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Advanced Smart Health Care

Mr. Naveena Pai G[1], Ms. Tasneem Afrida[2], Ms. Nischitha[3], Ms. Sharanya Prabhu[4], Ms. Thejaswini K N[5]

[1]*Assistant Professor, Dept. of ECE, Yenepoya Institute of Technology, Moodbidri, India-574225*
[2345]*Students, Dept. of ECE, Yenepoya Institute of Technology, Moodbidri, India-574225*

Abstract - *Internet of Things (IoT) technology has been significantly transforming the healthcare industry by revamping the way devices, apps and user connect and interact with each other for delivering healthcare services. IoT is continuously introducing innovative tools as well as capabilities like IoT enabled medical app development that build up an integrated healthcare system with the vision of assuring better patients care at reduced costs. It is an accumulation of numerous opportunities that hospitals and wellness promoters can consider while they optimize resources with automated work flows. IoT applications are offering enormous perks to health care providers and patients considerably improving health care services. In this era of new evolution, through new sensors, wireless technologies and mobile phones are driving the growth of internet of things (IoT), the exact business ethics of the IOT lies in analytics rather than in hardware inventions. Our proposed paper following the same metrics. As the population growth increases, the need of health care also increases. Hence it is a mandatory thing for everyone in this world to take care of their health properly.*

Key Words: Internet of things(IoT), Health care, Sensors, Mobile Phones, Wireless Technology.

1. INTRODUCTION

Even though many advanced automatic devices are used, ensuring the safety of the patient during IV period is still a challenging issue. To notify the hospital staff about the level of glucose in glucose bottle, that is being injected through the patient's vein[1]. This automation eliminates the manual need to monitor the level of glucose in the bottle.

Now-a-days, the nurses still use the manual method to give medicine to the patients, they will go to the patient's bed for three times per day and give the medicine to the patients. By using this method, the nurse will waste the time because they should go the patient's ward one by one. Besides, they also cannot monitor the patients properly because they do not have enough time and they will be busy in monitoring other patients[3]. The smart medicine box is to solve and help the nurse to handle the patients specifically.

According to the changing temperature which help user to adjust the fan speed according to their need. It reduces the use of remote controlling feature of fan[2]. Similarly other module which contain automatic brightness control of light, here as we have exchanged traditional lamp by LED and adding extra feature to the module[4]. The LED bulb adjust its intensity according to the brightness present outside.

Internet of Things (IoT) is the emerging technology, which contains huge amount of smart object smart devices connected to the internet for communicating with each other. In this project to analyze and compute the patient we are using Arduino Uno, which is the heart of this project. The final result are displayed on the android device.

2. PROPOSED ARCHITECTURE

2.1 Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital I/O pins, 6 analog inputs, a 16MHz crystal oscillator, a USB connection, a power jack, an ICSP header and a reset button. The outputs of different sensors are the inputs to the microcontroller and the it gives the result according to the code dumped.

2.2 Power Supply

The board can be supplied with power either from the DC power jack, the USB connector or the Vin pin of the board. In this proposed paper we have used USB connector(5V) for power supply.

2.3 Wi-Fi Module

It is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to Wi-Fi network. In this proposed paper we have used ESP8266 device to provide internet connectivity.

2.4 FDC1004 Capacitance Sensor Breakout Board

The FDC1004 is a single-chip IC for capacitance measurement for application including proximity sensing and liquid level sensing.

2.5 LDR Sensor

A light dependent resistor (LDR) is a component that has (variable) resistance that changes with the light intensity that falls upon it. In this proposed paper we have used LDR to sense the brightness intensity present inside the room.

2.6 Temperature Sensor

It is a low-cost digital sensor for sensing temperature and humidity. This can be easily interfaced with the microcontroller. We have used DHT11 sensor for measuring the temperature of the room.

2.7 Relay

The Single Channel Relay Module is a convenient board which can be used to control high voltage, high current load. In this proposed paper relay is used to control fan and light.

2.8 RTC (Real Time Clock)

RTC is used to track the current time and date. We have used DS1307 RTC Module.

3. IMPLEMENTATION AND WORKING

3.1 Monitoring the Glucose Bottle Level in Hospitals

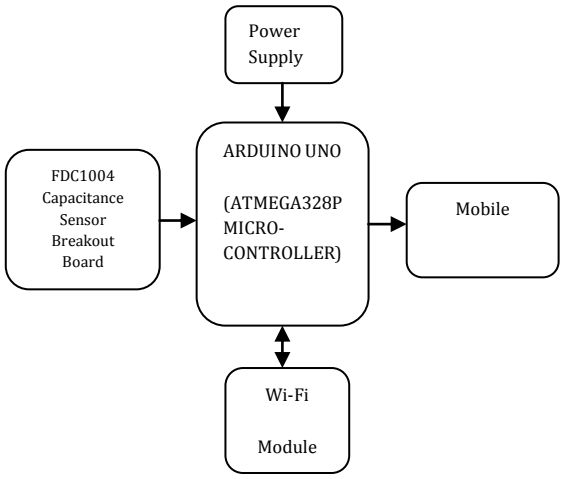

Fig - 1 : Basic block diagram of the remote monitoring the glucose bottle level in hospitals.

Liquid level sensing can be done in several ways but what is required is accurate liquid level measurement without putting anything inside the liquid itself. We used capacitance to measure the liquid level by sticking two copper tapes on the outside wall of the bottle to measure the liquid level inside. We then connected one of the electrodes to system ground and the other one to the CIN1 channel of the breakout board. The FDC1004 breakout board connects to an Arduino Uno using I2C standard interface. This chip is connected to the SCL and SDA pins of the Arduino. The data is sent through the Arduino's UART over USB to the system as shown in fig-1.The first intimation which is an SMS alert is sent through a Wi-Fi module, when the level of liquid is 50ml,which gives enough time for the hospital staff to reach the room and replace the bottle. The second intimation which is a call alert, is sent through a Wi-Fi module, when the level of liquid is 30ml. In case if the first intimation is missed, this call will alert the hospital staff about the urgent need to replace the bottle.

3.2 Smart Hospital Automation Using IOT

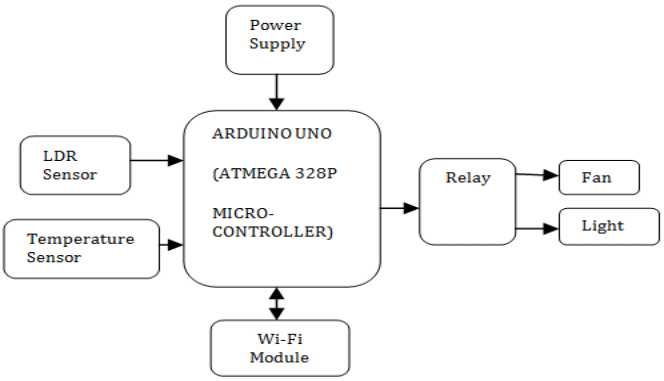

Fig - 2: Basic block diagram of smart hospital automation using IOT.

The temperature sensor senses the temperature of surrounding condition and adjust the speed of fan in the levels according to the code done in the microcontroller. The temperature sensed by the sensor is then shown on the LCD display in degree Celsius. We have set four levels in the code so that the fan can adjust its speed in those levels according to the temperature sensed by the sensor. It provides control over the speed of fan according to the user needs. The LDR sensor sense the brightness present inside and adjust the intensity of LED bulb according to it. The temperature sensor and the LDR sensor is connected to microcontroller as shon in fig- 2. We have burn the code in the microcontroller, such that if inside brightness increases and if the darkness in the inside conditions increases then the intensity of light increases. This is majorly happens because of the LDR sensor and the according to the code done in the microcontroller .So this modules adjusting the brightness of light according to the human need.

3.3 Smart Medicine Box

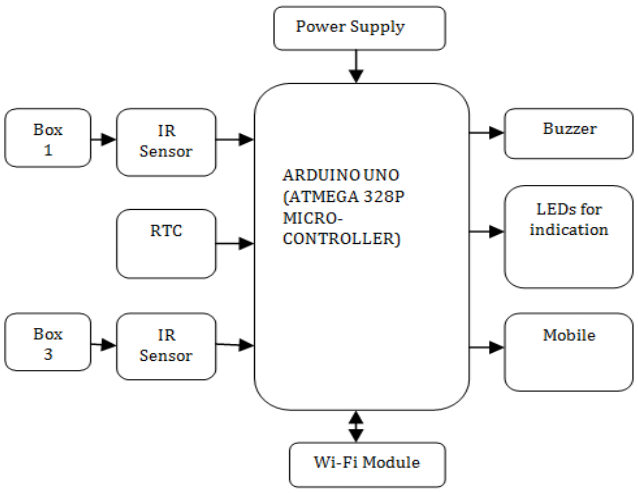

Fig - 3: Basic block diagram of smart medicine box.

All modules including RTC, LED strips, Buzzer etc are connected with Arduino as shown in fig - 3. We have also connected certain boxes in which user will load the pills. When system gets started, time and date will be updated. RTC will have its own set of timings and we will set the medicine timing in the system. When the RTC and system timings match, buzzer will rang and LED's will blink in the desired box notifying the user to open that box and take out pills from that box in which LED blinks. Buzzer and LED will turn off when user opens the box otherwise buzzer and LED will continuously notify until the time is passed of taking medicine. If the user opens and closes the box immediately, system will once again start to generate loud sound and forces the user to take pills again.

3.4 Android Application

All the information is sent through the Wi-Fi to the system. We have developed an Android App named "My Health" using Android Studio software. An android application is created in which complete information of the patient is obtained. Status of the level of the glucose in glucose bottle is also displayed. Patients can also find their medicine timings and dose of medicine in the app. They can also control fan and light through it.

4. RESULT AND CONCLUSION

4.1 Output Displayed On Serial Monitor

This proposed paper is based on advanced wireless sensor technologies, development and implementation of real-time monitoring system for patients using wireless technology.

The below figures are the snapshots of the outputs obtained from the hardware connection.

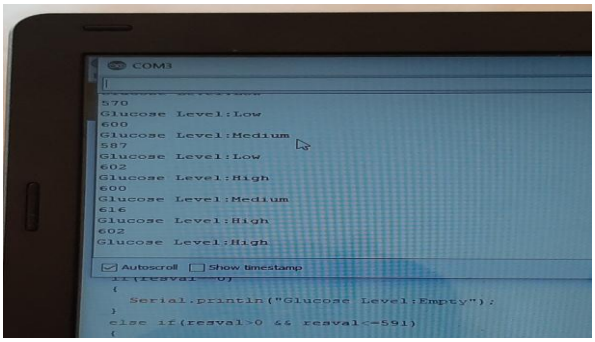

Fig – 4: Snapshot of the result from the glucose level detection module.

In this level of the glucose in the glucose bottle is detected as high, medium and low as shown in fig - 4. This automation eliminates the manual need to monitor the level of glucose in the bottle. The level of liquid present in the bottle can be calculated so that when the liquid reaches its minimum, Wi-Fi is used to send alerts to system.

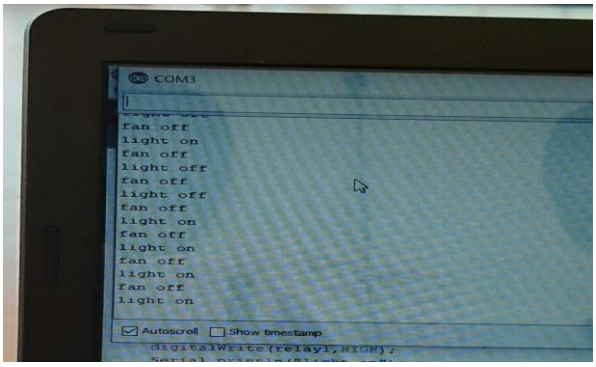

Fig - 5: Snapshot of the result from fan and light control module.

Fig - 5 shows the controlling status of fan and light according to the temperature and brightness present inside the room. The sensors sense the changes taking place due to which fan and light turns on and off. The module is used to avoid pointless consumption of electricity, due to physical switching. It provides effective and smart automatic control of fan and light with the help of DHT11 sensor and LDR.

4.2 Result from Android App

Monitoring the patient is very important in all the hospitals for checking the patient and their health parameters. "My Health" application is very useful in keeping an eye of the patient's health and it also easy to use.

The below figures are the snapshots of the "My Health" Android Application.

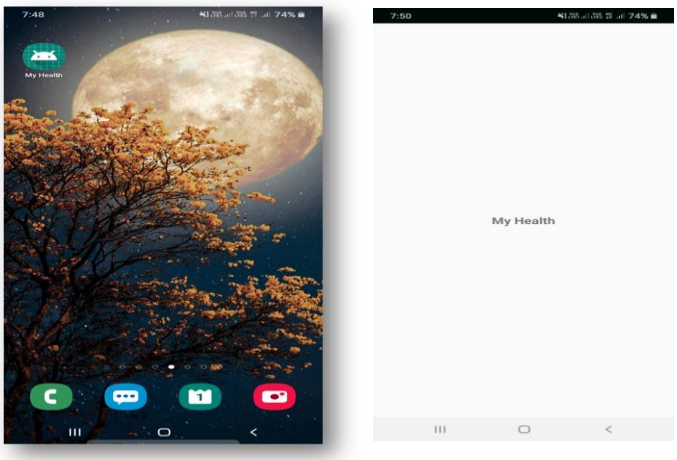

Fig - 6: Snapshot of the App icon and splash screen.

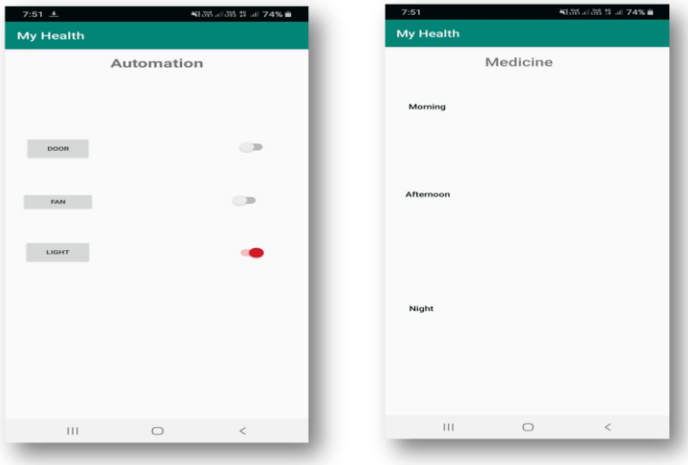

Fig- 7: Snapshot of the automation and medicine reminder page.

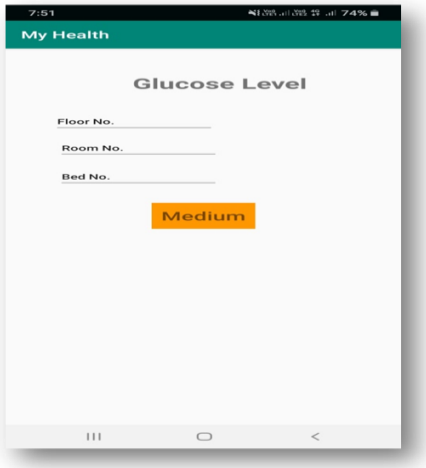

Fig - 8: Snapshot of the glucose level page.

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