PATIENT HEALTH MONITORING SYSTEM USING OPEN SOURCE TECHNOLOGY

[1]S.NEERAJA, [2]B.S.S.TEJESH, [3]N.MAYURI, [4]SK.SHABEENA

[1,2,3,4]Assistant Professor
Department of ECE,
SRK Institute of Technology, Vijayawada,India

Abstract: **IoT is an emerging technology, which permits devices and people correlated in an organized manner. In the medical area the applications like real time monitoring, patient information management and healthcare management are presently receiving a good scope in the market. Many patients are dying because of the unavailability of the doctor in correct time. Internet of things serves as a catalyst for the healthcare and plays prominent role in wide range of healthcare applications. In this project the Arduino Mega 2560 is used as a gateway to communicate to the various sensors such as temperature sensor, heartbeat, fault detection sensor and Blood Pressure module. The Arduino Mega 2560 picks up the sensor data and sends it to the network through Wi-Fi module ESP8266 and hence provides real time monitoring of the health care parameters for doctors. The controller is also connected with buzzer to alert the care taker about variation in sensor output. But the major issue in remote patient monitoring system is that the data as to be securely transmitted to the destination end and provision is made to allow only authorized user to access the data. At the time of extremity situation alert message is sent to the doctor through the developed Android application. Hence quick provisional medication can be easily done by this system. This system is efficient with low power consumption capability, easy setup, high performance and time to time response.**

IndexTerms**: IoT, Open Source Technology, Patient Health Monitoring System, Wi-Fi, Sensors.**

I. INTRODUCTION (HEADING 1)

The urge for the patient's health care management system is it can eliminate two dominant obstructions. First obstruction is that the doctor has to be on the site of the hospital for a long time. Second obstruction is that the patients are remained admitted in the hospitals for small health problems and may feel uncomfortable to stay in the hospital. Thus the implementation of this system more no of patients can be supervised and better services can be contributed. The wearable tiny sensors are easily integrated with the human body in the patient health monitoring system and so that it can sense the physical parameters of the patient's body[1]. The temperature sensor, BP sensor, Heartbeat sensor is low cost and are having predominant circumstances in the patient health care management system. The BP, heartbeat, the temperature sensor is familiar and frequently used because every patient's health will primarily depend on these parameters. In general, every doctor is confined to support only one patient in real time, but by this system one doctor can monitor real time details of many people. In comparison with the traditional approach to health care, the modern patient health management system will offer better health services 24x7 in any efficient manner[2]. In this developed patient health care management system, frequent visit of doctor by the patient's is completely eliminated[3].

Enhancements are ongoing for the implementations of the patient's health care management system. The data privacy is the considered to be the dominant aspect. The data of the patient must be secured and must enable them from outside network attacks. Data integrity is another issue because the patient's parameters are continuously transmitted to the central server there may be chances where data may be lost due to poor communication. With the employment of IoT in health care systems, the devices are connected to patient, collect real time data by a central The patient's health care management system has many challenging goals in the area of security. Many server and perform analytics on the data and provide the data to the real world in a user friendly manner.

Traditional remote health care system operates in the low speed processor and they are not efficient and cannot provide computations. As it operates on low memory, sufficient amount of data cannot be held by the IoT device [4].

In any system the power saving is the utmost challenge because the wearable sensors must not consume more power. A Certain power saving option must be enabled so as to reduce the power consumption. Employment of variable wired and wireless communication technologies like ZigBee, GSM, Wi-Fi, Ethernet, and Bluetooth can be integrated into the Patient health care management system. The Wearable sensors are limited by number because of the unavailability of interfacing ports in the central server Raspberry Pi 3. Appropriate technology is chosen for the efficient utilization of the patient's health care management system. In real world applications the Wearable sensors are mobile and must be easily integrated with the services provided by the IoT.

II. LITERATURE SURVEY

In the 21st century, IoT has become the most persuasive technology. In the modern world every device became part of the internet due to their computation and communication capabilities with the advancements made in IoT. In the era of IoT, more devices can be accessed and they get connected anytime based upon the network and will extend their services to real time applications. In future, IoT can uniquely create a trend on the devices which are having computation abilities. The generated data from the IoT devices is further analyzed and decisions are made. Many advancements and new methodologies go up day by day on the basis of Internet of Things. IoT has numerous enhancements in the domains like healthcare, Smart environment, Smart Home, Smart industries [5].

IoT extends its ease in the domain of the health care system, the Body sensor network is the most imperative technology in the field of health care systems.

Many enhancements are held in the development to the IoT in the field of health care systems. Some of the advancements made are diagnostics, Remote monitoring medical parameters, smart hospital services. The face of healthcare is transformed by implementing the way personnel, applications, devices communicate with each other with the support of IoT. With the help of SMS facility doctor will be notified.

Health is the most vital role in every human being. Even though people are having all the luxuries in their lives, but if their health is not in good condition they cannot enrich their lives. Many patients are dying because they are not receiving proper medication in time. So to control the patient's death rate the patient health monitoring system is implemented. The health services that are provided to the patients are not economical and are not affordable by all the classes of people. Generally in a hospital all the patients are kept in one room for treatment but, this may cause disturbance to other patients. The Doctor may be busy with dealing with the critical patient and may not extend the service to other patients. In traditional remote patient monitoring the patients are equipped with Personal digital assistants and the doctors are equipped with personal computers.

The IoT is the inter-networking of physical devices, architecture, transport vehicles & more elements embedded among electronics, software, sensors, actuators and network connectedness that empower these things collect the data and exchange the data the universal principles initiative going on internet of things defined of IoT as "the infrastructure of the information society". theIoT allow things to be controlled or sensed remotely across current networking. Infrastructure design opportunities' for high direct combination of the physical planet into computer base system and produced in improved performance ,accuracy, and budget benefit in adding to reduced human interference. When IoT is developed with actuators, sensors, the technology becomes an instance of the high frequent group of cyber physical system, which also encompasses technology such as a smart grid, virtual power, smart cites ,smart homes, smart health, and intelligences transport .all objects is different identity through its embedded computing system but is capable to interoperate within the present infrastructure. The professionals estimation to the IoT will consist of Approximately 50 billion things by 2020 [6].

Generally IoT is estimated to recommend advanced connectivity of systems, devices and services that goes further than machine to machine communication and covers a applications, domains, change the protocol. the inter connection of these embedded devices is hope to conduct in automation in near all fields, at similar time again enable highly developed applications like expanding areas such as smart cities and smart grid.[7] The application of the IoT is not only limited near these areas. other specialized use of the IoT may also exist an overview of some of the most important application areas is provided here based on the application domain, IoT products can be classified into five different types. they are smart health ,smart city, smart home, smart environment, smart enterprise. The IoT products and solutions in each of these market have different characteristics[8],[9]'.

III. IMPLEMENTED SYSTEM

The figure 1 shows the detailed block diagram of the implemented system.

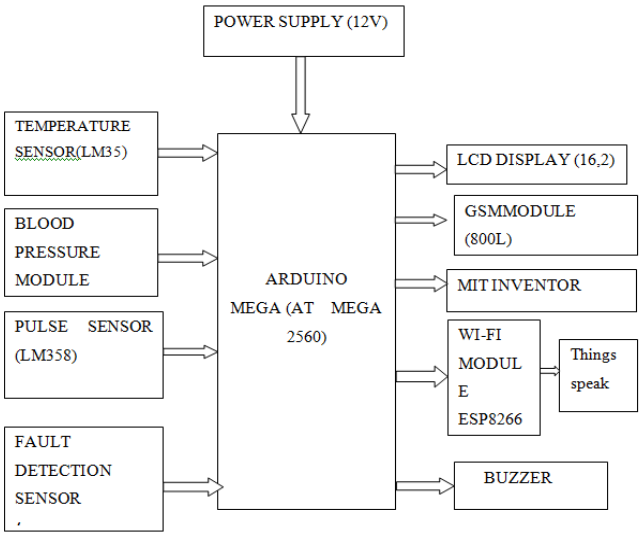

Figure 1 Block diagram of the implemented system.

BLOOD PRESSURE KIT

The BP kit works on UART and operates at a desired voltage of 5 V. It is capable of functioning on 8 bit data. The BP kit has three terminals the supply, ground, UART output. As the blood circulates upon on the walls of the blood vessels then there exists a pressure which is termed as Blood pressure. Whenever the heart beats Blood pressure shifts between Systolic and diastolic pressure. It is measured with the sphygmomanometer and the units are mm Hg. There exists various classifications in the Blood pressure for adults, they are Hypertension, Desired, pre hypertension, Stage-1 Hypertension, Stage-2 hypertension, hypertensive critics.

LM 35

A favored temperature sensor. It is a three terminal device. It has its own importance in the field of temperature measurement and it is widely used. It is precision integrated circuit temperature sensor. It has improved performance than thermistor and it eliminates the issue of oxidation as it is a sealed device. It has a linear scale of +10mV/0C. it has 0.1Ω low impedance. it is predominantly suitable to work for remote applications. the Lm35 employs current drain of less than 60µ . It functions on operating voltage ranging from 4-30 V. It is low cost and less current drain. The value measured by the LM 35 is linear with the Celsius temperature reading. It eliminates the problem of oxidation. It works on the fundamental of thermocouple. It has a desired accuracy of +/- 0.4°C. It canmeasurea set of values ranging from - 55°C to +150°C.

HEART BEAT SENSOR

The heartbeat sensor is used to poll the number of times the heart beats per minute. The heartbeat sensor is generally adhered to the finger or the ear lobe. The heart beat reflects the patient's health conditions. The desired heart beats for a person who is at rest in 60-100 per minute. Adults have a desired heartbeat of 90 beats per minute. For sports people their pulse rate is low compared with others. The heart beat sensor comprises of IR led and LDR both combined together to form a clip like structure. table 3.2 shows the heartbeat of different category of people.

GSM MODULE

SIM800L is nice and inexpensive GSM breakout board. We will set it up with Arduino and send simple text messages. The library can of course be used to do more things like calls etc., We will focus on setting the module the right way because you'll have to take care of a few things like powerand reset.

A **GSM modem** requires a SIM card to be operated and operates over a network range subscribed by the network operator. It can be connected to a computer through serial, USB or Bluetooth connection. **GSM modem** is usually preferable to a **GSM** mobile phone.

FAULT DETECTION SENSOR

For the improvement of reliability, safety and efficiency advanced methods of supervision, fault-detection and fault diagnosis become increasingly important for many technical processes. This holds especially for safety related processes like aircraft, trains, automobiles, power plants and chemical plants. The classical approaches are limit or trend checking of some measurable output variables. Because they do not give a deeper insight and usually do not allow a fault diagnosis, model-based methods of fault-detection were developed by using input and output signals and applying dynamic process models. These methods are based, e.g., on parameter estimation, parity equations or state observers. Also signal model approaches were developed. The goal is to generate several symptoms indicating the difference between nominal and faulty status. Based on different symptoms fault diagnosis procedures follow, determining the fault by applying classification or inference methods. This contribution gives a short introduction into the field and shows some applications for an actuator, a passenger car and a combustion engine.

ESP8266 Wi-Fi MODULE

This is WiFi serial transceiver module, based on ESP8266 SoC. The SOC has Integrated TCP/IP protocol stack.ESP8266 is a highly integrated chip designed for the needs of a new connected world. It offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking functions from another application processor.

ESP8266 has powerful on-board processing and storage capabilities that allow it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

ARDUINO MEGA 2560

The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), 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. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila.

IV. WORKING OF THE SYSTEM

In designed system we are interfacing various sensors related to biologicalparameters in the human body which will help in making us to know the real timeinformation of the patient by sending data wirelessly and making an immediate call ifvalues are greater than predefined. This entire designed system is done with the help ofprocessing information of sensors by Arduino MEGA, by using the temperature sensor we can measure the temperature the blood pressure module used to measure bp the pulse sensor measure the number of pulses rate occurs per minute.

The fault detection sensor detects the fault in direction of the human body. These are supplied as an input to arduino MEGA .The obtained values of the particular person are displayed on lcd screen as the output .If any of the values are exceeds beyond th threshold level the buzzer rings to alert the guardian and immediately the message and call reaches to doctor by using web server and results are displayed by using the things speak in graphical wave form The below Figure shows the connection between the sensor'sandarduino using PC.

V. FLOWCHART OF THE SYSTEM

The figure 2 depicts the flowchart of the system and describes the detailed working of the system.

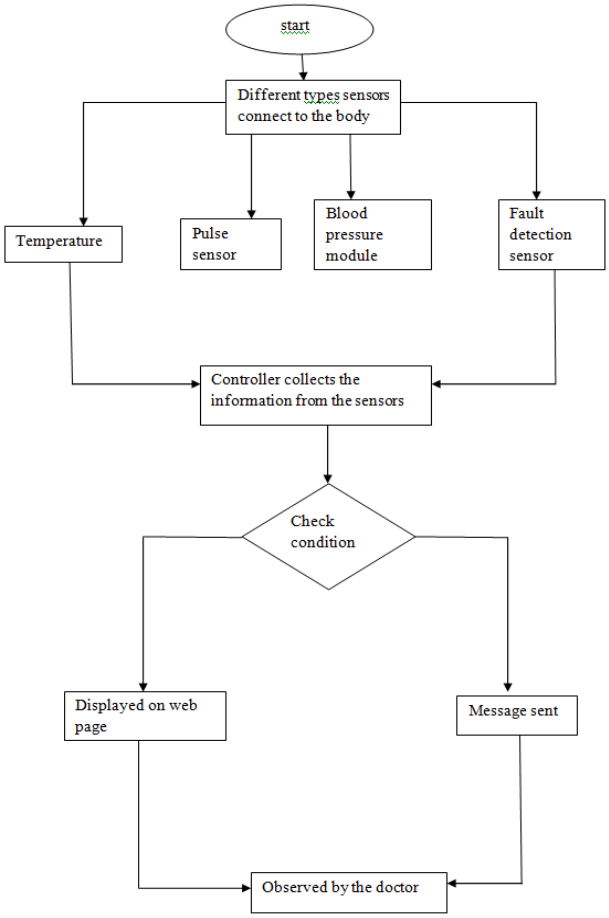

Figure 2 flow chart of the system

VI. RESULTS AND DISCUSSIONS

The below figure 3, figure 4, figure 5, figure 6 depicts the results of the implemented system.

The figure 3 depicts the temperature of the patient, figure 4 depicts the condition of the patient whether the patient is falled or not. The Figure 5 depicts the pulse readings of a patient. The figure 6 depicts the blood pressure readings of the patient.

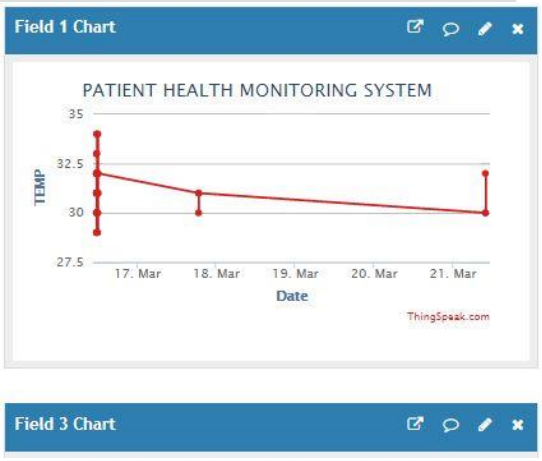

Figure 3 temperature reading of patient

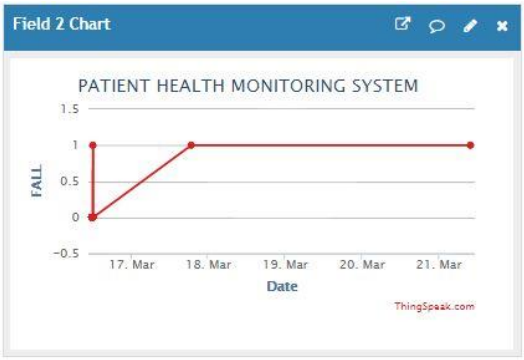

Figure 4 accelerometer reading for the patient

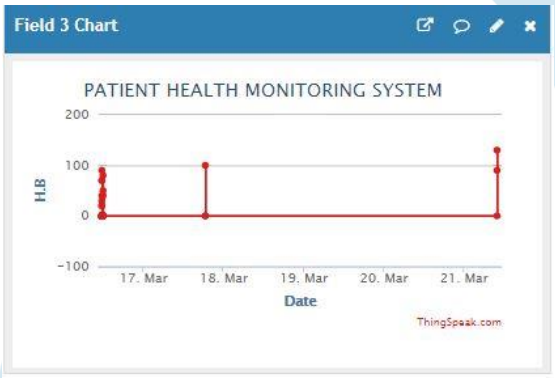

Figure 5 Pulse reading of the patient

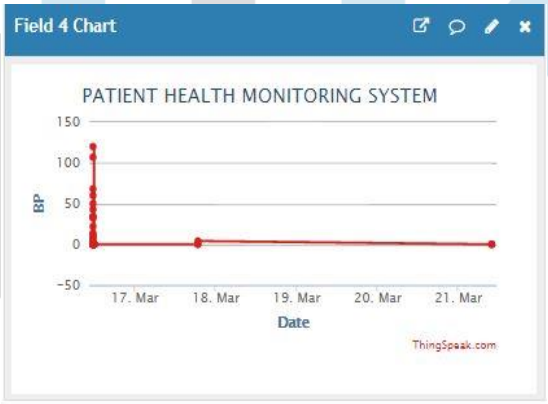

Figure 6 Blood pressure reading of the patient

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REFERENCES

[1] Md. Asaduzzaman Miah, Mir HussainKabir, Md. Siddiqur Rahman Tanveer and M.A. H. Akhand "Continuous Heart Rate and Body Temperature Monitoring System using Arduino UNO and Android Device" Proceedings of International Conference on Electrical Information and Communication Technology (EICT 2015)

[2] RAMAN YADAV SHARDA VASHISTH* ASHOK K. SALHAN "Real Time Acquisition and Analysis of ECG signals using MATLAB" International Journal of Advances in Engineering Science and Technology.[3] Qingchao Gong, Guangming Li, Peng

Sun and Yong Pang "Design and Implementation of Pulse Signal Detection System Based on Bluetooth Transmission" International Journal of Control and Automation"Vol.8,No.7(2015),pp. 141-148

[3] R.Prakash, B.Paulchamy "RemoteMonitoring of ECG and Body Temperature Signals" International Journal of Innovative Research in Science, Engineering and Technology, Vol. 3, Issue 5, May 2014

[4] Salomi S. Thomas, Mr. Amar Saraswat, AnuragShashwat, Dr.VishalBharti "Sensing Heart beat and Body Temperature Digitally using Arduino"

[5] Nnamdi Azikiwe University, Awka, Nigeria "HEARTBEAT MONITORING ANDALERT SYSTEM USING GSM TECHNOLOGY" International Journal of Engineering Research and General Science Volume 3, Issue 4, July-August, 2015, ISSN2091-2730

[6] Bandana Mallick, Ajit Kumar Patro "HEART RATE MONITORING SYSTEMUSING FINGER TIP THROUGH ARDUINO AND PROCESSING SOFTWARE" International Journal of Science, Engineering and Technology Research (IJSETR), Volume 5, Issue 1, January 2016

[7] Noureddine BELGACEM, Said ASSOUS, Fethi BEREKSI-REGUIG "BluetoothPortable Device and Matlab-based GUI for ECG Signal Acquisition and Analysis",2011 7th International Workshop on Systems, Signal Processing and their Applications(WOSSPA)

[8] Rakesh Kumar and Rajvir Singh "Design and Comparative Analysis of ECG Data Acquisition System using Low Power Microcontroller", International Journal of Bio Science and Bio-Technology