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Smart Hospital Using Iot

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***Abstract*:** *The rapid development of Internet of things (IoT) technology makes it possible for connecting various smart objects together through the Internet and providing more data interoperability methods for application purpose. The use of IoT technology in applications has spurred the increase of real-time data, which makes the information storage and accessing more difficult and challenging. Most of the time, due to negligence of hospital staff, excessive number of patients or inattentiveness of relatives some abnormality can go unnoticed which can result in patient's health issues. Thus, in this paper we have proposed a system which include combination of sensor technology and Internet of Things(IoT).Using this system one can monitor health of a patient, level of the saline bottle, heartbeat, blood pressure, temperature and control electricity from distant position*

Keywords: *Internet of Things(IoT), smart hospital, Temperature sensors(LM35),Heartbeat Sensor,LDR(Light Dependent Registor) wifi module, microcontroller, 2-way communication, Arduino UNO, water level sensors.*

I. Introduction

1.1. Problem Statement

In our project titled,"Smart Hospital Using IoT" which be uses Internet of things to monitor health of patient, level of saline bottle, blood pressure sensing and control electricity from distant position. The application would monitor the patient and generate an alarm if the condition of the patient is deteriorating and will get will suffer negligence and everyone will be treated properly the doctor attention immediately. Thus,no patient.The application would also switch off unnecessary electrical equipment thereby saving energy-consumption.

II. Literature Review

2.1 Design of Iot Based Smart Health Monitoring and Alert System(2015-2016)

This paper presents a reconfigurable sensor network for structural health monitoring. Real-time and periodic structural health monitoring can reduce the probability of collapse and the consequences of potential life-threatening conditions.Computer communication systems and Internet plays an important role. NFC technology to fetch patient complete information automatically when doctor approaches patient. Biosensors interfaced with the microcontroller will monitor patient's vital health. If any of the sensor's preset threshold value is exceeded beneath, an SMS will be sent

to doctor and the patient's caretaker.The monitoring system comprise of web server part: The sensor network in which the sensor nodes are equipped with different biometric sensors, sensor data will be regularly transferred to hospital database from which it is upload to hospital's webserver continuously. doctor can monitor the patient condition from any place.

2.2. IOT based Patient Health Monitoring System (2016-2017)

In any critical condition the SMS is send to the doctor or any family This paper gives us the development of a microcontroller based system for wireless heartbeat and temperature monitoring using Wi-Fi module. By this we can easily provide real time information available for many users and can send them alert in critical conditions over internet. In India many patients are dying because of heart attacks and reason behind this factor is that they are not getting proper help during the period. To give them timely and proper help first we want to continuous monitoring of patient health. The fixed monitoring system can be used only when the patient is lying on bed and these systems are huge and only available in the hospitals in ICU. The system is developed for home use by patients that are not in a critical member. So that we can easily save many lives by providing them quick service.

2.3. Secured Smart Healthcare Monitoring System Based on Iot(2015)

Technology plays the major role in healthcare not only for sensory devices but also in communication, recording and display device.It is very important to monitor various medical parameters and post operational

days. Hence the latest trend in Healthcare communication method using IOT is adapted. Internet of things serves as a catalyst for the healthcare and plays prominent role in wide range of healthcare applications. In this project the PIC18F46K22 microcontroller is used as a gateway to communicate to the various sensors such as temperature sensor and pulse oximeter sensor. The microcontroller picks up the sensor data and sends it to the network through Wi-Fi and hence provides real time monitoring of the health care parameters for doctors.The data can be accessed anytime by the doctor. The controller is also connected with buzzer to alert the caretaker 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. The security issue is been addressed by transmitting the data through the password protected Wi-Fi module ESP8266 which will be encrypted by standard AES128 and the users/doctor can access the data by logging to the html webpage. At the time of extremity situation alert message is sent to the doctor through GSM module connected to the controller. 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.

2.4. IoT-Based Health Monitoring System for Active and Assisted Living(2013)

The Internet of Things (IoT) has been widely used to interconnect the available medical resources and offer smart, reliable, and effective healthcare service to the elderly people. Health monitoring for active and assisted living is one of the paradigms that can use the IoT advantages to improve the elderly lifestyle.In this paper, we present an IoT architecture customized for healthcare applications. The proposed architecture collects the data and relays it to the cloud where it is processed and analyzed. Feedback actions based on the analyzed data can be sent back to the user. A prototype of the proposed architecture has been built to demonstrate its performance advantages.

2.5. Smart Hospital based on Internet of Things (2012)

In this paper, we propose an architecture and of smart hospital based on Internet of Things (IOT) in order to overcome the disadvantages of the present hospital information system, such as the fixed information point scheme, inflexible networking mode and so on. The key technologies and construction of smart hospital is presented based on understanding of the connotation and architecture of smart hospital. Furthermore, taking a third grade-A hospital as an example, a scheme of smart hospital is given,and its logic structure, application framework, the construction of basic network environment etc. are described in detail. Experiment proves that deployment of smart hospital can effectively solve the prominent problems existing the diagnosis and treatment of hospital and it brings a positive and profound effect for the present diagnosis and treatment mode in hospital.

III. Proposed System

The rapid development of Internet of things (IoT) technology makes it possible for connecting various smart objects together through the Internet and providing more data interoperability methods for application purpose. Recent research shows more potential applications of IoT in information intensive industrial sectors such as healthcare services. However, the diversity of the objects in IoT causes the heterogeneity problem of the data format in IoT platform.

Meanwhile, the use of IoT technology in applications has spurred the increase of real-time data,which makes the information storage and accessing more difficult and challenging. Most of the time, due to negligence of hospital staff, excessive number of patients or inattentiveness of

relatives it may happen that saline bottle is not monitored properly, and it may lead to cause heart attack due to “AIR EMBOLISM”. Thus, In this paper we have proposed a system which include combination of sensor technology and Internet of Things(IoT). Using this system one can monitor health of a patient, level of the saline bottle and control electricity from distant.

IV. Block Diagram:

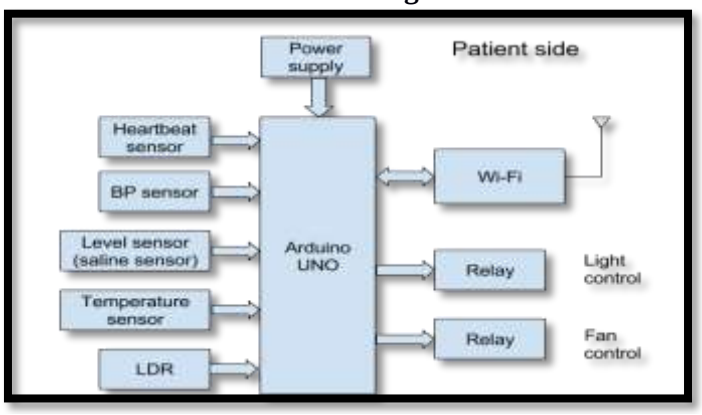

Figure 4.1. Block Diagram

How The System Works

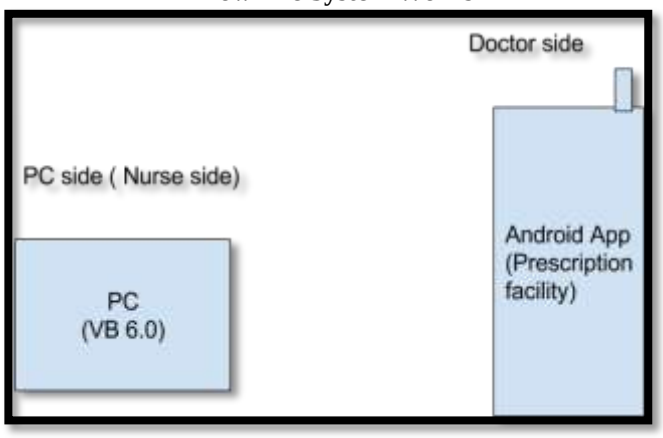

Figure 5.1. Nurse Side and Doctor side Applications

Arduino module: - Patient side

- Heartbeat sensor will give the pulse count and blood pressure will give information of blood pressure of patient continuously to
- are used to check the level of saline in bottle arduinouno.
- Level sensors and according to it, it sends notification to server where nurse is present.
- LDR, light dependent resistor and Temperature sensor is used to control the electricity in room. According to the LDR data, light will be controlled through relay and according to temperature sensor data, fan will be controlled.
- During day time LDR resistance will be low and in night it will be high. When the resistance is high Light will be on automatically.
- If the temperature of a room increases which will be given by the temperature sensor, the fan will be on automatically.
- The automation of light and fan will be dependent upon the data received by the LDR and temperature sensor.
- Using wifi modules all sensor data will be transmitted to server and will be updated in datalog present at server side in excel form.

Server (PC): - Nurse side

Server will collect the data from patient side kit and will update it in datalog. All the data related to patient will be send to android app present at Doctor side. After that according to patient condition doctor will take an action.If doctor gives any prescription to patient, nurse will read it and she will send an acknowledge from PC side present application to Doctor.

Doctor side (android app):

- All the sensor data will be received in android app through server.
- If any prescriptions have to be given to a patient, it will send that in server through android app.
- Nurse will receive that prescription and will send an acknowledge about it to doctor from PC side application.

All the modules will be connected through wifi (Intranet connection same router or same network for all wifi modules).

V. Requirement Gathering

5.1. Hardware Specifications

The hardware used for the development of the project is:

Sensor	• Heart beat rate sensor • Temperature Sensor(LM35) • Blood pressure Sensor-MPX10DP-Presure • Level Sensor-(Saline Sensor)
RAM	1 Gb
Micro-controller	Arduino UNO(Atmega 328)

Table 5.1

5.2. Software Specifications

The software used for the development of the project is:

OS	Windows 7
Language	C
Software	Arduino IDE
Database Server	VB 6.0

Table 5.2

VI. Components Details

6.1 Arduino UNO (ATMEGA328)

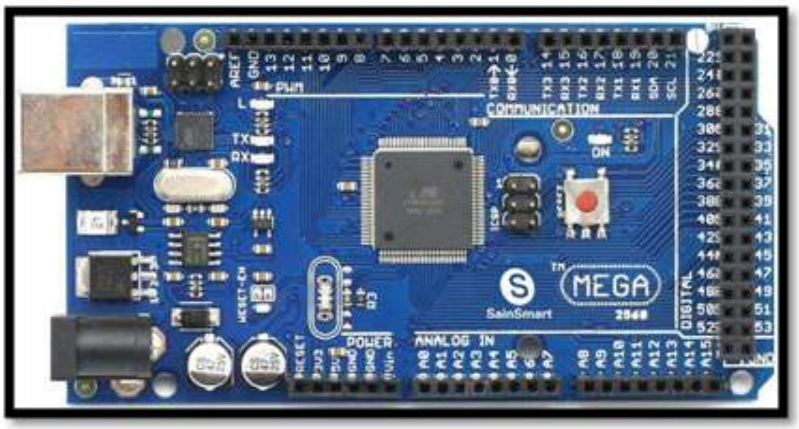

Figure 6.1 Arduino UNO (ATMEGA328)

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board.

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage(recommended)	7-12V
Input Voltage(limits)	6-20V
Digital I/O Pins	14(of which 6 provide PWM output)
Analog I/O Pins	6
DC Current per I/O Pin	40mA
DC Current for 3.3V Pin	50mA
Flash Memory	32KB(ATmega328)of which 0.5KB used by bootloader
SRAM	2 KB(ATmega328)
EEPROM	1 KB(ATmega328)
Clock Speed	16MHz
Length	68.6mm
Width	53.4mm
Weight	25g

6.2 Temperature sensor (LM35)

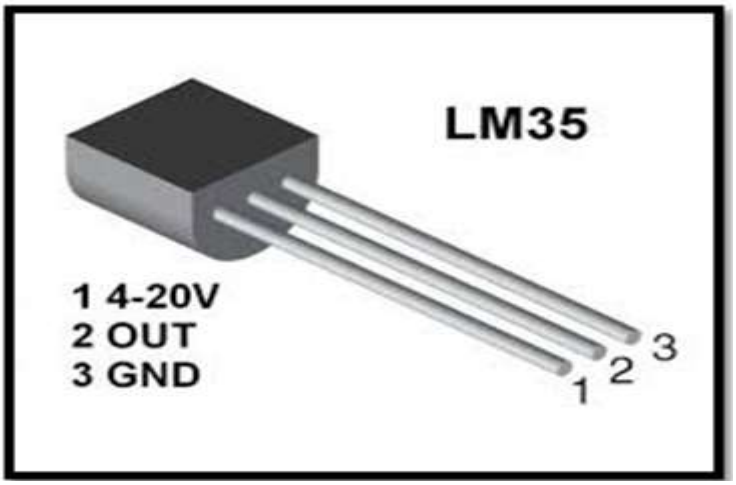

Figure 6.2 Temperature sensor (LM35)

The LM35 is precision integrated-circuit temperature sensor, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. It can be used with single power supplies, or with plus and minus supplies.

6.3 Heartbeat sensor

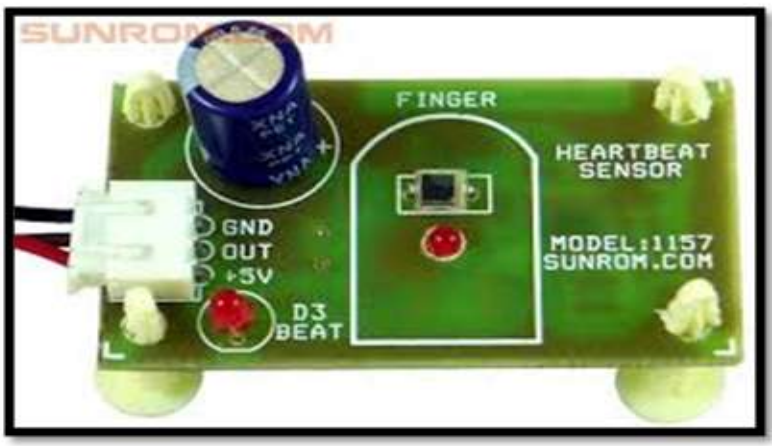

Figure 6.3 Heartbeat sensor

The sensor body is built with flexible Silicone rubber material that helps to keep the sensor tightly holds to the finger. Inside the sensor case, an IR LED and a photodetector are placed on two opposite sides and are facing each other. When a fingertip is plugged into the sensor, it is illuminated by the IR light coming from the

LED.

6.4 Blood pressure sensor

Figure 6.4: Blood pressure sensor

Blood pressure sensor includes:

- Blood Pressure Sensor MPX10DP
- Standard adult size adjustable cuff (27 cm to 39 cm)
- Bulb pump (with release valve)

6.5: LDR

Figure 6.5 LDR

A light dependant resistor also know as a LDR, photoresistor, photoconductor or photocell, is a resistor whose resistance increases or decreases depending on the amount of light intensity. LDRs (Light Dependant Resistors) are a very useful tool in a light/dark circuits. A LDR can have a variety of resistance and functions.

6.6 : Wi-Fi module - ESP8266

Espressif ESP8266EX delivers highly integrated Wi-Fi SoC solution to meet users' continuous demands for efficient power usage, compact design and reliable performance in the Internet of Things industry. With the complete and self-contained Wi-Fi networking capabilities, ESP8266EX can perform either as a standalone application or as the slave to a host MCU. When ESP8266EX hosts the application, it promptly boots up from the flash.

6.6.1 **Wi-Fi Protocols**

- 802.11 b/g/n/e/i support.
- Wi-Fi Direct (P2P) support.
- P2P Discovery, P2P GO (Group Owner) mode, GC(Group Client) mode and P2P Power Management.
- Infrastructure BSS Station mode / P2P mode / Soft AP mode support.

VII. Conclusion

In this project, Smart hospital using Internet of Things (IoT) has been successfully designed. This project is highly energy efficient as it uses arduino board having microcontroller 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. Status of a patient health can be monitor from remote location. It is user friendly system. Maintenance of this project is not costly.

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