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Towards a Novel and Smart Health Monitoring System using IOT

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ABSTRACT
Health Monitoring System is for monitoring the patient's body at any time using internet connectivity. The function of this system is to measuring some biological parameters of the patient's body like Temperature, Heartbeat, Blood pressure, by using sensors and the sensors will sense the body temperature, heartbeat and blood pressure of the patient and sends the values to IoT Cloud platform through WIFI-Module. All information about the patient health will be stored on the Cloud, it enables the doctors to monitor the patient's health, where the doctor can continuously monitor the patient's condition on his Smartphone. The results shown through our system are proved that can effectively use Wi-Fi technology for monitoring the patient's health status. And the power consumption of the Wi-Fi module (ESP8266) can be reduced as much as possible. Thus, the designed system provides low complexity, low power consumption and highly portable for healthcare monitoring of patients.
Keywords - Internet of Things, Health, Sensors

I. INTRODUCTION

Health is the one of the most important affecting factor of human beings. It is very significant to be careful about well-being [1,2]. The main objective is to implement a consistent patient monitoring system so that the healthcare experts can monitor the patients, who are both hospitalized and performing their normal daily life activities. Recently, patient monitoring systems is one of the major advancements because of their improved technology [3,4]. Presently, there is a requirement for a modernized health monitoring approach. They need to visit the patient's ward for necessary diagnosis and advice. There are two rudimentary difficulties related to this approach. Primarily, the healthcare experts must be existent on-site with the patient all the time and furthermore, the patient remains admitted in a hospital and bedside biomedical instruments for a period of time. In order to solve these two problems, a patient monitoring system (PMS) is required which used to improve the above-mentioned conditions, so that, we made use of technology in an innovative way [5,6].

1.1 Objective

The main objective of this project is to provide a technology-oriented, low cost, easily scalable, and rugged system for the patients in person. In order provide a feasible solution, the patients are provided with a health monitoring system that directs the live pulse status of patients to the doctor without approaching to them. Through the device patient can recognize his health condition, and he/she can check their pulse even in emergency situations.

II. LITERATURE SURVEY

Wan Seri Aaliyah, done a project where he used ZigBee, Arduino Uno, an ECG circuit and a temperature sensor. He used Lab view to process the signals. The problem is that this does not cover wide areas compared to GSM. Purnima, Puneet Singh, uses both ZigBee and GSM to transmit the data obtained from a patient. GSM is used for purpose of mobile phones while ZigBee is for PC's where the transmitted signals are processed. Bandana Mallick and Ajith Ku-mar proposed the use of a fingertip to measure the heart rate and process it using Arduino. Shreni Suresh Sarade proposed a project having a simple, microcontroller-based heartbeat rate & body temperature measuring device to display the information on the LCD display. The heart rate of the patient is measured from the index finger by IRD(Infra-Red-Device)sensors. Furthermore, the saline level is measured incessantly for dissimilar levels. The de-vice alarms when the heartbeat &

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the body temperature exceed the provided threshold value of 2.1.

2.1 Existing System

The current health monitoring system of patients is very stressful for doctors, nurses and patients as well to handle the situations immediately [7,8]. Thisleads to many dangerous consequences like patients may die eventually if the situation is unable to handle at the correct time. When there are any emergency cases the doctors and nurses need to rush to the patients to treat them. This is very difficult to handle the cases as there will be a number of patients in a hospital [9,10]. In modern times if these kinds are unable to handle by the doctors then we may see a lot of deaths in the upcoming days. These conditions need to be changed in order to save a lot of lives.

2.2 Proposed System

The proposed system is formed on the idea of the research work that's done by browsing various such documentation. Nearly all of the crimes are predicting supported the situation and therefore the sorts of crimes that are occurring in those areas.

III. SYSTEM DEVELOPMENT

3.1 Hardware Requirements

NODE MCU:

Node MCU is a low-cost open-source IoT platform. It basically comprised firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems and its hardware is based on the ESP-12 module. Node MCU is an open-source firmware that is associated with an open-source prototyping board.

Fig.1 Node MCU

PULSE SENSOR:

The Pulse Sensor is a plug-and-play heart-rate sensor for Arduino. We used the pulse sensor in order to easily incorporate for getting the live heart-rate data in our project. Actually, it is an integrated design of an optical amplifying circuit with noise eliminating circuit sensor. The clip in the pulse sensor to earlobe or fingertip and plug it into Arduino, so it can ready to read the human's heart rate.

Fig. 2 Pulse Sensor

JUMPER WIRES:

Jumper wires have connector pins at each end, this set-up allows to connect two points to connect the different devices without soldering. Jumper wires are characteristically used with breadboards and other prototyping tools to make it formal to alteration a circuit as needed. A jump wire is also identified as a jumper, jumper wire, jumper cable or DuPont wire.

Fig. 3 Jumper Wires

BUZZER:

An Arduino buzzer is also called a piezo buzzer. It is a miniature speaker that is connected to an Arduino board and made it sound the tone that is already set. The buzzer generates sound based on the conflicting piezoelectric effect.Also, buzzers are used tomake beep alarms and tones.

Fig. 4 Buzzer

BATTERY CLIPS:

In the proposed system, we used a 9V battery clip to connect with a 9V battery to the Arduino. Use one with leads to connect the battery directly to a breadboard or the VIN pin with the Arduino. Also, it is added a clip with a

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barrel jack for persevering directly into the Arduino's barrel jack.

Fig. 5 Battery Clips

BATTERY:

Whenever the battery voltage level is above 6 Vdc and pin 3 is above 5.1 Vdc then the comparator output becomes high. It can turn ON the FET, Q1 a BS170 which can supply the ground for the output, in turn, going to the Arduino. The positive voltage is passed directly from the batteries into the Arduino board.

Fig. 6 Battery

3.2 Software Requirements

3.2.1 ARDUINO IDE:

Our proposed system is programmed using Arduino, that can use the Arduino IDE (integrated development environment), which allows to program in Arduino understandable language. In the case of Arduino IDE which allows to write a C language program. The Arduino will execute the instructions and communicate with the outside world. Both Arduino hardware and software are open-source, so we can customize whatever we want in our system. The reason we used the Arduino IDE that comes with the Earthshine design Arduino starter kit which takes the Arduino PCB design.

3.2.2 Arduino and USB cable:

First, We used the Arduino board and USB cable, then plugged the B plug into the Arduino into the USB socket.

Fig. 7 USB cable

Then, we downloaded the Arduino IDE from the Arduino downloads page. Second, We installed the Arduino IDE, during the installation is presented with a new hardware wizard to add Windows to the drivers.

Fig. 8 New hardware wizard

Now, connect the other end of the USB cable to the USB socket on the PC. Here, we found that the new hardware wizard opens as soon as Windows detects the Arduino board is connected to the computer. We Connected with Windows Update (select No, not currently) and then clicked the Next button.

Now the Arduino is connected and the drivers for the USB chip are installed, we found it ready to try out the Arduino for the first time and upload the first sketch.

Fig. 9 Arduino 0015

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The Arduino can reset itself and immediately start running the sketch is uploaded. After that, we took a look at the Arduino IDE. Uploading I/O board button uploads the code in the current sketch window to the Arduino. Make sure the correcttool and port are selected before uploading (in the Tools menu). It is a good idea to check/compile the code before the upload to make sure there are no errors that need to be corrected first. There is also the Serial Monitor window, where you can see the error messages that IDE displays when trying to connect to your board, upload code or verify code.

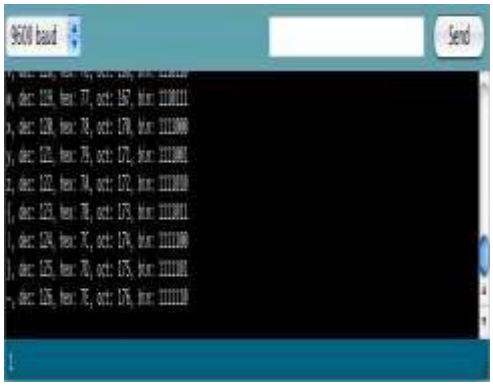

Fig. 10 Serial Monitor Window

The menu bar at the top of the IDE looks like the picture is different in Windows.

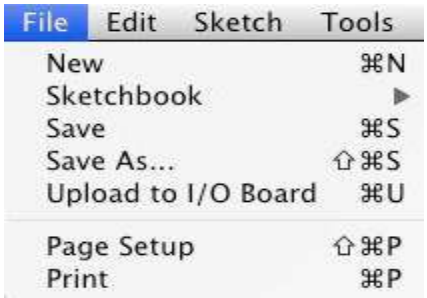

Fig. 11 Menu Bar

The IDE's next menu is the Tools menu. As with setting up an Arduino for the first time, this includes options for selecting the board that use and the serial port. Also, we have automated design functional forms to display the code neatly.

IV. WORKING PRINCIPLE OF THE PROPOSED SYSTEM

Our health monitoring system proposes a model of a Patient Health Monitoring System, with different components like pulse detection and oxygen level analysis. The sensors utilized as a part of this project are the heartbeat sensor and blood oxygen level (MAX30100). These sensors work autonomously with each other. The measured reading from the sensor is broke down for the patient and is made accessible to the specialist or to any concerned individual in the type of the web or smartphones. The Blynk interface and additionally versatile application servers are the user interface for this model. The other element added to this application is an examination of the information in past to caution visualizing the latest and the current reading of the exposure of the patients monitored, along with the display of the graph. Another element added to this application is an investigation of the information in past to caution the specialist and patient about huge changes events or make an alarm to the specialist or any concerned individual related with the patient when it sees any probability of a therapeutic crisis. The inter-facing between the equipment and the product part is done on the stage of IoT. The readings are sent to the Blynk server.

V. IMPLEMENTATION METHODOLOGY

This section explains how the proposed system is implemented in practical environment to analyze performance through the development of an application. The system implementation is done by connecting equipment with each other for making the health monitoring system.

Our proposed system monitors the oxygen level of the patient and automatically sends messages when the level drops. Here the oxygen level of the patient is reflected on the application. But here the model is designed according to the circuit is used to discover and control the accurate oxygen level automatically using NodeMCU. The Health Monitoring System level is made with a max30100 sensor mounted on the top of the system. Conventional cases of patients cannot be monitored always. As of now, the oxygen level must be checked manually and reloaded as per the requirements. By emphasizing the mentioned issues, our prototype develops an economical set-up while monitoring the oxygen level of patients in real-time, certainly with automatic health monitoring in an IoT environment.

VI. IMPLEMENTATION ANALYSIS

In this section, we explain how the proposed system is performing well in practical environment and its performance analyzed through the development of an application. The system implementation is done by connecting equipment with each other for making the health monitoring

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system.

Fig. 12 Output of health monitoring system

It's the output of the complete project which will be shown in the smart phone. It displays the heart rate of the patient. It shows the alert symbol when there is any emergency occurs. It displays the connection with the device. It works with cloud. This is the output of the device when connected with it.

Fig. 13 Working model of Health Monitoring System

The Internet of things (IOT) is the inter-networking of physical devices, vehicles buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. In 2013 the Global Standards Initiative on Internet of Things (IOT-GSI) defined the IOT as "the infrastructure of the information society." The IOT allows objects to be sensed or controlled remotely resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.

When IOT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IOT will consist of almost 50 billion objects by 2020.

A NodeMCU system consists of a reader and Wi-Fi module. In a typical working of an NodeMCU system, the reader sends out an identification request to the Wi-Fi module, and the network reply with the input information. If multiple signals reply simultaneously, signal collision occurs, and this leads to the unsuccessful identification of all the levels. Therefore, anti-collision protocols are employed to improve the identification rate of NodeMCU signals.

The two key parts of the system that are needed to do this are the NodeMCU 'Wi-Fi module' and the ‘reader’ connecting Wi-Fi module to a physical object allows the object to be 'seen' and monitored by existing computer networks and back-office administration systems. USB reader will be connected to the Arduino board. The IR Sensors are also connected with the Arduino board. Wi-Fi module relates to the Arduino board. The faculty entry is monitored by NodeMCU signals is taken from which the NodeMCU Receiver collects the data and host the data in the cloud. Analysis can be done in the cloud.

VII. CONCLUSION

We, therefore, conclude the health monitoring system and its features from the proposed method analysed in this paper. With this kind of technology, we can easily get clarity about the health care we take, and it looks smarter during its usage. The proposed model is easy to use, inexpensive and does not require special training. Our model enhanced the existing methods and used the different types of identification and detection technologies of radio frequency. Therefore, the whole system became smarter, the doctor caneasily monitor their patients from remote areas.

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