ISSN: 2321-8169
1392 – 1406

Healthcare Monitoring System

Mrs. A. G. Andurkar[1], Ms. Suvarna S. Patil[2],

Assistant Professor, ENTC, GCOEJ, Jalgaon, India [1]

M.Tech Student, ENTC, GCOEJ, Jalgaon, India[2]

Abstract-The proposed model enables users to improve health related risks and reduce healthcare costs by collecting, recording, analyzing and sharing large data streams in real time and efficiently. In a hospital health care monitoring system it is necessary to constantly monitor the patient's physiological parameters. For example a pregnant woman parameters such as blood pressure (BP) and heart rate of the woman and heart rate and movements of fetal to control their health condition. The idea of this project came so to reduce the headache of patient to visit to doctor every time he need to check his blood pressure, heart beat rate, temperature etc. With the help of this proposal the time of both patients and doctors are saved and doctors can also help in emergency scenario as much as possible. This system can detect the abnormal conditions, issue an alarm to the patient and send a information to the physician. The proposed outcome of the project is to give proper and efficient medical services to patients by connecting and collecting data information through health status monitors which would include patient's heart rate, blood pressure and sends an emergency alert to patient's doctor with his current status and full medical information.

*****

I. INTRODUCTION

In a hospital health care monitoring system it is necessary to constantly monitor the patient's physiological parameters. This paper presents a monitoring system that has the capability to monitor physiological parameters from multiple patient bodies. In the proposed system, a coordinator node has attached on patient body to collect all the signals from the wireless sensors and sends them to the base station. The attached sensors on patient's body form a wireless body sensor network (WBSN) and they are able to sense the heart rate, blood pressure and so on. This system can detect the abnormal conditions, issue an alarm to the patient and send a data to the physician. Also, the proposed system consists of several wireless relay nodes which are responsible for relaying the data sent by the coordinator node and forward them to the base station. The main advantage of this system in comparison to of both patients and doctors are saved and doctors can also help in emergency scenario as much as possible. The proposed outcome of the project is to give proper and efficient medical services to patients by connecting and collecting data information through health status monitors previous systems is to reduce the energy consumption to prolong the network lifetime, speed up and extend the communication coverage to increase the freedom for enhance patient quality of life. We have developed this system in multi-patient architecture for hospital healthcare and compared it with the other existing networks based on multi-hop relay node in terms of coverage, energy consumption and speed.

The proposed model enables users to improve health

example of the application of this system is controlling a pregnant woman. A pregnant woman's blood pressure should be the same as any other person's normal blood pressure. It is important to monitor the blood pressure during pregnancy, to watch recording in case of children, elderly people and critical patients. Physical properties that canbe sensed include temperature, pressure, vibration, sound level, weight, flow rate of gases and liquids, etc. The smart sensors which can be worn by the patient connect to the master hub (Central Computer) of the doctor sitting at a distance using wireless information and communication technology (ICT) network. The features of this technique include portability and non-invasive nature resulting in non-interference with the day to day activities of the patients. This technology is advantageous in the regions having limited resources and situations where continuous emergent diagnosis is required.

II. LITERATURE REVIEW

Aging presents a series of challenges for the entire world population, primarily because seniors slowly lose their ability to be self-sufficient due to chronic diseases, physical and/or mental disabilities, or the general frailty that characterizes the aging process [2]. Any of these conditions represent factors that limit the elderly or endanger their lives, even within the confines of their homes. Consequently, 24-hour-a-day monitoring of the elderly can improve attention provided for chronic or acute health concerns, accidents such as falls, as well as a series of other conditions that can detrimentally affect the elderly. Additionally, non-fatal falls by the elderly can severely compromise quality of life and/or represent considerable medical expenditures (*i.e.*, in Finland $3,611 dollars per injury, in Australia $1,049dollars per injury) [3].

Providing remote healthcare monitoring and services presents a series of important challenges; therefore, it is important to generate remote monitoring strategies to provide primary healthcare services and mechanisms that allow seniors to receive long-term assistance. To better meet the needs of the aging population, research has significantly advanced both the theory and application of e-Health technologies; largely because their application can reduce costs generated by patient monitoring and provide a variety of advanced services [4]. Importantly, studies show that the elderly generally accept e-Health technologies and consider them beneficial [3]. The Amit Laddi1, presents the paper in demonstrate collection, integration, and interoperation of IoT data flexibly which can provide support to emergency medical services like Intensive Care Units(ICU), using a INTEL GALILEO 2ND generation development board. The proposed model enables users to improve health related risks and reduce healthcare costs by collecting, recording, analyzing and sharing large data streams in real time and efficiently[3]. The idea of this project came so to reduce the headache of patient to visit to doctor every time he need to check his blood pressure, heart beat rate, temperature etc. With the help of this proposal the time of both patients and doctors are saved and doctors can also help in emergency scenario as much as possible. The proposed outcome of the project is to give proper and efficient medical services to patients by connecting and collecting data information through health status monitors which would include patient's heart rate, blood pressure and ECG and sends an emergency alert to patient's doctor with his current status and full medical information[3]. The Fen Miao and Xiuli Miao presents the paper on MobiHealthcare System: Body Sensor Network Based M-Health System for Healthcare Application in 2012, they are discusses about, M-health, which is known as the practice of medical and public health supported by mobile devices such as mobile phones and PDAs for delivering medical and healthcare services, is currently being heavily developed to keep pace with the continuously rising demand for personalized healthcare[1]. To this end, the Mobile Healthcare system, whichprovides a personalized healthcare based on body sensor network, is developed. The system includes various body sensors to collect physiological signals specifically for different requirements, a cell phone to facilitate the joint processing of spatially and temporally collected medical data from different parts of the body for resource optimization and systematic health monitoring, a server cluster with great data storage capacity, powerful analysis capabilities to provide data present novel ideas to improve healthcare systems in India with the help of telecommunication and information technology[1].

III. SYSTEM CONCEPT AND FLOW

The health monitoring system is intelligent enough to monitor the patient automatically that collects the status information through these systems which would include patient's heart rate, bloodpressure, temperature and sends an emergency alert to patient's doctor with his currentstatus and full medical information. This would help the doctor to monitor his patient from their cabin. This model can be deployed at various hospitals and Medical institutes. The systemuses smart sensors that generates raw data information collected from each sensor and send it to a LCD display where the data can be further analyzedand statistically maintained to be used by the medical experts. Maintaining a database server isa must so that there is even track of previous medical record of the patient providing a better and improved examining. This system is also connected the emergency to each bed of hospitals whenever the user required the help they can press the button which alerts the ward boy with indication and alarm.

Controller related risks and reduce healthcare costs by collecting, recording, analyzing and sharing large data streams in real time and efficiently. The idea of this project came so to reduce the headache of patient to visit to doctor every time he need to check his blood pressure, heart beat rate, temperature etc. With the help of this proposal the time of both patients and doctors are saved and doctors can also help in emergency scenario as much as possible. The proposed outcome of the project is to give proper and efficient medical services to patients by connecting and collecting data information through health status monitors which would include patient's heart rate, blood pressure and sends an emergency alert to patient's doctor with his current status and full medical information. In simple terms, i.e. "Smart" objects which use various sensors and actuators that are able to perceive their context, and via built in networking capabilities they could communicate to each other, access the open source Internet services and interact with the human world. This not only makes the world connected but also robust and comfortable. The Internet of things in the fieldof healthcare also plays a major role in providing ease to patients and doctors. It consists of a system that communicates between network connected systems, apps and devices that can help patients and doctors to monitor, track and record patients' vital data and medical information. Some of the devices include smart meters, wearable health bands, fitness shoes,RFID based smart watches and smart video cameras. Also, apps for smart phones also help inkeeping a medical record with real time alert and emergency services.In an 2012, Body Area Network based Health Monitoring of Critical Patients: a Brief Review. This paper discusses recent techniques for the detection of physical, chemical and biological signals along with their measurement and stor-age, data mining and visualization. Compared with existing M-Health system, the MobiHealthcare system is character-istics of low coupling

ISSN: 2321-8169
1392 – 1406

and powerful parallel computing capabilities[2]. Various healthcare applications have been implemented in the proposed system to demonstrate its effectiveness in providing a powerful platform[2].

The Media Aminian and Hamid Reza Naji presents the paper in 2013, A Hospital Healthcare Monitoring System Using Wireless Sensor Networks, In a hospital health care monitoring system it is necessary to constantly monitor the patient's physiological parameters. For example a pregnant woman parameters such as blood pressure (BP) and heart rate of the woman and heart rate and movements of fetal to control their health condition[1].

This paper presents a monitoring system that has the capability to monitor physiological parameters from multiple patient bodies[3]. In the proposed system, a coordinator node has attached on patient body to collect all the signals from the wireless sensors and sends them to the base station. The attached sensors on patient's body form a wireless body sensor network (WBSN) and they are able to sense the heart rate, blood pressure and so on. This system can detect the abnormal conditions, issue an alarm to the patient and send a SMS/E-mail to the physician. Also, the proposed system consists of several wireless relay nodes which are responsible for relaying the data sent by the coordinator node and forward them to the base station[4]. The main advantage of this system in comparison to previous systems is to reduce the energy consumption to prolong the network lifetime, speed up and extend the communication coverage to increase the freedom for enhance patient quality of life[2]. We have developed this system in multi-patient architecture for hospital healthcare and compared it with the other existing networks based on multi-hop relay node in terms of coverage, energy consumption and speed. The Balakrishna D presents the paper, Mobile Wireless Sensor Networks: Healthcare in Hospitals in 2013, Wireless Sensor Networks (WSN) have attracted much attention in recent years. The applications of Wireless Sensor Network are immense. Wireless Sensor networks have been used for various applications like environment monitoring, health examining. This systemis also connected the emergency to each bed of hospitals whenever the user required the help they can press the button which alerts the ward boy with indication and alarm.

The Punit Gupta presents the paper on design and implementation of an IOT-based health monitoring system for emergency medical services which can In an example of the application of this system is controlling a pregnant woman. A pregnant woman's blood pressure should be the same as any other person's normal blood pressure. It is important to monitor the blood pressure during pregnancy, to watch for preeclampsia. These women need frequent BP checks. If BP goes too high, the patient may be hospitalized. But, the patient is limited to her bed in hospital.

BLOCK DIAGRAM

The block diagram of a Healthcare monitoring system is as shown in following figure 3.1,

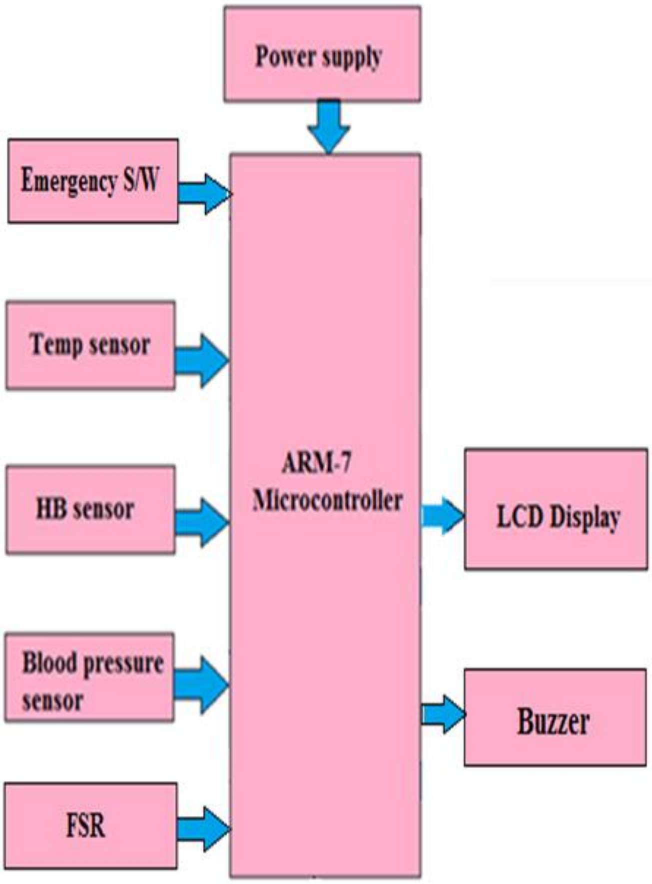

Fig. 3.1 Block Diagram of Healthcare Monitoring System

The system is consists of the advance embedded ARM-7 controller to which we have connected the Temperature sensor, HB sensor, Blood pressure sensor, FSR sensor, buzzer and emergency button also. Figure 3.1 shows the healthcare monitoring system. All collected data are transfer to the PC. Then all data are received by PC that will automatically it display.

Components used in the system are as follows:

1. Temperature sensor
2. Heart beat sensor
3. Blood pressure sensor
4. FSR
5. Emergency switch
6. LCD display
7. Buzzer

TEMPERATURE SENSOR LM35

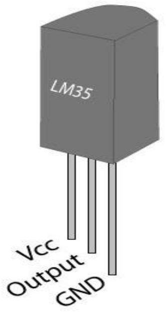

Fig. 3.2 Pin Diagram of LM35

The pin diagram of temperature sensor LM35shown in the above fig. 3.2. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ˚ Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. 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 (−10˚ with improved accuracy).

The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

Features of LM35

- Calibrated directly in ˚ Celsius (Centigrade)
- Linear + 10.0 mV/˚C scale factor n 0.5˚C accuracy guaranteeable (at +25˚C)
- Rated for full −55˚ to +150˚C range
- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts
- Less than 60 μA current drain
- Low self-heating, 0.08˚C in still air
- Nonlinearity only ±1⁄4˚C typical
- Low impedance output, 0.1 Ω for 1 mA load

Applications of LM35

- Thermostatic Controls
- Industrial Systems
- Consumer Products
- Thermometers
- Thermally Sensitive Systems

HEART BEAT SENSOR

The heartbeat sensor is used to measure the Heart Rate or pulse rate of a person. Through the fingertip we can measure the heart rate . This Heart Beat Sensor provides an easy way to integrate heart rate measurement into project. When the heart beats it pumps blood into artery of finger tip. This causes a change in the blood volume which is then sensed by HeartBeat sensor. In this system I used the blood pressure sensor with heartbeat measurement, this can reduce the size or weight of the model.

When the heart is contracting or expanding the sound will produce as they force blood from one region to another this is nothing but the heart beats..The number of times the heart beats per minute (BPM), is the heart beat rate and the beat of the heart that can be felt in any artery that lies close to the skin is the pulse.

- **Principle of Heartbeat Sensor**

The heartbeat sensor is based on the principle of photo phlethysmography. In case of applications where heart pulse rate is to be monitored, the timing of the pulses is more important. The flow of blood volume is decided by the rate of heart pulses and since light is absorbed by blood, the signal pulses are equivalent to the heart beat pulses[14].

The below fig.3.3 shows the transmission and reflection of photophlethysmography.

- There are two types of photophlethysmography:

1. Transmission: Light emitted from the light emitting device is transmitted through any vascular region of the body like earlobe and received by the detector.

2. Reflection: Light emitted from the light emitting device is reflected by the regions.

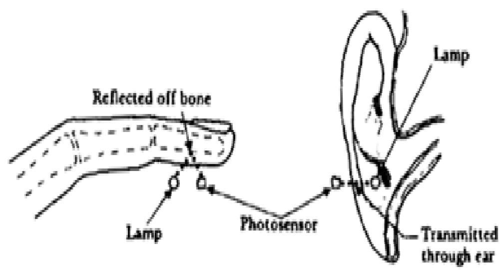

Fig. 3.3 Transmission and Reflection of Photophlethysmography

Working of a Heartbeat Sensor

The basic heartbeat sensor consists of a light emitting diode and a light detecting resistor or a photodiode. The heart beat pulses causes a variation in the flow of blood to different regions of the body. Figure 3.3 shows the

ISSN: 2321-8169
1392 – 1406

transmission and reflection of Photophlethysmography. When a light emitted by the led, it either reflects or transmits the light. Some of the light is absorbed by the blood and the transmitted or the reflected light is received by the light detector[10]. The amount of light absorbed depends on the blood volume in that tissue. The detector output is in form of electrical signal and is proportional to the heart beat rate.

This signal is actually a DC signal and the AC component synchronous with the heart beat and caused by pulsate changes in arterial blood volume is superimposed on the DC signal. Thus the major requirement is to isolate that AC component.

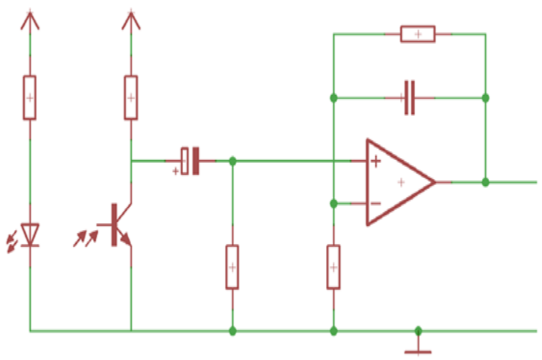

Fig. 3.4 Circuit Diagram of Heartbeat Sensor

The circuit diagram of heartbeat sensor shown in above fig. 3.4. For getting AC the output from the detector is first filtered using a 2 stage HP-LP as shown in figure 3.4 circuit and is then converted to digital pulses using a comparator circuit or using simple ADC[11]. The digital pulses are given to a microcontroller for calculating the heat beat rate, given by the formula-

BPM(Beats per minute) = 60*f

Where, f is the pulse frequency.

BLOOD PRESSURE SENSOR

The below fig.3.5 shows the blood pressure senor and systolic and diastolic pressure readings.

Fig.3.5 Blood Pressure sensor

Blood Pressure & Pulse reading are shown on display in fig. 3. with serial out for external projects of embedded circuit processing and display. Shows Systolic, Diastolic and Pulse Readings. Compact design fits over your wrist like a watch. Easy to use wrist style eliminates pumping.

Features of Blood Pressure Sensor

- compression and decompressionare automatic
- Easy to operate, switch for measurement.
- 60 store groups memory measurements
- Can give one or all measures.
- automatic power saving device in 3 minutes.
- Intelligent device debugging, automatic power to detect
- wrist circumference as 135-195mm
- Large-scale digital liquid crystal display screen.
- Easy to Read Display.
- Fully Automatic, Clinical Accuracy, High-accuracy
- Power by External +5V DC

Specifications of Blood Pressure Sensor

- Power-Internal electric source BF group.
- Output Format :Serial Data at 9600 baud rate(8 bits data, No parity, 1 stop bits). Outputs three parameters in ASCII.
- Sensing unit wire length is 2 meters
- Weight-105gm.
- Accuracy-
  Blood pressure-+,-3mmHg or +,-2%
  Pulse-+,-5% of measure data.
- Measurement range-
  Blood pressure-20-280mmHg
  Pulse rate-40-165 times/min.

Sensor Pinouts

1. TX-OUT = Transmit output. Output serial data of 3V logic level, Usually connected to RXD pin of microcontrollers/RS232/USB-UART.
2. +5V = Regulated 5V supply input.
3. GND = Board Common Ground

Basic of Blood Pressure

Blood pressure is the pressure of the blood in the arteries as it is pumped around the body by the heart.

When your heart beats, it contracts and pushes blood through the arteries to the rest of your body. This force creates pressure on the arteries. Blood pressure is recorded as two numbers— the systolic pressure over the diastolic pressure. The unit which measures this is called Sphygmomanometer.

Monitoring blood pressure at home is important for many people, especially if you have high blood pressure. Blood pressure does not stay the same all the time. It changes to meet your body's needs. It is affected by various factors including body position, breathing or emotional state, exercise and sleep. It is best to measure blood pressure when you are relaxed and sitting or lying down.

It is one of the vital signs, along with respiratory rate, heart rate, oxygen saturation, and body temperature. Normal resting blood pressure in an adult is approximately 120 millimetres of mercury (16 kPa) systolic, and 80 millimetres of mercury (11 kPa) diastolic, abbreviated "120/80 mmHg".

Blood pressure that is low due to a disease state is called hypotension, and pressure that is consistently high is hypertension. Both have many causes and may be of sudden onset or of long duration[4]..

The risk of cardiovascular disease increases progressively above 115/75 mmHg.[6] In practice blood pressure is considered too low only if noticeable symptoms are present.[4]

Table 3.1 Classification of blood pressure for adults (18 years and older)

	Systolic (mm Hg)	**Diastolic (mm Hg)**
Hypotension	< 90	< 60
Desired	90–119	60–79
Prehyper tension	120–139	80–89
Stage 1 Hypertension	140–159	90–99
Stage 2 Hypertension	160–179	100–109
Hypertensive Crisis	≥ 180	≥ 110

Table 3.1 shows the classification of blood pressure for adults. High blood pressure (hypertension) can lead to serious problems like heart attack, stroke or kidney disease. High blood pressure usually does not have any symptoms, so you need to have your blood pressure checked regularly.

Venous pressure is the vascular pressure in a vein or in the atria of the heart. It is much less than arterial pressure, with common values of 5 mmHg in the right atrium and 8 mmHg in the left atrium[9].

Fetal Blood Pressure

In pregnancy, it is the fetal heart and not the mother's heart that builds up the fetal blood pressure to drive blood through the fetal circulation. The blood pressure in the fetal aorta is approximately 30 mmHg at 20 weeks of gestation, and increases to approximately 45 mmHg at 40 weeks of gestation.[5]

The average blood pressure for full-term infants:[5]

Systolic 65–95 mmHg

Diastolic 30–60 mmHg

Output Readings

Following are example output readings from sensor. Each reading consist of 15 bytes at 9600 baud rate. The reading packet's last byte is always enter key character(0x0A in hex and 10 in decimal) so you can view each reading on new line. Also this character can be used to sync in microcontrollers after reach readings.

The output reading is 8bit value in ASCII format fixed digits, from 000 to 255.

FSR (Force Sensitive Resistor)

The fig.3.6 and fig. 3.7 shows the FSR (Force Sensitive Resistor) view and FSR (Force Sensitive Resistor) structure respectively.

Fig.3.6 FSR View

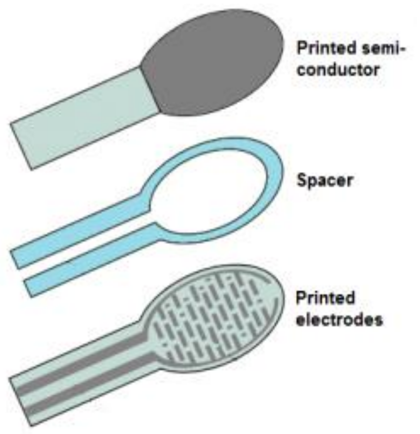

Fig.3.7 FSR Structure

A force-sensing resistor is a material whose resistance changes when a force or pressure is applied. They are also known as "force-sensitive resistor" and are sometimes referred to by the initials "FSR".

Properties of FSR

Force-sensing resistors consist of a conductive polymer, which changes resistance in a predictable manner following application of force to its surface. They are normally supplied as a polymer sheet or ink that can be applied by screen printing. The sensing film consists of both electrically conducting and non-conducting particles

 ISSN: 2321-8169
1392 – 1406

suspended in matrix. The particles are sub-micrometer sizes, and are formulated to reduce the temperature dependence, improve mechanical properties and increase surface durability. Applying a force to the surface of the sensing film causes particles to touch the conducting electrodes, changing the resistance of the film. As with all resistive based sensors, force-sensing resistors require a relatively simple interface and can operate satisfactorily in moderately hostile environments. Compared to other force sensors, the advantages of FSRs are their size (thickness typically less than 0.5 mm), low cost and good shock resistance. A disadvantage is their low precision: measurement results may differ 10% and more[7].

Uses of FSR

Force-sensing resistors are commonly used to create pressure-sensing "buttons" and have applications in many fields, including musical instruments, car occupancy sensors, artificial limbs, Foot pronation systems and portable electronics.

LM7805 (3 TERMINAL VOLTAGE REGULATER)

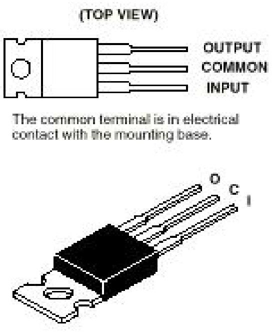

Fig.3.8 Pin description of LM7805

Fig.3.9 View of LM7805

Fig. 3.8 and fig. 3.9 shows the Pin description of LM7805 and View of LM7805 respectively. This is used to make the stable voltage of +5V for circuits. The LM7805 is three terminal positive regulators are available in the TO-220 - package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators.

IV SYSTEM HARDWARE AND DISCRIPTION

ARM-7 Controller

ARM is a family of instruction set architectures for computer processors based on a reduced instruction set computing (RISC) architecture developed by British company ARM Holdings.

LPC2148 is the widely used IC from ARM-7 family. Following figure 4.1 shows the LPC2148 , it is manufactured by Philips and it is pre-loaded with many inbuilt peripherals making it more efficient and a reliable option for the beginners as well as high end application developer.

Features of LPC214x Series Controllers

Fig. 4.1 IC LPC214x

- 8 to 40 kB of on-chip static RAM and 32 to 512 kB of on-chip flash program memory.
- 128 bit wide interface/accelerator enables high speed 60 MHz operation.
- One or two (LPC2141/2 vs. LPC2144/6/8) 10-bit A/D converters provide a total of 6/14analog inputs, with conversion times as low as 2.44 us per channel.
- Single 10-bit D/A converter provides variable analog output.
- In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software.
- Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1ms.
- USB 2.0 Full Speed compliant Device Controller with 2 kB of endpoint RAM.
- Processor wake-up from Power-down mode via external interrupt, USB, Brown-Out Detect (BOD) or Real-Time Clock (RTC).
- Single power supply chip with Power-On Reset (POR) and BOD circuits:
- Two 32-bit timers/external event counters PWM unit (six outputs) and watchdog.
- Low power real-time clock with independent power and dedicated 32 kHz clock input.

- Up to 45 of 5 V tolerant fast general purpose I/O pins in a tiny LQFP64 package.
- On-chip integrated oscillator operates with an external crystal in range from 1 MHz to30 MHz and with an external oscillator up to 50 MHz.
- Power saving modes include Idle and Power-down.

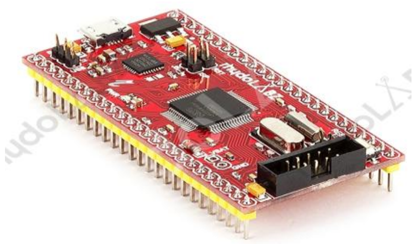

Fig. 4.2 LPC2148 Stick Board

The above fig. 4.2 shows stick board of LPC2148 microcontroller has 512KB of internal flash and 32+8K RAM, can be clocked up to 60Mhz. LPC2148 features include USB 2.0 device, 2xUARTs, RTC, 2x10bit ADCs each ADC has multiple channels, 1xDAC, 6XPWM, 2xI2C, 1xSPI, 1XSSP, 2x32-bit TIMERS, FAST I/0 support and WDT. LPC2148 also supports In System Programming (ISP)

The Stick Series quick start boards from rhydoLABZ are primarily intended to be used as a development system for 64-pin ARM Controllers (LPC2129/38/48), which can also be used as stand-alone devices.

Features of Stick LPC2148

- 12MHz Crystal for system clock and 32kHz Crystal for onchip RTC
- JTAG connector with 2x5 pin layout for programming/debugging
- Jumper pins to switch the USB interface between MCU USB pins and UART pins
- High Quality PTH PCB with printed legends for easy hardware troubleshooting
- Perfect solution for developing USB peripherals
- USB interface for Serial communication and Programming.
- Power Indication LED
- Breadboard Compatible design
- Onboard LDO regulator for 3V3 Supply
- USB powered or externally powered
- On board USB to Serial converter
- On board LPC2148 loaded with bootloader code
- Access to all Port pins for external connection
- Programmable via USB interface and JTAG interface
- RTC battery backup pins brought out via protection diodes
- Push button to hardware reset the controller
- Automatic ISP entry mode (via Jumpers - J4 & J5)

LPC2148 Key Features

- 16/32-bit ARM7TDMI Microcontroller in a tiny LQFP64 package
- 40 kB of on-chip static RAM and 512 kB of on-chip flash memory. 128-bit wide interface/accelerator enables high-speed 60 MHz operation
- In-System Programming/In-Application Programming (ISP/IAP) via on-chip boot loader software. Single flash sector or full chip erase in 400ms and programming of 256 B in 1 ms
- **USB 2.0 full-speed compliant device controller** with 2 kB of endpoint RAM
- Low power Real-Time Clock (RTC) with independent power and 32 kHz clock input

Specifications of LPC2148

- Input Voltage: 4.5V ~ 6.5V
- Dimensions: 64.5 x 31.5 MM
- Current Draw: 500mA @5V
- Recommended Voltage input: 5V

Following are the salient features of the board shown in above figure 4.4

- Dimensions: 47x47 mm2
- Two layer PCB (FR-4 material
- 12MHz crystal
- 32Khz crystal for RTC

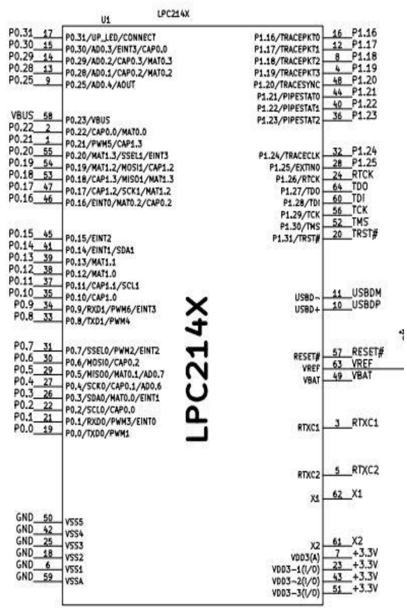

Fig.4.5 Pin Diagram of LPC214x

ISSN: 2321-8169
1392 – 1406

Pin configuration of the LPC214x is shown in above figure 3.4.

LIQUID CRYSTAL DISPLAY (LCD)

- Most common LCDs connected to the microcontrollers are 16x2 sown in below fig.4.6 and 20x2 displays.
- This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.
- The standard is referred to as HD44780U, which refers to the controller chip which receives data from an external source (and communicates directly with the LCD.

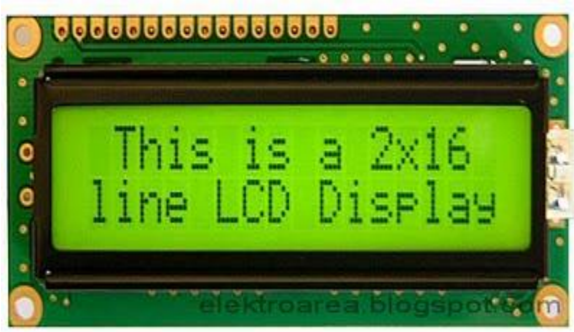

Fig.4.6 LCD 16x2

LCD BACKGROUND

Fig.4.7 shows the pin diagram of LCD display. If an 8-bit data bus is used the LCD will require 11 data lines (3 control lines plus the 8 lines for the data bus)

The three control lines are referred to as EN, RS, and RW

EN=Enable (used to tell the LCD that you are sending it data)

RS=Register Select (When RS is low (0), data is treated as a command) (When RS is High (1), data being sent is text data)

R/W=Read/Write (When RW is low (0), the data written to the LCD)(When RW is low (0), the data reading to the LCD)

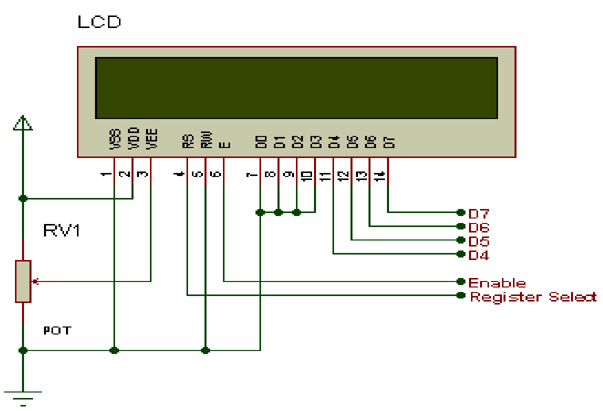

Fig.4.7 LCD Display Pin diagram

DESIGN OF INDIVIDUAL MODULE

Power Supply

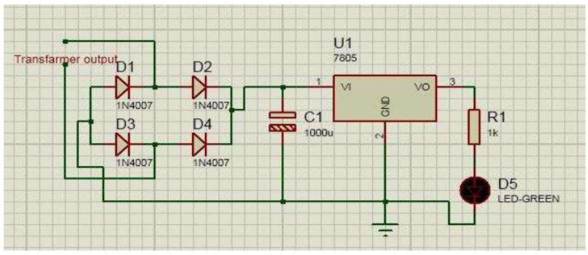

Fig. 9 Circuit Diagram of Power Supply

Power is derived initially from standard 12V AC/DC adapter or 12V_500ma Transformer. This is fed to bridge rectifier D1 ~ D4, the output of which is then filtered using 1000uf electrolytic capacitor and fed to U2 (voltage regulator). U2 +5V output powers the PIC micro controller. LED L10 and its associate 1K current limiting resistors provide power indication. The unregulated voltage of approximately 12 V is required for relay driving circuit.

Micro controller required 5V DC supply for operation, we used USB +5V Power from PC or External +5V power supply via CN10. External Power and USB power can be selectable via J1**.** There is need 12V external Power supply for relay's and its driver circuits.

POWER SUPPLY DESIGN

Power supply is the most important part of the project. For project +5V regulated power supply with maximum current rating 500mA. Following basic building blocks are required to generate regulated power supply.

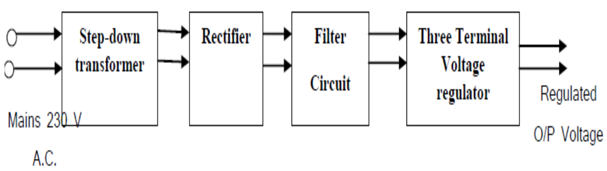

Fig. 10 Block Diagram of Power Supply

STEP DOWN TRANSFORMER

Step down transformer is the first part of regulated power supply. To step down the mains 230V A.C. we

A voltage regulator is a circuit that supplies constant voltage regardless of change in load current. IC voltage regulators are versatile and relatively cheaper. The 7800 series consists of three terminal positive voltage regulators. These ICs are designed as fixed voltage regulator and with adequate heat sink, can deliver o/p current in excess of 1A. These devices

ISSN: 2321-8169
1392 – 1406

do not require external component. This IC also has internal thermal overload protection and internal short circuit and current limiting protection. For our project we use 7805 voltage regulator IC.

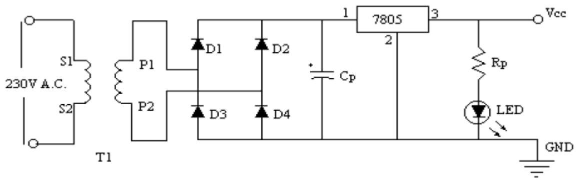

Fig. 11 Regulated Power Supply

SELECTION OF COMPONENTS FOR POWER SUPPLY

Design of components for power supply are given below,

Design of Step Down Transformer

The following information must be available to the designer before he commences for the design of transformer.

1) Power Output.

2) Operating Voltage.

3) Frequency Range.

4) Efficiency and Regulation.

Size of core

Size of core is one of the first considerations in regard of weight and volume of transformer. This depends on type of core and winding configuration used. Generally following formula is used to find area or size of core.

Ai =□ P1/0.87

Ai = Area of cross - section in Sq. cm. and

P1= Primary voltage.

In transformer P1 = P2

The project requires +5V regulated output. So transformer secondary rating is 12V, 500mA.

So secondary power wattage is,

$P2 = 12 \times 500 \times 10^{-3}$w.

= 6w

So Ai = □ 6/0.87

= 2.62

Generally 10% of area should be added to core to accommodate all turns for low Iron losses and compact size.

So, Ai = 2.88.

Turns per volt

choose 1000 □ f / 25V filter capacitor.

IC7805 (Voltage Regulator IC)

Specifications:

Available o/p D.C. Voltage = + 5V.

Line Regulation = 0.03

Load Regulation = 0.5

Vin maximum = 35 V

Ripple Rejection= 66-80 (dB)

Selection for Current Limiting Resistance for LED Fig.3.12 Current Limiting Resistance

The output of microcontroller is equal to supply voltage i.e. +5V DC. If directly connected LED to micro controller then very high current flowing through it because internal resistance of LED is very small about 5 to 8 ohm so it is possibility to damage LED so we

place current limiting resistance R in series with diode the value of this resistance is calculated.

From ohms low

V = R I

Where

I= If safe forward current flowing through LED which normal intensity glow and this value near about 8 to 10 mA

5 = Rx 8mA

R = 625 □

So we select near about value 680□ .

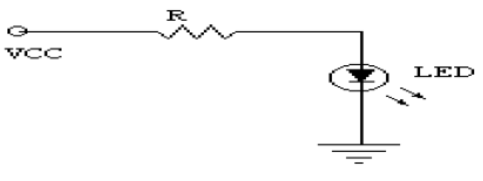

Fig. 12 Current Limiting Resistance

The output of microcontroller is equal to supply voltage i.e. +5V DC. If directly connected LED to micro controller then very high current flowing through it because internal resistance of LED is very small about 5 to 8 ohm so it is possibility to damage LED so we place current limiting resistance R in series with diode the value of this resistance is calculated. Figure 3.12 shows circuit of current limiting resistance.

From ohms low

V = R I

Where

I= If safe forward current flowing through LED which normal intensity glow and this value near about 8 to 10 mA

5 = Rx 8mA

R = 625 Ω

So we select near about value 680Ω.

PCB DESIGNING

PCB refers to printed circuit Board. It uses the use of wires for making any circuit. In PCB conducting tracks are used instead of wires. PCB designing is process of making printed circuit to minimize board using copper clad laminates etc.

PCB designing is done by using many techniques such as by using machine or by hands. PCBs using machinery are made where large amount of PCBs are required and in less time. This process is normally used in industries. But in colleges PCBs are made by hands. Hand making PCB comprises of following process. The process involve in making handmade PCBs are:

1. PCB layout
2. Layout transferring
3. Etching
4. Drilling
5. Tinning

PCB LAYOUT:

The foremost step involve in PCB designing is taking the layout for PCB. Layout means a design according to which the PCB is to be made. The layout consists of proper placing of components and interconnecting the components according to circuit diagram. Layout avoids short circuit between two components or tracks. It helps reduce space.

Layout can be made using different technique such as using graph and PCB making software. By using graph sheet the user has to be more careful while placing the components, he has to take care that the dimension of the components are proper otherwise it well create problem. It is more difficult to design layout using graph sheet. Another way of making layout is by using layout editor software.

There are different software's available for making layout, some of them are express PCB, eagle layout editor, dip trace, track maker etc. which of them is express PCB is most convenient way to design layout. Using software it becomes easy to design layout. User does not have to bother about the Dimension of the components, he just have to place the components and interconnect them.

LAYOUT TRANSFER

After taking the layout the next step is to transfer it on copper clad. There are different methods of transferring the layout such as,

1. Direct resist method
2. Photo resist method

DIRECT RESIST METHOD

In direct resist method is layout is directly made on The copper clad using a black marker pen.

PHOTO RESIST METHOD

In photo resist method the layout is first printed on photo sensitive paper after that it is placed on copper clad on which glass slab is placed so that closed contact can be obtained. After doing a light is exposed is normally fluorescent light. After exposing for 10-15 min the copper clad is dipped in developing solution for some time which makes the layout more visible.

ETCHING

After transferring the layout the nest is to remove the unwanted copper to gain a proper tracking. This process is known as etching.

Normally etching is done ferric chloride (fecl3) solution. Ferric chloride is mixed with water in proper proportion and mixed thoroughly after preparing solution the copper clad is dipped in the solution and is kept in it for some time which removes the unwanted copper from copper clad.

DRILLING

After etching the PCB is wished off to remove the portion from the copper clsad. After washing the copper clad it is drilled using hand machine or electrical drill machine. Copper clad is drilled in order to place the components and solder it. Drilling is done using bit of 0.8 mm or 1 mm depending upon the component to be placed.

TINNING

Tinning is the process of covering the copper tracks using thin layer of tin metal to avoid the copper tracks from damage, corrosion etc.

PCB DESIGNING USING COMPUTER AIDED DESIGNING (CAD)

CAD has many advantages over manual designing, important among them is:

1) Changes can be easily made because we don't have to erase our pencil work on paper repeatedly.

2) Time is saved.

3) Before taking printout we can have preview of the design etc.

The software which we have used is Quick-route.

 ISSN: 2321-8169
1392 – 1406

CIRCUIT DIAGRAM

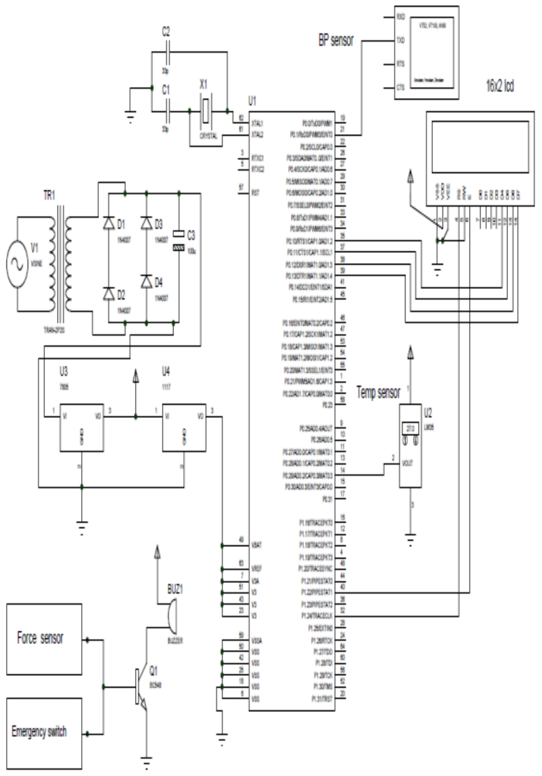

Fig. 4.12 Circuit Diagram of Healthcare Monitoring System

The system is consists of the advance embedded ARM-7 controller to which we have connected the Temperature sensor, HB sensor, Blood pressure sensor, FSR sensor and emergency button also. Figure 3.1 shows the healthcare monitoring system. All collected data are transfer to the PC. Then all data are received by PC that will automatically it display.

PROGRAM

```
#include "adc.h"
#include "lcd.h"
#include "systemInit.h"
#include "delay.h"
#define  pulse_input         4
#define  LED          5
#define MR0I (1<<0) //Interrupt When TC matches MR0
#define MR0R (1<<1)      //Reset  TC  when  TC  matches MR0
#define DELAY_MS 500 //0.5 Seconds Delay
#define PRESCALE 60000 //60000 PCLK clock cycles to increment TC by 1
#define MULVAL 15
#define DIVADDVAL 1
void delayMS(unsigned int milliseconds);
irq void T0ISR(void);
void initTimer0(void);
unsigned char UART0_Read(void);
void Delay_ms(unsigned long times);
void initUART0(void);
unsigned int value=0,k;
char sbuffer[30], ch;
unsigned char pos;
unsigned char SS, DS, HR;
        int main()
        {
        intadcValue;
         float temp;
        SystemInit();
        ADC_Init();       /* Initialize the ADC module */
        initTimer0();
         initUART0();
        IODIR0 &= ~(1<<pulse_input);
        IODIR0 |=  (1<<LED);
        LCD_Init(2,16);
        T0TCR = 0x01; //Enable timer
        LCD_Clear();
        LCD_GoToLine(0);
        LCD_Printf("Patient Health");
        LCD_GoToLine(1);
        LCD_Printf("Monitoring");
        while(1)
        {
        ch = UART0_Read(); //loop till character received
        if(ch==0x0A)  //  if  received  character  is  <LF>, 0x0A, 10 then process buffer
        {
        pos = 0; // buffer position reset for next reading
        // extract data from serial buffer to 8 bit integer value
        // convert data from ASCII to decimal
        SS  =  ((sbuffer[1]-'0')*100)  +  ((sbuffer[2]-'0')*10) +(sbuffer[3]-'0');
        DS  =  ((sbuffer[6]-'0')*100)  +  ((sbuffer[7]-'0')*10) +(sbuffer[8]-'0');
        HR   =   ((sbuffer[11]-'0')*100)   +   ((sbuffer[12]-'0')*10) +(sbuffer[13]-'0');
        // Do whatever you wish to do with this sensor integer variables
        // Show on LCD or Do some action as per your application
        // Value of variables will be between 0-255
        break;
```

ISSN: 2321-8169
1392 – 1406

```
        }
        else
        { //store serial data to buffer
        sbuffer[pos] = ch;
        pos++;
        }
}
adcValue = ADC_GetAdcValue(AD0_2); // Read the ADC value of channel zero where the temperature sensor(LM35) is connected//P0_29;
 /* Convert the raw ADC value to equivalent temperature with 3.3v as ADC reference
Step size of AdC= (3.3v/1023)= 3.225mv.
for every degree celcius the Lm35 provides 10mv voltage change.
1 step of ADC=3.225mv=0.5'c, hence the Raw ADC value can be divided by 3.1 to get equivalent temp*/
temp = adcValue/(float)3.1; // Divide by 3.1 to get the temp value.
//
LCD_GoToLine(0);
LCD_Printf("TP:");
LCD_DisplayFloatNumber(temp);
LCD_Printf(" ");
LCD_Printf("HR:");
LCD_DisplayNumber(C_DECIMAL_U8,HR,3);
LCD_GoToLine(1);
        LCD_Printf("SS:");
        LCD_DisplayNumber(C_DECIMAL_U8,SS,3);
        LCD_Printf("  ");
        LCD_Printf("DS:");
        LCD_DisplayNumber(C_DECIMAL_U8,DS,3);
        DELAY_sec(4);
        LCD_Clear();
        LCD_GoToLine(0);
//      Classification of blood pressure for adults (18 years and older)
//      Systolic (mm Hg)        Diastolic (mm Hg)
//      Hypotension     < 90    < 60
//      Desired 90–119  60–79
//      Prehypertension  120–139        80–89
//      Stage 1 Hypertension    140–159         90–99
//      Stage 2 Hypertension    160–179         100–109
//      Hypertensive Crisis     = 180   = 110
      if(SS<90&&DS<60)
        LCD_Printf("Hypotension");
        if(SS>=90&&SS<=119&&DS>=60&&DS<=79)
        LCD_Printf("Normal");
        if(SS>=120&&SS<=139&&DS>=80&&DS<=89)
        LCD_Printf("Prehypertension");
        if(SS>=140&&SS<=159&&DS>=90&&DS<=99)
        LCD_Printf("Stage 1 Hypertension");
        if(SS>=160&&SS<=179&&DS>=100&&DS<=109)
        LCD_Printf("Stage 2 Hypertension");
        if(SS>=180&&SS<=179&&DS>=100&&DS<=110)
        LCD_Printf("Hypertensive Crisis");
        DELAY_sec(5);
   }
}
```

V RESULT AND DISCUSSION

INTRODUCTION

I have proposed a health monitoring system that is monitor the patient automatically that collects the information through these systems which would include patient's heartbeats, blood pressure and temperature and sends an emergency alert to patient's doctor with his current status and full medical information. This would help the doctor to monitor his patient from their cabin. This model can be use at various hospitals and Medical institutes. The system uses smart sensors that generates raw data information collected from each sensor and send it to a database server where the data can be further analyzed and statistically maintained to be used by the medical experts. The emergency switch is connected to each bed of hospitals whenever the user required the help they can press the button which alerts the ward boy with indication and alarm.

Proposed system gains its full potential by utilizing the key role playing objects i.e. "Smart" objects which use various sensors and actuators that are able to perceive their context, and via built in networking capabilities they could communicate to each other.

This will ensure them not only with reliable results but also time saving which will be of maximum benefit. This health monitoring system which would collect all the medical data of a patient including his heart rate, blood pressure and Temperature would send data regarding his/her full medical information, providing a fast and reliable healthcare service. The project helps to find a better solution to monitor the patients in emergency .

RESULT

The fig. 5.1shows the setup of the healthcare monitoring system this system helps the doctor to monitor

ISSN: 2321-8169
1392 – 1406

his patient from their cabin. The system uses smart sensors that generates raw data information collected from each sensor and send it to a LCD display where the data can be further analyzed and statistically maintained to be used by the medical experts. Fig 5.2 shows the output readings of temperature, heartbeat and systolic and diastolic pressure.

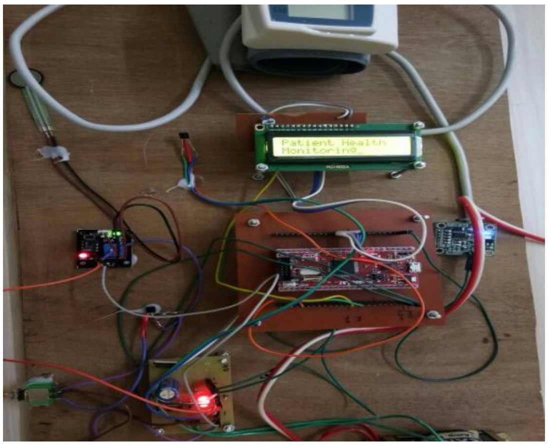

Fig. 5.1 Setup of Healthcare Monitoring System

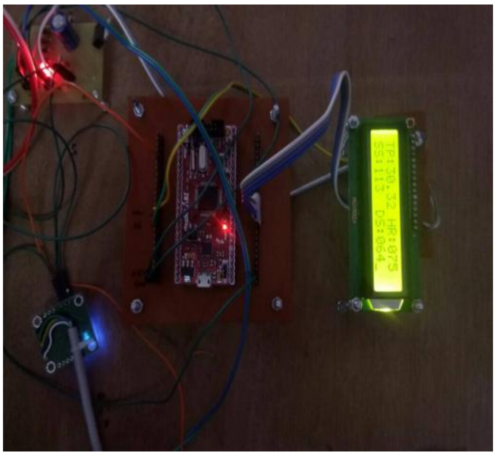

Fig. 5.2 Temperature , systolic and diastolic pressure and heart beats readings are display in LCD display.

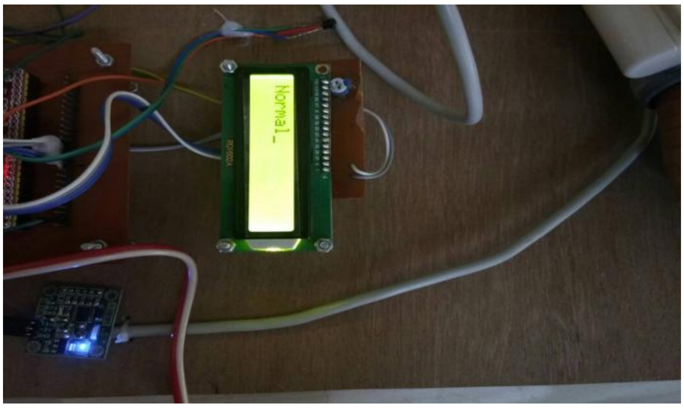

Fig. 5.3 Normal Blood Pressure , Heartbeats and Temperature

The above fig.5.3 shows the patients blood pressure , heartbeats and temperature is normal this is display in LCD.

ADVANTAGES OF HEALTHCAREMONITORING SYSTEM

1.Easy to handle , patient should understand the readings.

2. Emergency alert is provided that alerts the doctor before critical condition.

3. Time to time monitors the patients ,save the doctors time.

4. Continuous health monitoring system can save up to 60% of human lives through timely detection.

5. Portable

6. Small Size

7. Easy to use

8. Light weight

APPLICATIONS

This model can be use at various hospitals and Medical institutes. This system uses smart sensors that generates raw data information collected from each sensor and send it to a LCD display where the data can be further analyzed and statistically maintained to be used by the medical experts.

FUTURE SCOPE

Capturing and sharing of vital data of the network connected devices through secure service layer is what defines smart healthcare system. We can include wearable bands fitness shoues.The various sensors can be defined as the wireless network of devices which are connected to each other to share information and data in order to communicate and produce new information so as to record and analyze it for future use. This system is also robust and comfortable. The field of healthcare also plays a major role in providing ease to patients and doctors. It consists of a system that communicates between network connected systems and devices that can help patients and doctors to monitor, track and record patients' vital data and medical information. Some of the devices include smart meters, wearable health bands, fitness shoes; RFID based smart watches and smart video cameras. Also, apps for smart phones also help in keeping a medical record with real time alert and emergency services.

VI CONCLUSION

The main idea of the proposed system is to provide better and efficient health services to the patients by implementing a networked information cloud so that the experts and doctors could make use of this data and provide a fast and an efficient solution. The final model will be well equipped with the features where doctor can examine his patient from anywhere and anytime. The proposed model can also be deployed as a mobile app so that the model

ISSN: 2321-8169
1392 – 1406

becomes more mobile and easy to access anywhere across the globe[12].

REFERENCES

[1] AmitLaddi, Neelam R. Prakash, Shashi Sharma, Amod Kumar, "Body Area Network based Health Monitoring of Critical Patients: a Brief Review", International Journal of Instrumentation and Control Systems (IJICS) Vol.2, No.3, July 2012.

[2] Swati Gawand, Prof. Santosh Kumar, "Wireless Sensor Network Based Healthcare Monitoring: A Review", International Journal of Electronics, Communication & Soft Computing Science and Engineering ISSN: 2277-9477, Volume 3, Issue 7.

[3] ProsantaGope and Tzonelih Hwang, "BSN-Care: A Secure IoT-Based Modern Healthcare System Using Body Sensor Network", IEEE SENSORS JOURNAL, VOL. 16, NO. 5, MARCH 1, 2016.

[4] Punit Gupta, DeepikaAgrawal, JasmeetChhabra, Pulkit Kumar Dhir, "IoT based Smart HealthCare Kit",2016 International Conference on Computational Techniques in Information and Communication Technologies.

[5] https://cooey.co.in/

[6] Golzar, M.G. ;AsanPardazan Co. ; Tajozzakerin, H.R., "A New Intelligent Remote Control System for Home Automation and Reduce Energy Consumption", Mathematical/Analytical Modelling and Computer Simulation (AMS), 2010, IEEE.

[7] Alkar, A.Z., HacettepeUniv; Roach, J. ; Baysal, D., "IP based home automation system", Consumer Electronics, IEEE Transactions on (Volume:56 ,Issue: 4), November 2010, IEEE

[8] Al-Ali, A.R. ,AL-Rousan, M., "Java-based home automation system", Consumer Electronics, IEEE Transactions on (Volume:50 ,Issue: 2), May 2004,IEEE

[9] Sharma S. "Evolution of as-a-Service Era in Cloud". arXiv preprint arXiv:1507.00939. 2015 Jun 29.

[10] Sugam Sharma, U S Tim, ShashiGadia, and Johnny" Wong.(2015).Growing Cloud Density &asaService Modality and OTH Cloud Classification in IOT Era.(http://www.public.iastate.edu/~sugamsha/articles/OTHCloud% 20in%20IoT.pdf)

[11] https://www.healthvault.com/in/en/overview.

[12] http://www.internationaljournalssrg.org.

[13] http://wwwsunrom.com/p/blood-pressure-sensor-serial-output

[14] http://www.elprocus.com/heartbeat-sensor-working-application/