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IOT Patient Health Monitoring System

Ahmed Abdulkadir Ibrahim*, Wang Zhuopeng **
*(College of Electronic Communication and Physics, Shandong university of Science and Technology, China
*** (College of Electronic Communication and Physics, Shandong university of Science and Technology, Chin*a
Corresponding Author : Ahmed Abdulkadir Ibrahim*,

ABSTRACT
Monitoring and Recording of various medical parameters of patient outside hospitals has become Widespread phenomenon. The Reason behind this project is to design a system for monitoring the patient's body at any time using internet connectivity. The function of this system is to measuring some biological parameter 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 patient's health, where the doctor can continuously monitor the patient's condition on his Smart phone. The results showed that this project can effectively use Wi-Fi technology to monitor patient health status. And the power consumption of Wi-Fi module (ESP8266) can be reduced as much as possible. Thus, the designed system provides low complexity, low power consumptions and highly portable for healthcare monitoring of patients. **Error! Reference source not found.**
Keywords **:** LM35 , Heart beat sensor, Temperature sensor, blood pressure , ESP8266 Wi-Fi module ,IOT cloud , AVR At mega328 Microcontroller

I.   INTRODUCTION

Technology has always been there to simplify and makes the human life much easier. It affected the various areas of life; the medical field is one of them. It benefits from the technology in different ways; now it is easier to diagnose internal diseases using some digital devices.The healthcare sector is going through a huge change, with digital capabilities changing the way doctors interact with their patients. Nowadays, patients have the tools to view their key vitals themselves and help doctors to have immediate access to patient data on-the-go. In a form of wearable devices e.g. Apple watches [2]. However, we note that these devices are quite expensive and it is difficult to find these devices used by poor people, who are facing the biggest part of diseases burden. Moreover, most of the existing medical devices are still need some investigations once it comes to the concept of the Internet of Things. The concept of the IOT entails the use of electronic devices that capture or monitor data and are connected to a private or public cloud, enabling them to automatically trigger certain events. Medical data such as blood pressure and heart rate are collected by sensors on peripheral devices; these data are transmitted to healthcare providers or third parties via wireless telecommunication devices. The data are evaluated for potential problems by a health-care professional and health providers are immediately alerted if a problem is detected [1]. As a result, timely intervention ensures positive patient outcomes. As illustrated in the figure 1-1. Two groups of people, who have high-levels of medical-care need, are the elderly and the chronically ill. The World Health Organization (2016) indicates that elderly people, who frequently suffer from chronic disease, require a highly effective and efficient provision of care [2]. According to the National Broadband Plan (2015) by the Federal Communications Commission (FCC), the use of remote patient monitoring under IOT technology will save the healthcare industry $700 billion over 15 to 20 years [4]. Then it is important to focus on the IOT technology to benefit from the most recent technology.

Bluetooth, ZigBee, and Wi-Fi are the common wireless technologies for remote patient monitoring systems. However, their suitability and usability for this task are widely varying. Therefore, there are significant considerations while selecting a technology for IoT medical devices; you need to be aware of what their characteristics for specific requirements. The proposed system will help patients in remote places (e.g. home healthcare) and that is not just about monitoring a chronic disease state but about helping prevent patients from getting to that state. By implementing this project, it will offer an inexpensive system for remotely patient's health monitoring, which can save their lives by giving emergency alert in real-time.
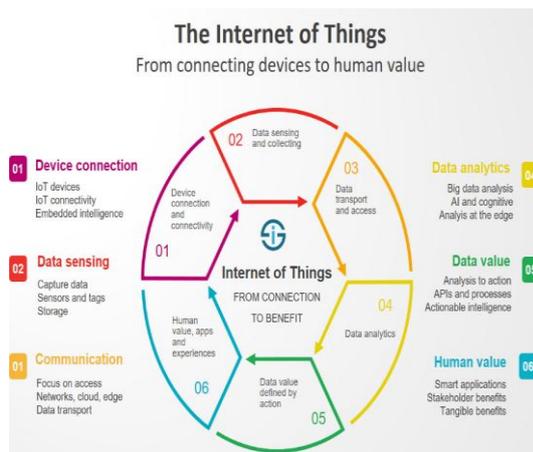
Figure 1-1 The IOT concept in the real-World

II. PROBLEM TO SLOVED

In hospitals, where patient's status needs to be regularly monitored, is usually done by a doctor or other paramedical staff by constantly observing some important parameters, such as body temperature, heartbeat, and blood pressure thus, this task becomes tedious after sometime. Hence it can cause problems. However, there are many researchers have attempted before to solve it in many different ways, but the earlier methods in several cases either SMS will be sent using GSM or RF module will be used to send patient's data from sender device to receiver device.

Moreover, in the earlier cases the history of the patient cannot be displayed, only current data is displayed . So the purpose of this project is to maintain record of patient's data and to give emergency alert if required, using different technology which is Internet of Things (IOT); where it allows us to store patient's data on the cloud. Thus the history data of the patient will be available for doctors to access at any time from everywhere. By implementing this project we can monitor patients remotely and we can secure their lives by giving emergency alert in real-time.

III. SYSTEM DESIGN

The block diagram of the proposed system is shown in figure 3.1 . The sensors of Temperature, Heartbeat and Blood pressure are connected to the Arduino board. The values from the Microcontroller is given to the Web Server using Wifi-Connectivity. The parameter values can be viewed by the Android Application installed in doctors and patient's smart phone. In our system Arduino Board is used. The microcontroller is connected with all other hardware units in the module.


Figure3.1 Block diagram of the Patient unit

3.1 Temperature sensor

The most widely measured physical parameter is body temperature; it can be calculated by putting the sensor in contact with human body. The sensor used in this project is an LM35 temperature sensor. LM35 is a precision IC temperature sensor with its output proportional to the temperature (in °C). The LM35 sensor has more features that attracted us to choose it, such as Calibrated directly in Celsius (Centigrade), Linear + 10-mV/°C scale factor; it measures temperatures from -55°C to +150°C range, the accuracy ±0.5°C.
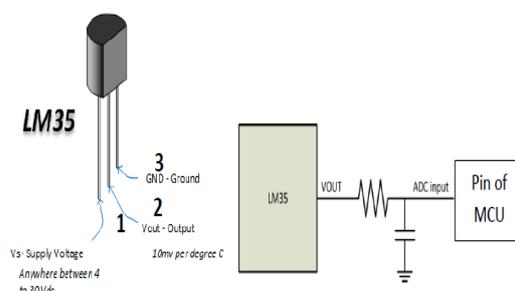

Figure 3-2 The LM35 sensor and its interfacing with microcontroller

3.2 Heatbeat Sensor:

Heart beat sensor is designed to give digital output of heat beat when a finger is placed inside it. This digital output can be connected to Arduino directly to measure the Beats per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger each pulse. IC LM358 is used for this sensor. Its dual low power operational amplifier consists of a super bright red LED and light detector. One will act as amplifiers and another will be used as comparator. LED needs to be super bright as the light must pass through finger and detected at other end.

When heart pumps a pulse of blood through blood vessels, finger becomes slightly more opaque so less light reach at the detector. With each heart pulse, the detector signal varies which is converted to electrical pulse

3.3 Simulation Results
When she/he can power on the circuit shown in the figure 3.3, all the LEDs on PCBs are glowing, indicating that circuit is working properly shown in figure 3.3 Here there is a use of the industrial temperature sensor i.e. LM 35 which gives us room temperature in **o**C. That temperature is displayed on the LCD as shown in figure 3.3.1 The simulation results are given below:
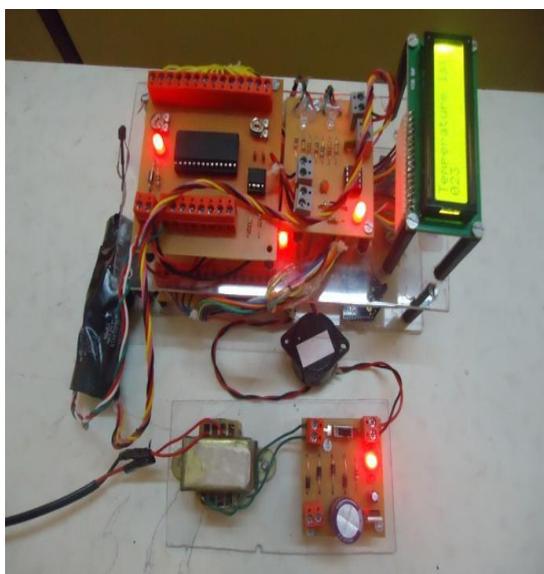
Figure 3.3 implemented circuit in working condition

Figure 3.3.1 Temperature display on LCD
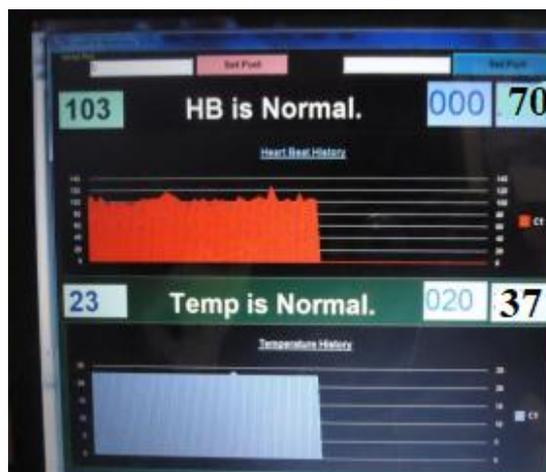
Figure 3.3.2 Graphical representation of TEMP

IV. CONCLUSION AND FUTURE WORK

In this proposed system a mobile physiological monitoring system is presented, which is able to continuously monitor the patients heart beat, blood pressure and other critical parameters in the hospital. We proposed a continuous monitoring and control mechanism to monitor the patient condition and store the patient data's in server using Wi-Fi Module based wireless communication, we also proposed remote health care data acquisition and smart storage system.The Future work of the project is very essential inorder to make the design system more advanced. In the designed system the enhancement would be connecting more sensors to internet which measures various other health parameters and would be beneficial for patient monitoring i.e. connecting all the objects to internet for quick and easy access. Establishing a Wi-Fi mesh type network to increase in the communication range.

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