Smart Hospitals using IOT

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Abstract— A patient's health must be treated within time and with right attention. In India, many times it happens that the patient suffers severe health problem due to delay in treatment and sometimes may also suffer death. ICU patients in critical condition need continuous attention. Their statistics of health has to be in check from time to time, but sometimes if their health needs instant attention, problem may occur if within time the notification of patient's urgency hasn't reached till the nurses or doctors allotted to them. Apart from this, in clinics and hospitals, real time parameters are not up to the mark which may disturb the patient's report. This project brings to you an effective solution to the above mentioned problems by using sensors technology and Internet of Things (IoT). In this project, by making use of IoT a patient's health can be constantly kept in check. The setup is made such that from a distance, the patient's health can be monitored continuously and information of the necessary parameters of patient's health can be obtained and right action can be taken within time.

Index Terms— Internet of Things(IoT), Light Dependent Resistor(LDR), Internet Server, Sweat sensor, Pulse rate.

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1. INTRODUCTION

Technology in which the equipments can interact with his project is based on internet of Things (IOT). IOT is a each other and can be operated through internet without human control. As the name suggests, here 'thing' refers to any electrical object to be used. The equipments behave according to the environmental changes. This entire working becomes possible by assigning IP address to each equipment participating in the interaction. After knowing the benefits of IoT such as reduced costs, advanced technology and its ability of being a time saving and smart working system, we have implemented this technology in our project.

The IOT technology is the revolutionary for health care industry it is changing health care domain by reducing operational cost and helping care takers.

Using this technology, connectivity of health care solutions through internet server is possible which gives caregivers the ability to access real time information that enables them to make informed decisions as well as offer treatment that is evidence based. One can constantly monitor patients from distant positions using internet server. This system consists of different types of sensors to sense body parameters of patients and transfer this measured parameters through internet server so that caretaker can continuously monitor patients health from distant position. This ensures health care provision is timely and also treatment outcomes are improved by using this technology.

This project also helps to control consumption of electricity by regulating electrical appliances such as lights and fans from distant position thus eliminating wastage of electricity.

2. PROBLEM STATEMENT

The important problem related to hospitals in India is to constantly monitor and supervise patients due excessive number of patients. Due to this, everyday many lives are affected because the patients are not timely and properly treated. Also, for real time parameter values are not efficiently measured in clinic as well as in hospitals.

One more problem is that, in hospital caretaker or nurses need to visit patients room continuously to check patient condition. This affects patients sleep. In critical condition maximum sleep and rest is necessary for the patients. Also, frequently vising patients room by nurses and caretakers is disturbing their own health by increasing work load.

Climate change, or global warming, is caused mainly by burning fossil fuels (coal, oil, gasoline, and natural gas). This creates carbon dioxide (CO2), a gas that stores heat. Electricity is produced mostly by burning fossil fuels. In America the fuel mix for electricity production is: 37% oil, 31% coal, 22% nuclear, 7% natural gas, 1% hydro. Hospitals consume a very huge amount of electricity by using big electrically working medical appliances. Somehow, it happens that electrical appliances like fans, lights, etc. are left ON even when not needed. This wastes a lot of electricity and may even contribute to increasing global warming.

3. LITERATURE SURVEY

Nowadays it has become important to focus on healthcare awareness and also the growth of wireless technologies. to complete our needs, IOT has made possible to view, control things in real time wirelessly through the use of internet. Due to use of wireless sensor network in a healthcare we are able to reduce complications of wire networks and we can move a healthcare from one location to another desired location.

This research is design and realization of real-time monitoring and alarming system for patient health, especially for patients suffering from diseases during their normal life.

4. BLOCK DIAGRAM

4.1 Transmitter section

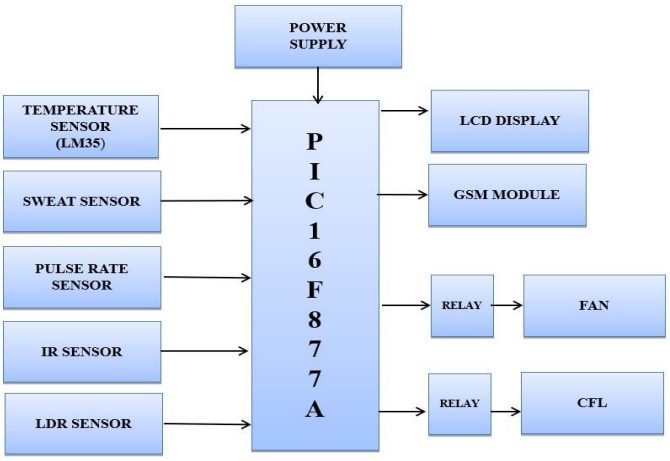

Fig 4.1: Block diagram of Transmitter section

4.2 Receiver section

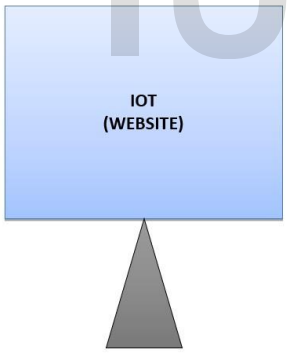

Fig 4.2.1: Block diagram of Receiver section

In the above block diagram, there are four parts which as follows:

1.Back End which includes all the sensors such as Temperature sensor, Sweat sensor, Pulse rate sensor, IR sensor, LDR sensor.
2. Peripheral Interface Controller (PIC) 16F877A.
3. LCD Display, GSM module, controller for FAN & CFL.
4. IOT Server (receiver)

5. METHODOLOGY

5.1 Circuit Diagram

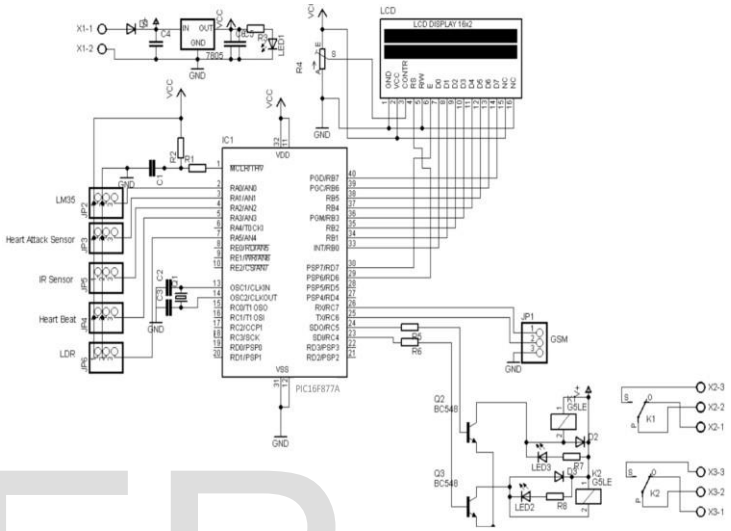

Fig 5.1.1: Circuit diagram

5.2 Working

The proposed system consists of a microcontroller with PIC16F877A & GSM Module. The sensors used here are Temperature sensor, Sweat sensor, Pulse rate/heart beat sensor, IR sensor, LDR sensor.

These sensors such as temperature sensor, sweat sensor, pulse rate/heartbeat sensors are placed on human body and IR sensor, LDR sensor are placed in patient's room. These body sensors helps to monitor the health condition of the patient without disturbing the daily routine of the patients and these health related parameters are then communicated to physicians server using GSM/GPRS module.

In this system sweat sensor is used to detect sweating of the patient. Sweating more than usual, especially if you aren't exercising or being active could be an early warning sign of heart problems. Pumping blood through clogged arteries takes more effort from your heart, so your body sweats more to try to keep your body temperature down during the extra exertion. If you experience cold sweats or clammy skin, then its early signs of heart attack. Thus, it becomes necessary to detect sweating of the patient to monitor early signs of heart attacks.

The temperature sensor used here is LM35. This temperature sensor is used to sense the body temperature of the patient.

Pulse rate/heartbeat sensor is used to heartbeats of the patient. A lower resting heart rate correlates very closely to a state of greater general fitness and health. On the other hand, a high resting heart rate increases the risk of heart attack and can be indicative of a predisposition for diabetes and obesity.
So, it is very important to monitor pulse rate.

LDR sensor is used to detect the lighting conditions of the patient room so that it can automatically turn ON and OFF lights. If there is sufficient light in the room then lights will be turn off if the lighting conditions gets poor then lights will be turn ON automatically.

IR sensor is used for security purpose. It can detect the entry or exit of any entity from that specific patient room.

All these sensors will send data wirelessly over the internet to IoT server. The IoT server holds the live data of the patient's health condition. The appointed caretakers of the patients will get all the required data from IoT server. The appointed caretaker can also control the electrical appliances over the IOT server.

In this project we have used PIC16F877A to taking input from the sensors and sending commands to GSM/GPRS module. we will use GPRS, present on the GSM Module board, to send data to the web server on the internet. The data collected from the sensors will send it to IOT website shown in fig(5.2.1) using PIC16F877A and GPRS. Here we have also attached a LCD display to see the data locally. Here we have used a normal GSM Module with a SIM card for GPRS connection. In this project, GPRS is responsible for sending data to the IOT server.

Fig(5.2.1): IOT Web site

6. COMPONENTS REQUIRED

6.1 GSM

GSM is one of the widely used mobile standards. GSM is Global System for Mobile Communication. As the name specifies, it enables the mobile users to interact all over the world at any time.

WHY GSM TECHNOLOGY?

GSM was actually designed to be platform independent. Because GSM provides a common standard, cellular subscribers can use their telephones over the entire GSM area which includes all the countries around the world where the GSM system is used. In addition, the GSM provides user services such as high-speed data communication, facsimile and a Short Message Service (SMS). The GSM technical specifications are also designed to work with other standards as it guarantees standard interfaces. Finally, a key aspect of GSM is that the specifications are open ended and can be built upon to meet the future requirements.

6.2 Relay

A relay is an electrical switch that uses an electromagnet to move the switch from the off to on position instead of a person moving the switch. It takes a relatively small amount of power to turn on a relay but the relay can control something that draws much more power

6.3 Peripheral Interface Controller (PIC) 16F877A.

The PIC16F877A device has many types of advanced features that are capable of performing additional special tasks and operations. These features increases the stability of the PIC and increases its functional reliability. It is also helpful for designers to decrease the entire cost of the designed circuit by the integration and replacement of external components and also by providing a lot of power saving protections. The general special features of a modern PIC6F877A chip are given below.

- Oscillator Selection
- Reset
- Interrupts
- Watchdog Timer (WDT)
- Sleep
- Code Protection
- ID Locations
- In-Circuit Serial Programming
- Low-Voltage In-Circuit Serial Programming
- In-Circuit Debugger

The PIC16F877A series basically supports different types of oscillators. It also has a Watchdog Timer which can be shut-off only through configuration bits. It runs off its own RC oscillator for added reliability (Configurations as compared to normal microcontrollers/processors). The different oscillator modes can be easily selected by the user. The user can program two configuration bits (foscillator1 and foscillator0) to selection of the basic four modes. The basic oscillator modes and the typical values used for these oscillators are given in the picture below.

- LP Low-Power Crystal
- XT Crystal/Resonator
- HS High-Speed Crystal/Resonator
- RC Resistor/Capacitor

6.4 Temperature sensor (LM35)

The LM35-series devices are precision integrated-circuit temperature sensors, with an output voltage linearly proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The features of the LM35 make it suitable for many general temperature sensing applications.

Why LM35?

- Small in size.
- No external circuitry required for calibration.
- Calibrated Directly in Celsius (Centigrade)
- Linear + 10-mV/°C Scale Factor
- 0.5°C Ensured Accuracy (at 25°C)
- Rated for Full −55°C to 150°C Range
- Suitable for Remote Applications
- Low-Cost Due to Wafer-Level Trimming
- Operates from 4 V to 30 V
- Less than 60-µA Current Drain
- Low Self-Heating, 0.08°C in Still Air
- Non-Linearity Only ±¼°C Typical
- Low-Impedance Output, 0.1 Ω for 1-mA Load

6.5 Sweat sensor

In this system sweat sensor is used to detect sweating of the patient. Two tgin copper plates is used to make this sensor.

6.6 LDR Light Intensity Sensor

We can control a Light bulb using this sensor. If the sensor output is below 1000mV, Light will turn ON as Light intensity is less. If sensor output is above 1000mV, Light will turn OFF as Light intensity is high enough.

Principle:

- This sensor uses LDR for Light intensity detection.
- LDR stands for Light Dependent Resistor.
- The Resistance of LDR is inversely proportional to intensity of light.
- It is used in a resistor divider to control the output voltage as per the change in the intensity of light.

Specifications:

- LDR Resistance in dark: Greater than 200K Ohms.
- LDR Resistance in Full light: Less than 400Ohms.
- Sensor Voltage: 5V
- Sensor Threshold value: 1000mV.

6.7 IR Sensor

IR sensor is used for security purpose. It can detect the entry or exit of any entity from that specific patient room.

6.8 Pulse rate sensor

It essentially combines a simple optical heart rate sensor with amplification and noise cancellation circuitry making it fast and easy to get reliable pulse readings. Also, it sips power with just 4mA current draw at 5V so it's great for mobile applications.

7. RESULTS AND CONCLUSION

In this project , Smart hospital based on Internet of Things (IoT) has been successfully designed. This project is highly energy efficient as it uses GPRS/GSM with PIC16F877A which having low power utilization. We do not need to manually turn ON or turn OFF the switch of the light. It is possible to control the switch from a webpage or from the mobile application. This system is a time consuming . It will save patient from the many risks. It is user friendly system. Maintenance of this project is not costly.

8. REFERENCES

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