TVM5 people-meter's covering 11,130 TV homes [1].

A device called as people-meter is attached to the TV set in a few thousand viewers' houses for calculating TRP's. It is hooked up to each TV set and is accompanied by a remote control unit. Each family member in a sample household is given a personal 'viewing button'. It identifies each household member's age and gender. If the TV is turned on and the viewer fails to identify themselves then the meter will flash a light to remind them. An additional buttons on the device enable visitors to take part within the pattern through recording their age, gender and viewing status into the device. Several stakeholders were unhappy with the existing system due to lack of transparency, small sample size and also outdated technology which was coming in the way of collecting authentic data [2]. The Fig.1 shows people-meter.

Fig. 1 People-meter [1]

BARC make use of very innovating technology referred to as watermarking. With watermarking, a mark is inserted at source - by the channel or broadcaster - when a programme is broadcast. This mark has to consequently stay part of the programme regardless of the gadget used to observe it. Watermarking needs a device to identify this mark which is called as BAR-O-meters.The watermark is broadcast along with the content. As viewing information is recorded by means of the BAR-O-meters, so are the watermarks [3].

II. Literature Survey

In 1983, Indian Market Research Bureau (IMRB) conducted television ratings first time in India. In 1986 Operation Research Group -Market and Research Group (ORG-MARG) also did ratings. IMRB distributed total 3600 diaries in eight cities and decided that whoever will watch television more than five minutes would be considered as television viewer. The rating of the very popular epic serial Ramayana was measured around 80 percent. Even after the appearance of private television channels in 1991 the TRP was measured only by the diary method. It was only in 1995 that IMRB and ORG-MARG came together to import people meter from America. The

cost of one people meter was rupees 70,000 at that time. Next year world's number one rating company A.C. Nielsen started ratings in partnership with Indian company IMRB and established TAM. Along with this ORG-MARG also continued with Indian Television Audience Measurement (INTAM). In 2000, TAM took over INTAM [1].

Many broadcasters were not satisfied with the way TAM was working and consequently the pass to make BARC the legit body for TRP calculation has been welcomed by the industry; this is especially because, again and again, hands have been pointed at the data furnished by means of TAM in India. In 2012, whilst an information broadcaster challenged the authenticity of TAM rankings in courtroom, the organization's ratings were boycotted with the aid of the enterprise for nine weeks [2].

The people-meter consists of 2 vital elements. The human interface is a small box that sits on pinnacle of every TV set in the house. Household member's use this or a remote control to record who is watching. Each person is assigned a button and there is a place on top where visitor can enter their age and gender. A row of light on the front blinks red when the set is first turned on. Household members are instructed to push their button when they are watching TV. Second is the larger box off in a closet someplace that identifies which channel the set is tuned to and sends the records via cellphone line to the corporation [2, 4]. Fig. 2 shows people-meter along with its remote control unit.

Fig. 2 People-meter with its Remote Control [2]

To measure viewing in an Analog home, TAM used the same technology that is used in more than 30 countries worldwide. The TAM technology is a frequency matching technology. This means that the people-meter records the frequency of the channel which is viewed. Now each time someone switches from one channel to the other channel, the tuner of the TV set 'fixes' onto the particular frequency. The detector of the people-meter setup transmits this frequency, which it gets from the sensors, to the people-meter. The information is stored as encrypted data in the data module and is now polled daily or accrued every week by way of the TAM data collector [4]. Fig. 3 shows basic working of people-meter.

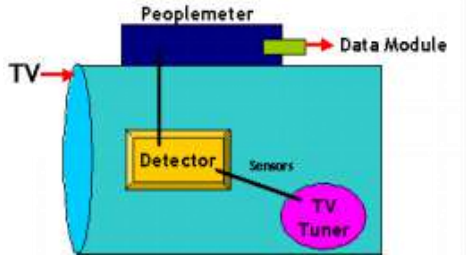

Fig. 3 Basic Working of people-meter [4]

III. Audience Measurement Using Watermarking Technology

A watermark is embedded into the video material on behalf of the content owner. All information pertinent to the embedded watermark is stored in a central database. This central database allows the numerical data embedded into the video to be correlated into meaningful information. A large number of tracking stations are required, physically located in the television service areas where monitoring is to take place. When a watermarked sign at this kind of station is detected, the specific identifier and time code records are forwarded to the principal database and processed. Further, the time, location and channel of the broadcast are also recorded [5].

BARC India is an Industry body, to design, commission, supervise and own an accurate, reliable and timely television audience measurement system for India. It makes use of watermarking technology for audience measurement which is very innovative technology. It consists of inserting a mark which is inaudible to the human ear into programmes. This mark contains the identification of the channel which broadcasts the programme and also the regular broadcast time markers. The audimeters installed in panelists' homes can then recognize this information [1, 6].

The audimeters are upgraded to "watermarking" standards in two stages. The first stage is the "NG Premier" stage: an external sensor is connected to the existing audimeters of some panelists. This enables the mark to be identified. The second stage is the "NG Evolution" stage: development and widespread deployment of new audimeters with an internal sensor. One new feature is that television channels are involved directly in "watermarking". The channels are required to install the mark inserts in the master control room [6].

Watermarking technology expands the scope of audience measurement. It also has an effect on certain indicators, such as total audience ratings. Up until now, these have been calculated from the first second a programme is watched. With "watermarking", the audimeters take 7 to 15 seconds to detect which channel is being watched. After a detailed analysis, the market and Médiamétrie have set the new threshold for the Total Ratings and derived indicators at 10 consecutive seconds. The Total TV Individual Listening Time is also concerned. In fact, there will always be some channels that are not marked (channels in border areas, foreign channels, etc.) which will be watched. Their audience cannot therefore be taken into account directly in Total TV. The conventions will change for these two cases. This does not cast any doubt on the accuracy or relevance of the measurement. They simply change the scope taken into account in calculating the indicators that must be shared and known [6].

From the point of embedding the watermark in the content in the master control room to the detection of these watermarks for the purpose of calculating TRP's is explained step by step in the Fig. 4.

Fig. 4 Flow of the entire process of audience measurement [6]

The basic description and diagram of BAR-O-meter is shown in the Fig. 5.

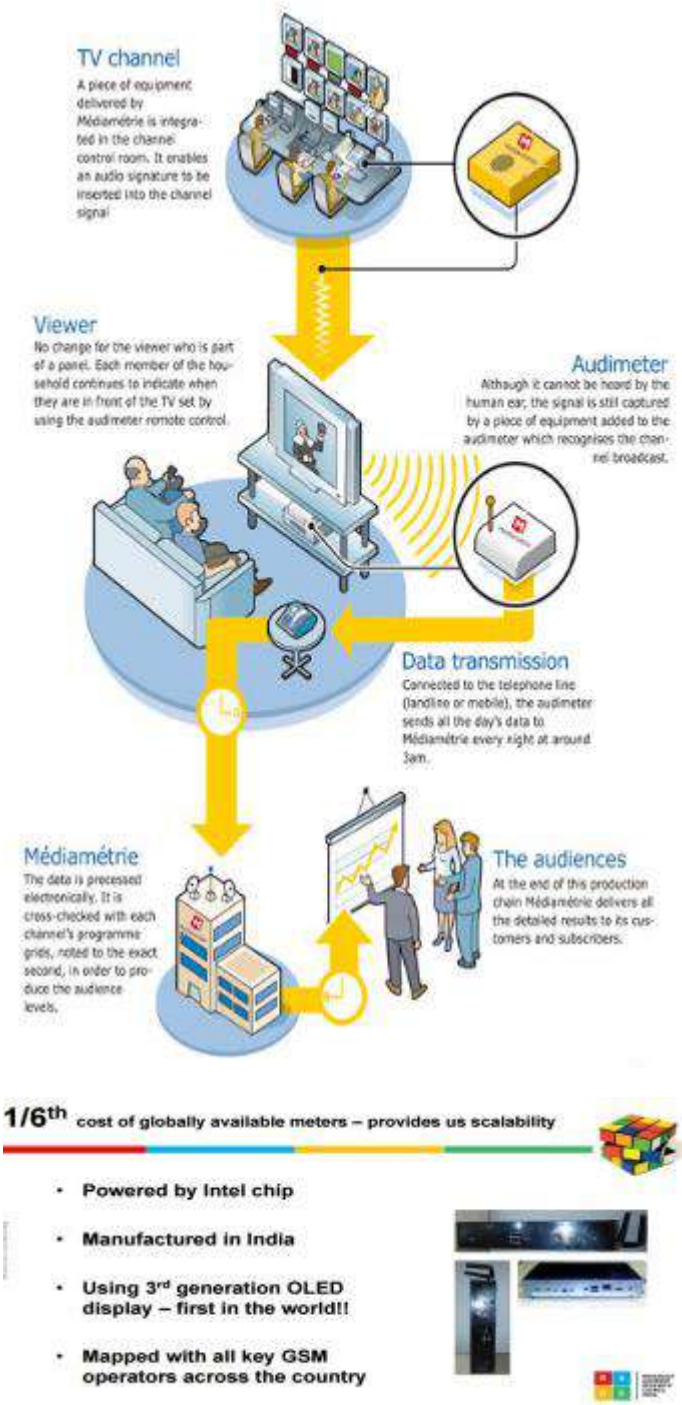

Fig. 5 BAR-O-meter diagram with description [3]

Manufactured in India and mapped with the entire GSM operator across the country BARC make utilization of cutting edge BAR-O-meters in place of people-meter for audience measurement. The BAR-O-meters placed in the metered homes are compact and use the most recent innovation. They have a 3rd-generation OLED display and an embedded SIM to automatically upload viewing data. As they are indigenously made, they price is almost one-sixth the price of imported meters [3].

IV. Conclusion

India is a country which has large population, one of the highest TV owners in the world and there is also great diversity. Subsequently there is the need of innovative technique for calculation of TRP's which make utilization of exceptionally inventive innovation which is future proof. BARC India makes use of watermarking technology for audience measurement which is very innovative technology. As far as frequency matching technique is concerned where cable operators frequently change the frequencies of the different channels before sending signals to the homes, is very misleading. Hence this watermarking technology proves to be best where audio watermarking embeds audio watermarks in video content prior to upload and broadcast. As the watermark is part of the content any endeavor to obliterate or expel it will likewise demolish the nature of the material in which it is inserted. This expands the trustworthiness of the information created by BARC.

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Carbon Nano Tube Yarns Replace Copper Windings In Electric Motors: An Innovation For The Industry

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Abstract -- The high level of electricity consumption by the electric motors gives the need to design highly efficient and less power consuming motors. Copper wires in the electric motors which lead to losses in terms of maintenance and revenue can be thus replaced by Carbon Nano Tube yarns which posses qualities like good conductivity and help reduce electricity consumption.

Keywords -- CNT (Carbon Nano Tubes), motors, yarns, copper wires.

I. INTRODUCTION

The need for the use of carbon nano tubes in motors was driven by the global electricity consumption. It is a verifiable truth that electric motors are the single largest consumers of electricity which estimates upto 45% of the global power consumption. When copper windings in the electric motors are replaced by carbon nano tubes made yarns or woven threads; it is seen that there is a significant amount of increase in the efficiency of the motors. The losses occurring in the motors are also less.

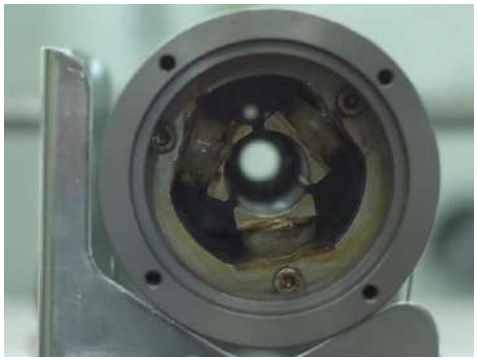

Figure 2. Carbon Nano tubes yarn replacing copper windings [3]

Copper is used in copper winding of the motors because it is the best conducting metal and is relatively cheap. However, with good conductivity it also offers some resistance, which lead to losses in the motor.

II. LITERATURE SURVEY

Meanwhile carbon nanotubes have conductivity far beyond the best metals and their limits of conductivity have not been found: some have been measured at 100 megasiemens/meter, compared to ultra-pure copper at 58.65 MS/m. With this kind of conductivity, carbon nanotube-based windings could result in double the conductivity of today's copper windings, according to the Finnish researchers.

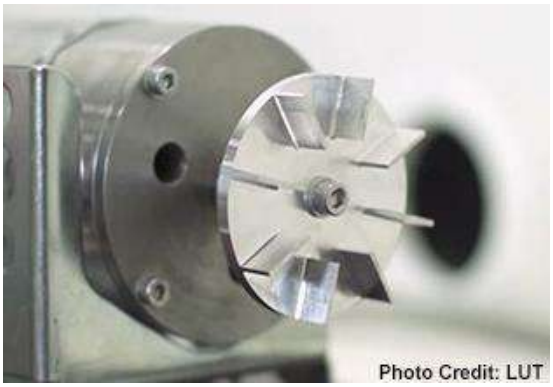

Figure 3. An electric motor using carbon nano tubes [3]

The prototype motor uses carbon nano tube yarns spun and converted into an isolated tape by a Japanese-Dutch company Teijin Aramid, which has developed the spinning technology in collaboration with Rice University, the USA.

According to Pultarova, industrial applications of this new material are still being considered. Scaling up the production capacity, the researchers believe, together with improved yarn performance, will be the impetus behind significant progress as time progresses.

III. CARBON NANO TUBE YARNS

The CNT yarns are made by solution extrusion or twist spinning process. The same equipment required for the production of a copper wire is used for obtaining CNT yarns. The yarns also have a polymer insulation like that of the copper wires, thus; unless the wires are cut, it is

difficult to make out whether it is copper or CNT yarns.

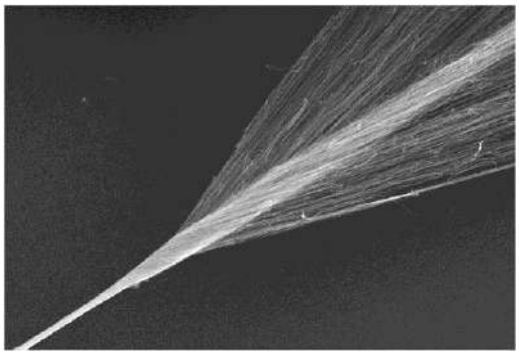

Figure 4. Carbon Nano Tube Yarns [4]

CNT yarns have good level of tensile strength and can be used as a string or spring depending on its composition and application.

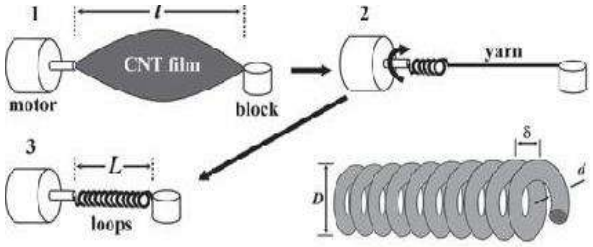

Figure 5. Process of obtaining a CNT yarn [3]

With the uncountable advantages come some disadvantages of the CNT yarns which are; the CNT yarns are very long and thin structures which if inhaled can be dangerous, also; if the proper material composition and dimensions are not followed while designing, inducing flux also becomes a problem.

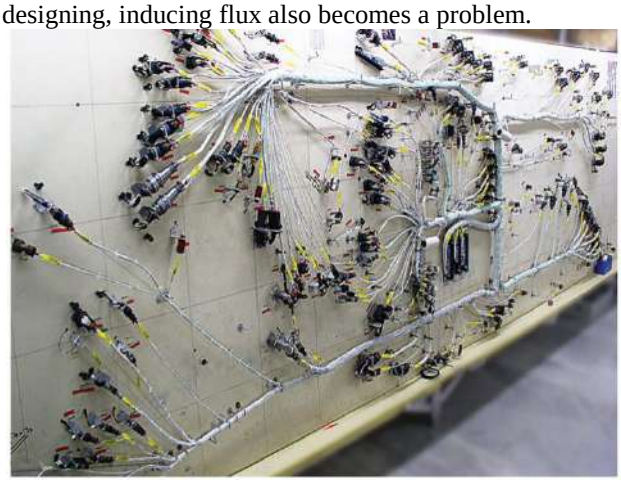

Figure 6. The wiring in an aircraft which can weigh around 1000 pounds [4]

An average vehicle contains 55 pounds of copper which is mostly the weight of electric wires, which if reduced may also increase the fuel efficiency.

IV. CONCLUSION

A single house consists of various electric motors in different electric appliances, use of carbon nano tubes reduces the electricity consumption and will also have an impact on the carbon footprint.

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