AN IOT FRAME WORK ON PATIENT HEALTH MONITORING WITH DOCTOR ALERT

[1]Dr. S. Venkatesan

Professor / Department of CSE

Aurora's Technological & Research Institute ,Uppal,Hyderabad

[2]Srikanth Nalluri

Assistant Professor

Computer Science and Engineering

Kallam Haranadha Reddy Institute of Technology

Guntur-Chennai Highway, Dasaripalem, Andhra Pradesh 522019

[3] Dr.G.SARAVANAN

AP/CSE

Erode Sengunthar Engineering College

[4] Dr.P.Dileep

Associate Professor, Department of Computer Science and Engineering, Malla Reddy College of Engineering and Technology, Hyderabad, India.

[5] Dr. SHARAVANAN. S

ASSISTANT PROFESSOR

DEPARTMENT OF MECHANICAL ENGINEERING

VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES (VISTAS)

[6] Dr.M.Saravanan

Professor/EEE

Holy Mary Institute of Technology & Science

ABSTRACT

With the large number of Internet of Things (IoT) devices such as smartphones, sensors, cameras. It is possible to collect massive amount of data for localization and tracking of Health of the patient.This Proposed method describes the design of a simple, low-cost controller-based patient health monitoring system. Heart rate of the subject is measured from the thumb finger usingIRD (Infra-Red Device sensors and the rate is then averaged and displayed on a 16 X 2 LCD display). Health is one of the global challenges for humanity. According to the constitutions of World Health Organization (WHO) the highest attainable standard of health is a fundamental right for an individual In hospitals there are provisions for continuous monitoring of patients.Their heartbeat, temperature, are continuously monitored. There is no provision to check the parameters when they return to home.

And hence there is a chance that the disease may return again. Patient's data (temperature, heart rate, oxygen level, saline level) will be frequently measured and sent to server.Period of sending (say every 1 min) can be set. Monitoring person learns patient specific threshold. Say the regular body temperature of a patient is 37c whereas one person feels feverish if his body temperature is 37.0˚c. By employing an averaging technique over a relatively long time, Observer can learn these thresholds for patients. Using Android Application in doctor's smart phone, doctor can view his patient's health status.When any of the parameter goes beyond the threshold value, he will get an alert notification. Using Android Application in patient's or his caretaker's smart phone the patient can view his health status.

Keywords :- Android Application , controller-based patient health monitoring system, World Health Organization (WHO)

1. Inroduction :-

It is possible to collect massive amount of data for localization and tracking of health of the patient based on IOT and displays on lcd. An IOT frame work on patient health monitoring by doctor alert using embedded system.

Embedded systems are designed to do some specific tasks, rather than be a general-purpose computer for multiple tasks. Some also have real time performance constraints that must be met, for reason such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs.

An embedded system is not always a separate block - very often it is physically built-in to the device it is controlling. The software written for embedded systems is often called firmware, and is stored in read-only memory or flash convector chips rather than a disk drive. It often runs with limited computer hardware resources: small or no keyboard, screen, and little memory.

Wireless communication has become an important feature for commercial products and a popular research topic within the last ten years. There are now more mobile phone subscriptions than wired-line subscriptions. Lately, one area of commercial interest has been low-cost, low-power, and short-distance wireless communication used for personal wireless networks." Technology advancements are providing smaller and more cost-effective devices for integrating computational processing, wireless communication, and a host of other functionalities. These embedded communications devices will be integrated into applications ranging from homeland security to industry automation and monitoring. They will also enable custom tailored engineering solutions, creating a revolutionary way of disseminating and processing information. With new technologies and devices come new business activities, and the need for employees in these technological areas. Engineers who have knowledge of embedded systems and wireless communications will be in high demand. Unfortunately, there are few adorable environments available for development and classroom use, so students often do not learn about these technologies during hands-on lab exercises. The communication mediums were twisted pair, optical fiber, infrared, and generally wireless radio.

2. LITERATURE SURVEY

Internet of Things (IoT) and cloud computing plays a vital role in today's Tele- monitoring health system. This system keeps track of patient's physiological parameters through collection of body sensors' data using Raspberry Pi board. The patient's health card is developed by the doctors and displayed on a webpage where doctors and patients can access and communicate each other without physical presence. Using cloud computing, the data can be stored, updated and accessed from anywhere in the world. It is very suitable for rural areas where medical facilities are not available. In Remote health monitoring system using IoT, Body wireless sensor Network (BWSN) is used to transmit the patients' health parameters collected through Raspberry Pi

microcontroller to the physicians and caretaker wirelessly. Being long range wireless technology, emergency situation of the patient's health is quickly detected and timely intervention leads to save the life of the patient. Owing to costlier healthcare and long waiting time in hospitals, the concept of in-home patient monitoring system has been emerging in the recent years. This system collects data of various body parameters through Biosensors, wearable devices and smart textiles and it transmits the data to central node server securely through Cipher text Policy Attribute Based Encryption (CP-ABE) method. In turn, the server shares the collected data to the hospitals for further treatment. The server rings alarm to the ambulance during emergency situation. It is very beneficial for elders and chronic patients who require continuous monitoring.

The specialized healthcare monitoring system for elderly people is a growing need in the aging population world. This system performs basic health checkups by measuring the body parameters regularly and report the data to the doctors. The result data are then displayed as statements in a web application where doctors and patients can interact with each other. Evaluation is of two parts: 1) Qualitative interviewing and 2) Quantitative Survey. The main challenge is to make elders equipped with for growing new International Journal of Pure and Applied Mathematics Special Issue 250 technologies and to become familiarity towards Smartphone, computer, etc. IoT based Smart healthcare with the help of smart devices and objects improves the healthcare monitoring system effectively, thus by reducing the inefficiencies of existing healthcare system. Smart devices with new and upgraded technologies enhances the data accuracy to be collected, real-time accessibility of patient's condition, intelligent integration of data collected, maintaining the integrated data smartly through cloud service, etc. IoT along with smart devices reduce complexity and complications in the healthcare system. The penetration of mobile technologies and smart devices over healthcare system cause huge impact on the world. The full-fledge utilization of M-health and E-health applications in today's world is made aware to the people for improving and maintaining the good quality of life. Apart from regular monitoring of patient's condition through M-health system, the main objective is to educate them through recommendations of healthy eating habits and effective workout routines for improving their quality of healthy life. In remote mobile health monitoring system, the patient health parameters are recorded by a smart phone by eliminating an additional hardware and transmit data through a web interface. It facilitates end to end monitoring screen through three steps. Firstly, the real time health parameters are measured through wearable sensors and transmitted to a smart phone which shows the patient health status in graphical interface. Secondly, this system provides a data to family member and doctor through web interface for further monitoring. Thirdly, I provide real time alarm if the patient is at emergency situation such as heart attack, etc. Despite monitoring, there are quite few challenges in using the wearable tracking devices for a long time. Firstly, the daily use of wearable tracking devices is based mainly on small size, rough use and low energy consumption. Secondly, the major challenge is of the accuracy, validity and integrity of measurement data with other devices. Thirdly, the usability and the experiences of the user with the device and its friendly supporting software play vital role in continuing regular and long period use of wearable tracking devices. The use of Internet of Things (IoT) and its e-

Health applications in the Tele-medicine health system leads to seamless flow of information between doctors and patients, thus making healthcare cost effective and improving the quality of patients' treatment. This system uses the K53 Tower System platform for e-Health applications to expose the benefits of IoT in medical system. The twofundamental aspects in monitoring people at risk are: 1) Prevention 2) Effective and early intervention during medical emergency.

3. Proposed module approach

- Real-time health monitoring system using IOT can help doctors prioritize patients, andprovide urgent care to those who are in the most danger thereby saving lives.

- More competent patient management can help utilize the resources of the hospital more wisely and save money.

- It is easy to use the system for patients and medical professionals.

- The remote health monitoring system (HMS) is especially useful to monitor patients with chronic diseases. Most chronic diseases are incurable, so it is necessary to monitor the state of the patient while at home, and quickly respond if health indicators worsen.

- The HMS is convenient and portable so it is very convenient for doctors to manage patients from one app, and it is also very easy for patients to monitor their own health by wearing a lightweight device like a bracelet.

4. Motivation of the Proposed module

The progression of the advance technology has constantly intrigued us. Moreover, we additionally found that there are not critical examines on computerization technology for hospital IoT based Patient Monitoring System. Along these, we began to search the published paper and advancements around us. In present time, medical science is improving and enhancing day by day. Patient monitoring system is much accessible, painless and smooth for the patient. Recently grew innovative devices executed in patient's body to reestablish ordinary activities. Sometimes it is quite difficult to know about health condition of patient for doctor and nurse. For this, they cannot give the proper treatment and instant result to the patient. Now it is very important to build up a system which can help doctor and nurse to maintain patient monitoring.

5. THEORETICAL ANALYSIS

This is a block diagram that explains the IoT Based Patient Health Monitoring System using ESP8266 & Arduino. Pulse Sensor and LM35 Temperature Sensors measureBPM & Environmental Temperature respectively. The Arduino processes the code and displays it to 16*2 LCD Display. ESP8266 Wi-Fi module connects to Wi-Fi and sends thedata to IoT device server. Finally, the data can be monitored from any part of the world bylogging into the Blynk app.
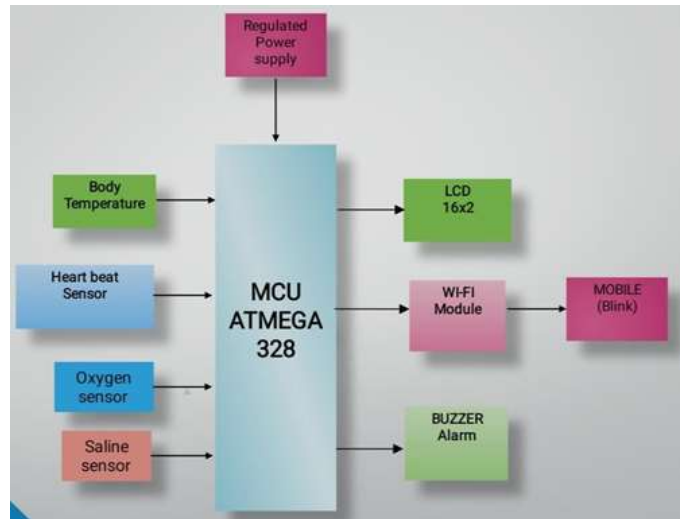

Fig 1 Block diagram

Sensors

In the broadest definition, a sensor is a device, module, machine, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. A sensor is always used with other electronics.

Sensors are used in everyday objects such as touch-sensitive elevator buttons and lamps which dim or brighten by touching the base, besides innumerable applications of which most people are never aware. With advances in micromachinery and easy-to-use microcontroller platforms, the uses of sensors have expanded beyond the traditional fields of temperature, pressure or flow measurement, for example into MARG sensors. Moreover, analog sensors such as potentiometers and force sensing resistors are still widely used. Applications include manufacturing and machinery, airplanes and aerospace, cars, medicine, robotics and many other aspects of our day-to-day life. There are a wide range of other sensors, measuring chemical & physical properties of materials. A few examples include optical sensors for Refractive index measurement, vibrational sensors for fluid viscosity measurement and electro-chemical sensor for monitoring pH of fluids.

Fig 2 Sensors

A sensor's sensitivity indicates how much the sensor's output changes when the input quantity being measured changes. For instance, if the mercury in a thermometer moves 1 cm when the temperature changes by 1 °C, the sensitivity is 1 cm/°C (it is basically the slope dy/dx assuming a linear characteristic). Some sensors can also affect what they measure; for instance, a room temperature thermometer inserted into a hot cup of liquid cools the liquid while the liquid heats the thermometer. Sensors are usually designed to have a small effect on what is measured; making the sensor smaller often improves this and may introduce other advantages.

Technological progress allows more and more sensors to be manufactured on a microscopic scale as microsensors using MEMS technology. In most cases, a microsensor reaches a significantly faster measurement time and higher sensitivity compared with macroscopic approaches. Due to the increasing demand for rapid, affordable and reliable information in today's world, disposable sensors—low-cost and easy-to-use devices for short-term monitoring or single-shot measurements—have recently gained growing importance. Using this class of sensors, critical analytical information can be obtained by anyone, anywhere and at any time, without the need for recalibration and worrying about contamination.

6. IMPLEMENTATION OF Proposed Module

This project has been developed with Arduino microcontroller connected with sensors which are attached to the patient. All the sensors and data sent from microcontroller to lcd display and mobile devices which are connected to WIFI module. A doctor or guardian can log in to blink app to monitor patient's data at any point in time. In case of emergencies, like temperature spike or heartbeat spike or oxygen level spike or saline level spike etc. an SMS and buzzer alert sent to doctor and guardian's mobile. And at any point of time either a doctor or guardian can log into blink application with patient unique credentials and can track patient's data which would help medical services to send appropriate help in case of emergencies. From the interfacing diagram from adapter, we provided 12v ac supply to voltage regulator which converts ac supply to dc supply. It converts 12v ac supply to 5v dc supply and supplies power to Arduino and all other components.

Fig 3 Interfacing diagram

6.1 Working of flow chart:

- For this project we give 12v ac supply as an input, voltage regulator converts 12v ac supply to 5v dc supply and that supplies over all components as 5v by Regulated power supply.

- And we use Arduino nano ATMEGA328, the pins of this are connected to sensors, wi- fi module, lcd display & buzzer.

- When power is switched on, the wi-fi module need to be connected to nearby device like mobile/laptop by user id and password that is generated in code. If saved already, it connects automatically.

- When connected, the notification is displayed on lcd board and device which is connected through 'blink app'. And also, further output notifications.

- For knowing patient health condition, at first a patient/person finger should be placed on the heart beat sensor and the button on the side of sensor need to be clicked to calculate the persons heart beat pulses. And the pulses are displayed on lcd and notified on mobile.

- If there is a change in threshold value of heart beat according to age or any fluctuations an alert is given to nearby person by buzzer and notification on mobile screen.

- For oxygen measuring, If the persons oxygen level is low then a notification alert is send to doctor/nurse mobile with oxygen percentage & a buzzer alarm is sounded.

- For saline level measuring, there are 4 probes "orange, black & yellow" that indicates level of saline and "green "acts as main power supply & gives access to remaining 3-probes as "high, medium & low".

- When saline level is low a buzzer is given as an alert and the notification is send to mobile as the other sensors.

- Temperature sensor used is LM35, it senses the body temperature of a person /patient. If the body temperature of a patient is high or low than the threshold value then buzzer alarm is sounded with the notification of person health on lcd display and mobile to doctor/nurse through blink app.

- The reset button is used when there is any distortion showed on lcd.

- Distortion is occurred due to overheat of voltage regulator.

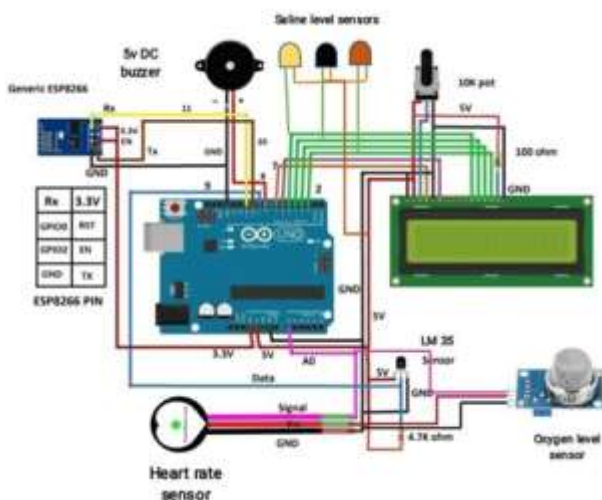- By this the 'temperature, heartbeat, saline &oxygen level of a patient or a person is measured, detected using iot.
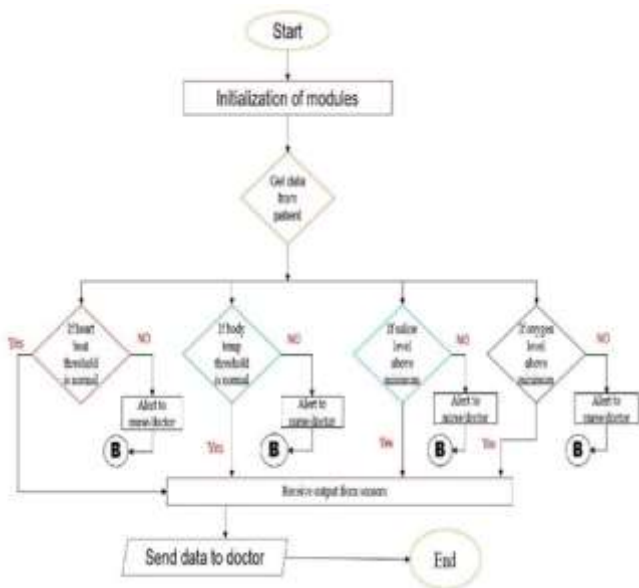
Fig 4 Flow chart of IOT health monitoring

Flow chart

The developed project was tested with various subjects of different ages in different conditions. In the test cases, for heartbeat, body temperature, and oxygen level sensors, saline level sensors we manually calculated the actual value and observed value from the developed system. From the data, we measured error rate to show the effectiveness of the system. The actual and observed data with values of heartbeat, body temperature, saline level sensors and oxygen level sensors are demonstrated on LCD and mobile device.
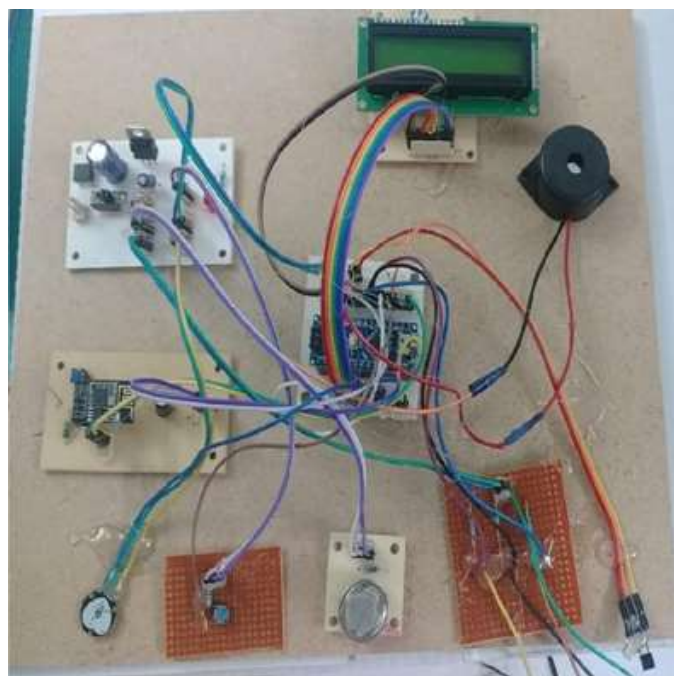

Fig 5 Experimental circuit

6.2 Heart beat sensor outputs

We have to place the patient finger in pulse rate sensor and we have to press the button provided in a kit and then heart rate of a patient is displayed in a lcd display and mobile device which is connected to blink app.

Fig 6 heart beat sensor valuesdisplays on lcd

And the same result also displays in mobile device which is connected to wifi module andsends alert if there is maximum or minimum heartbeat and also buzzer gives an alert sound

Fig 7 Giving alert when it is minimum

Fig 8 hear beat sensor values ismaximum or minimum displaying on Blink app

Oxygen level sensor outputs

Oxygen level sensor gives alert when the oxygen level in a oxygen gas cylinder is low it gives an alert to device which is connected and to the doctor by buzzer the below picture indicates normal oxygen present in a room

Fig 9 Displaying oxygen levels on lcd

6.3 Saline level sensor outputs

Comes to saline level sensor when the sensor level is medium are low there is no alert given doctor or mobile.If the saline level is low then the notification is send to mobiledevice and buzzer sounds an alarm alert.

Fig 10 Displaying saline levels in lcd app

Fig 11 displaying saline levels in blink

The mobile notification alert will send to devices which are connected to wifi module
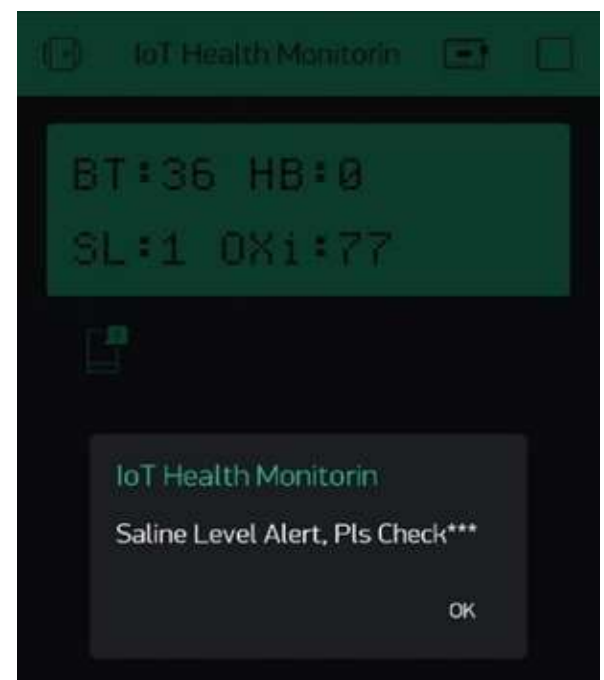

Fig 12 Giving alert when saline levels low in blink app

6.4 Body temperature sensor ouputs

Body temperature of a patient will be measured by these sensor.when the temperature highthe buzzer alert will get and send alert to mobile devices shown in below picture

Fig 13 Body temperature displaying on lcd

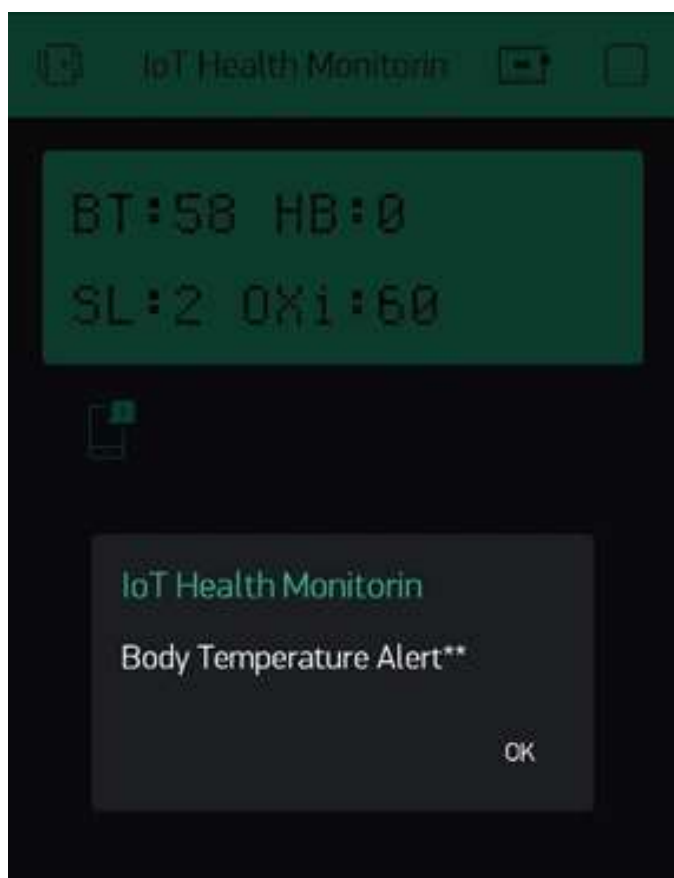When there is a high temperature the alert will notified as below picture

Fig 14 when temperature is high or blink app

Fig 15 Body temperature displayinglow its gives alert in on blink app

7. CONCLUSION AND FUTURE SCOPE

Conclusion

The main objective of the Proposed module was successfully achieved. All the individual modules like Heartbeat detection module, temperature sensor. Etc., WIFI module gave out the intended results. The designed system modules can further be optimized and produced to a final single circuit. More important fact that came up during project design is that all the circuit components used in the patient health monitoring system are available easily. With the development in the integrated circuit industry, Micro Electro Mechanical Systems (MEMs) and microcontrollers have become affordable, have increased processing speeds, miniaturized and power efficient. This has led to increased development of embedded systems that the healthcare specialists are adopting. These embedded systems have also been adopted in the Smartphone technology. And with increased internet penetration in most developing countries through mobile phones, and with use of Internet of things (IoT) will become adopted at a faster rate. The patient Health Care system utilizes these conceptsto come up with a system for better quality of life for people in society. From an engineering perspective, the Proposed method has seen concepts acquired through the computer science and embedded study period being practically applied. The Electric circuit analysis knowledge was used during design and fabrication of the individual modules. Electromagnetic fields analysis used in the wireless transmission between microcontrollers and Software programming used during programming of the microcontrollers to come up with a final finished circuit system.

Future scope

According to the availability of sensors or development in biomedical trend more parameter can be sensed and monitored which will drastically improve the efficiency of the wireless monitoring system in biomedical field. A graphical LCD can be used to display a graph of rate of change of health parameters over time. The whole health monitoring system which we have framed can be integrated into a small compact unit as small as a cell phone or a wrist watch. This will help the patients to easily carry this device with them wherever they go. In addition, with medical application we can use our system in industrial and agricultural application by using sensors like humidity sensors, fertility check sensors, etc.

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