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INTERNET OF THINGS BASED REMOTE HEALTH MONITORING SYSTEM USING ARDUINO

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Abstract: In India, approximately 2 hundredth of the whole population loses their lives because of interrupted health observance system i.e. in most of the hospitals, doctor visits patients either in morning shift or in evening shift. It is not possible for a doctor to continuously monitor a patient 24 by 7**,** To over come this problem we came up with this project .Here we use various sensors like heartbeat sensor , respiratory sensor , mems sensor , temperature sensor to continuously monitor patients health condition virtually. Here we use Arduino as a main controller where all these sensors are connected to this . The Arduino collects the data from these sensors and it is processed here. This processed data is transferred to the GSM , and this GSM uploads the data to the allotted server (THINGS SPEAK SERVER). It is used to visualize, and analyze the live data on the IoT platform. The message and buzzer will be sent when sensor values crosses the threshold level.

I. INTRODUCTION

In present day, people are suffering from various kinds of disease and many health problems such as CHF (Chronic Heart Failure) is commonly seen in elderly persons. CHF is a cause of hospital admission particularly for older adults reaching a prevalence of 1.3%, 1.5, and 8.4% in 55-64 year old, 64-74 year, and 75 years or older segment respectively. Hospital stuffs face severe difficulty when they are faced with the task of taking care of multiple patients simultaneously. Problems such as waiting in the queue, travelling time, moving patient, waiting for doctor etc are some of the issues faced by the patients [1]. During an emergency, the situation might get worse. Monitoring the critical patient 24/7 is very important for reducing life threating risk. Wireless application put the great impact in the health care services. It also reduces operating costs of the hospital. In medical science wireless application has several number of advantages such as, ease of use, reduced risk of infection and enhanced mobility [2]. With the help of wireless system, it is very easy to monitor several patients simultaneously. In this paper, an IOT based health monitoring system has been proposed which is able to perform different types of functions within limits of specified time, accuracy and cost. This IoT base system is cheap and can operate remotely. Biological parameters of patients is detecting by sensors. The use of sensor with Arduino and GSM has made the patient monitoring system more effective [1]

II. LITERATURE SURVEY

In this decade, IoT based system place the key role in medical appliances. For that reason, many researchers are trying to develop numerous IoT based medical appliances. Some the researcher work is given below; A researcher [3] implemented a patient monitor system, which aim is to gather data for clinical research and academic studies. PHS will enable faster and safer preventive care, lower overall cost, improved patient centered practice and enhanced sustainability. In this paper [4] researchers implemented a system, which is monitoring the body parameter such as pulse rate, ECG. ARM7LPC 2138 processor is used as a main interface and the data

III. EXISTING SYSTEM

- At present generally using temperature sensor to monitor temperature data and that will be send to the pre-registered mobile number through GSM.

Drawbacks:

- There are some drawbacks in the existing system which were identified in general. They are:
- But the existing system is Not accurate method
- Uploading data to server is not implemented.
- Less efficient

IV. PROPOSED SYSTEM

The sensors system is used to obtain the information or readings from the patient and the reading which is read is converted into signals. These signals are provided for processing to Arduino is used to send the data to server. This information can be accessed by the doctor on his phone/computer and get the information using GSM. Here we are using Arduino as main controller for it we are interfacing the sensors. Heartbeat sensor, Temperature sensor, MEMS sensor and Respiratory sensor these are used to monitor the heartrate, Respiration, movement of the patient respectively.

V. BLOCK DIAGRAM

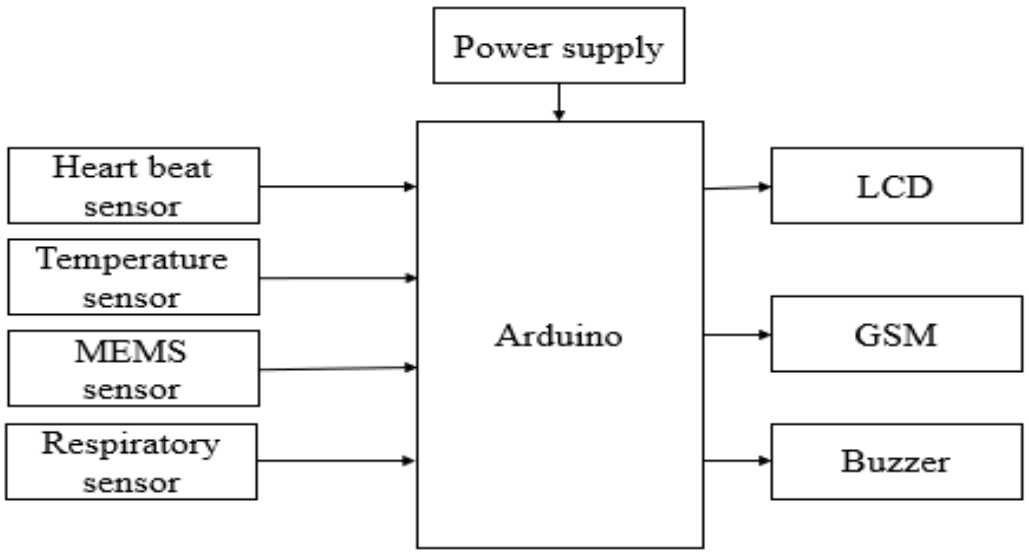
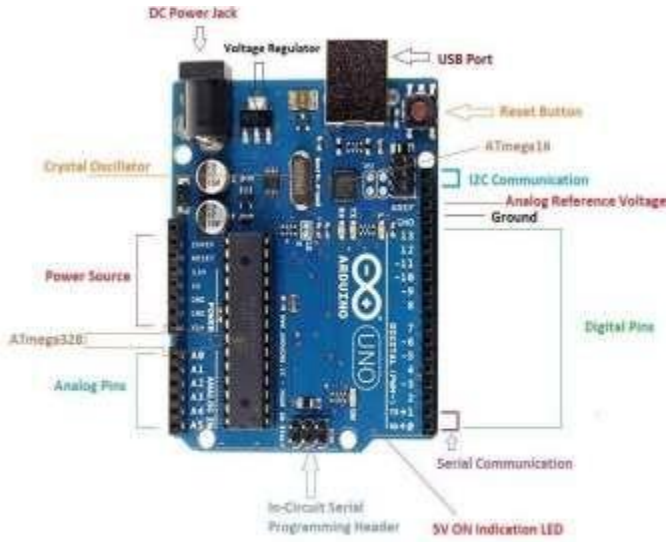


Fig 1: Block diagram of proposed system

VI. HARDWARE ARCHITECTURE DISCRIPTION

Arduino uno:



Arduino UNO

The Arduino uno board is a popular open-source microcontroller board that is designed to be easy to use for beginners in electronics and programming. The board is based on the Atmega328p microcontroller chip and has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, and a power jack. The digital pins can be used for digital input/output, pulse width modulation (PWM), and communication with other devices via protocol such as SPI, I2C, and UART, Additionally, the analog inputs can be used to measure voltages within rages of 0 to 5 volts.
13KB of flash memory is used to store the number of instructions in the form of code. The board is powered up in three ways i.e USB, Vin pin the board or DC power jack. Arduino uno comes with built-in LED providing HIGH value when it gets turned ON and LOW when it gets turned OFF. Serial communication is carried out through two pins called pin 0(Rx) and pin (Tx). Here Rx pin for receiving data and Tx pin for transmitting the data.

GSM:

GSM (Global System for Mobile Communications) is a standard for digital cellular communications used for mobile devices. Itis widely used in embedded systems for various applications, such as remote monitoring, control, and communication.
GSM works by transmitting data over a cellular network using radio waves. The data is encoded and transmitted over a series of base stations, which are connected to the public switched telephone network (PSTN). The GSM standard includes various features, suchas voice communication, text messaging, and data transmission.

In embedded systems, GSM is typically used for remote communication and control. For example, a device with an embeddedGSM module can send and receive data over a cellular network, allowing it to be controlled or monitored from a remote location. This is particularly useful for applications such as remote monitoring of industrial equipment, environmental sensors, or security systems.

GSM modules for embedded systems are available in different formats, including compact modules that can be easily integrated into embedded systems. These modules typically provide a serial interface for communication with the host device and can be programmed to provide different levels of functionality, such as voice communication or data transmission.

DS18B20 Temperature Sensor:

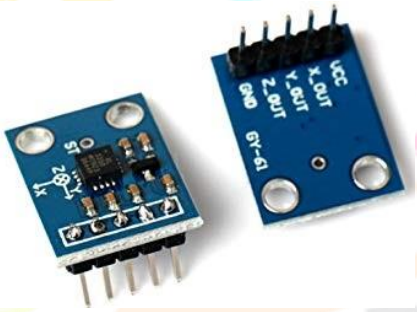
The digital temperature sensor like DS18B20 follows single wire protocol and it can be used to measure temperature in the range of -67oF to +257oF or -55oC to +125oC with +-5% accuracy. The range of received data from the 1-wire can range from 9-bit to 12-bit. Because, this sensor follows the single wire protocol, and the controlling of this can be done through an only pin of Microcontroller. This

is an advanced level protocol, where each sensor can be set with a 64-bit serial code which aids to control numerous sensors using a single pin of the microcontroller. This article discusses an overview of a DS18B20 temperature sensor.

MEMS Sensor:

MEMS are low-cost, and high accuracy inertial sensors and these are used to serve an extensive range of industrial applications. This sensor uses a chip-based technology namely micro-electro-mechanical-system. These sensors are used to detect as well as measure the external stimulus like pressure, after that it responds to the pressure which is measured pressure with the help of some mechanical actions. The best examples of this mainly include revolving of a motor for compensating the pressure change.

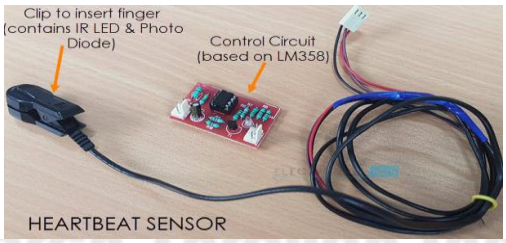
The MEMS accelerometers can be divided into two important micro system architectures: piezo resistive and capacitive. Even though both of these two types of accelerometers possess internal proof masses which are excited by acceleration, the differences of these two architectures lie in the transduction mechanism which is used to the movement correlation of the internal proof mass to accelerate.



By sensing the mounting angle, the sensor can assist in compensating for the devices mounting angle, and therefore makes it possible to use ACCELEROMETER FACTSHEET MEMS 3-AXIS ACCELEROMETER normal SMD technology in high density boards, and also to realise the precise detection of the inclination angle. An interface IC within the sensor package also has temperature sensing and self-diagnosis functions.

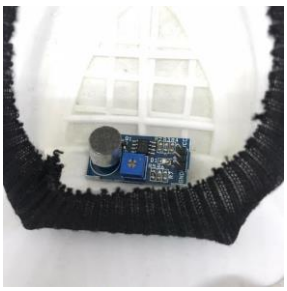
Heartbeat Sensor:

Monitoring heart rate is very important for athletes, patients as it determines the condition of the heart (just heart rate). There are many ways to measure heart rate and the most precise one is using an Electrocardiography.But the more easy way to monitor the heart rate is to use a Heartbeat Sensor. It comes in different shapes and sizes and allows an instant way to measure the heartbeat.Heartbeat Sensors are available in Wrist Watches (Smart Watches), Smart Phones, chest straps, etc. The heartbeat is measured in beats per minute or bpm, which indicates the number of times the heart is contracting or expanding in a minute.



Respiratory Sensor:

Respiratory sensor is nothing but which detects the breath from the person. It will look like a mask with a sound sensor in it. But the sensor gives the values based on the breath we are exhaling. Works on 5Volts.



LCD:

LCD (Liquid Crystal Display) is the innovation utilized in scratch pad shows and other littler PCs. Like innovation for light-producing diode (LED) and gas-plasma, LCDs permit presentations to be a lot more slender than innovation for cathode beam tube (CRT). LCDs expend considerably less power than LED shows and gas shows since they work as opposed to emanating it on the guideline of blocking light.

A 16x2 LCD show is an essential module that is generally utilized in various gadgets and circuits. These modules more than seven sections and other multi fragment LEDs are liked. The reasons being: LCDs are affordable; effectively programmable; have no restriction of showing exceptional and even custom characters (not at all like in seven fragments), movements, etc.

A 16x2 LCD implies 16 characters can be shown per line and 2 such lines exist. Each character is shown in a lattice of 5x7 pixels in this LCD. There are two registers in this LCD, in particular Command and Data.

Buzzer:

A buzzer is a simple but versatile device used in embedded systems to generate audible alerts or notifications. It is an electro- acoustic transducer that converts electrical signals into sound waves. This makes it easy to use in embedded systems, as it can be driven using simple digital signals from the microcontroller or processor. Buzzer is commonly used in applications such as alarms, timers, and notifications. It can produce a range of sounds, from simple beeps to more complex melodies, depending on the type of circuitry and driver used. Buzzer can also be used in combination with other sensors or modules, such as temperature sensors, to create more sophisticated warning systems. Additionally, buzzer is typically small and lightweight, making it suitable for use in portable or handheld devices. It can be made more versatile by incorporating features such as adjustable volume or tone.Overall, buzzer is a cost-effective and reliable component for adding audible feedback to embedded systems.

Fig 10: Buzzer

VII. WORKING OF PROPOSED SYSTEM

In this project we use various sensors like heart beat sensor, respiratory sensor, mems sensor ,temperature sensor to continuously monitor patients health condition virtually. Here we use Arduino as a main controller where all these sensors are connected to this. The Arduino collects the data from these sensors and it is processed here .This processed data is transferred to the GSM, and this GSM uploads the data to the allotted server(THINGS SPEAK SERVER).It is used to visualize and analyze the live data on the IoT platform. The message and buzzer will be sent when sensor values crosses the threshold level.

VIII. RESULTS

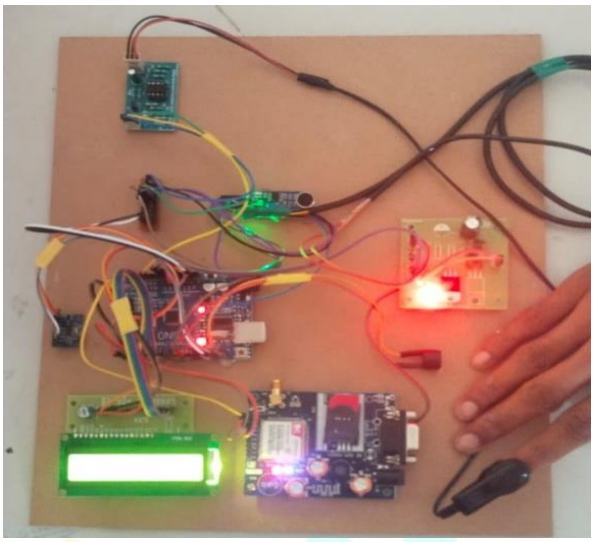


Fig: Results shown on LCD Display

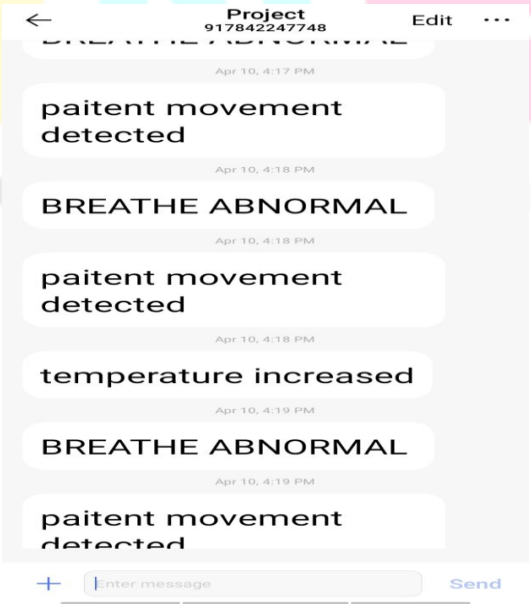


Fig: Messages when the patient condition is abnormal

IX. CONCLUSION

The objective of this project work has been framed into chapters for the development of IOT based remote health monitoring system using arduino .The basic embedded C programming using Arduino have been included.

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