

IOT Based Patient Health Monitoring System using ESP8266 & Arduino

Sabyasachi Mukhopadhyay¹, Suraj Kumar², Sushil Raj³

^{1,2,3} Department of ECE, SET, Sharda University

Abstract— With tons of new healthcare technology start-ups, IoT is rapidly revolutionizing the healthcare industry. In this project we have designed IoT Based Patient Health Monitoring System using ESP8266 & Arduino. The IoT platform used in this project is Thing Speak. Thing Speak is an open source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. This IoT device could read pulse rate and measure surrounding temperature. System has the cloud database which stores all information about patient's health and the Doctors will prescribe medicine using this information stored on cloud. Device even it allows patient to move freely and can be monitored continuously it continuously monitors the pulse rate and surrounding temperature and updates them to an IoT platform. The Arduino Sketch running over the device implements the various functionalities of the project like reading sensor data, converting them into strings, passing them to the IoT platform and displaying measured pulse rate and temperature on character LCD.

Keywords— Arduino -Uno, Internet of Things, Pulse Sensor, Temperature Sensor, ESP8266 Wi-Fi Module, Thing Speak.

I. INTRODUCTION

Today increasingly growing number of people with different type of diseases, this is due to different risk factors such as, physical inactivity and alcohol consumption among others. According to figures from the World Health Organization, 4.9 million people die from lung cancer from the consumption of Cigarettes, overweight 2.6 million, 4.4 million for elevated cholesterol and 7.1 million for high blood pressure. It is said that in the next 10 years, deaths from Kidneys diseases will increase by 17% which means in figures of about 64 million people; Kidneys diseases are highly variable in their symptoms as well as their evolution and treatment. Some if not monitored and treated early they can end the patient's life. Among the most common chronic diseases that can be treated and monitored are diabetes, blood pressure, cardiac arrhythmial Patients with these diseases besides having limitations in their physical condition, also often have economic, emotional and social relations problems, among others [1-2].

Patients usually take time to adapt and accept the reality of disease long-term because disability. Reason where by this group of people with these diseases must have constant monitoring by your doctor to discuss the state of it and set the appropriate treatments. For many years the standard way of measuring glucose levels, blood pressure levels and heart was with traditional exams in a specialized health centre. Thanks to technological advances in today there is great variety running sensor reading vital signs such as blood pressure cuff, gluco-meter, heart rate monitor, including electrocardiograms, which allow patients to take their vital signs daily [3].

The concept of Internet of things is recent and is defined as the integration of all devices that connect to the network, which can be managed from the web and in turn provide information in real time, to allow interaction with people they use it . Another concept of IoT "is the general idea of things, especially everyday objects, which are readable, recognizable, locatable, addressable and controllable via the Internet - either through RFID, wireless LAN, wide area network, or by other means ". IoT The term itself was first mentioned by Kevin Ashton in 1998 and aims at the exchange of information. On the other hand the Internet of things can be seen from three paradigms, which are Internet-oriented middleware, things sensors oriented and knowledge-oriented semantics. Therefore, it is appropriate, such delimitation because the interdisciplinary nature of the subject. However the usefulness of the IoT is reflected when crossing between the three paradigms in the development of applications [4-5]. The Internet of Things has a number challenges that are still working. As in the hardware layer, whose purpose is to allow the interconnection of physical objects using sensors and related technologies? The challenges associated with this layer are related to miniaturization, while today there are devices with storage processing internal parts should be smaller and to improve efficiency.

In the case of the sensors used to measure diabetes, blood pressure, among others, is not very precise and its size is very large and consumes a lot of power. Another challenge is found in the communications layer, which is tasked billion devices connected to the network, which involves improving bandwidth and the electromagnetic spectrum. Faced with the above from the application layer and services are presented countless possibilities that allow to obtain, process and recommend valuable information for patients to treatment of diseases and improve their lifestyles [5].

II. ROLE OF IOT IN HEALTH CARE

In simple sense, Internet of Things (IoT) can be viewed as the wireless integration of smart devices for the purpose of information exchange and storage. Here the reason behind calling the devices “smart”, are they have sensing capabilities as well as able to access the open source internet services due to their in-built networking features. They are also able to interact with human world [6].

The application of this technology in the medical domain, especially in health care system is very prominent and increasing day by day. Gone are the days when for any severe health attack, patients has to look for ways to reach the nearby medical unit to consult doctors in emergency. They are now connected with each other through IoT. Some of the devices include smart meters, wearable health bands, fitness shoes; RFID based smart watches and smart video cameras. Also, Apps for smart phones also help in keeping a medical record with real time alert and emergency services [7].

Following are the reasons for choosing the area for work,

1. To reduced the death rate.
2. To overcome the gap between patient and doctor.
3. reduced the cost of regular check-up.
4. Today’s health care system for patient who stays in home is not reactive so there is need to develop the system.

Patient Health monitoring system and control using IOT technology is used to monitor of the different parameters like (pulse rate, heartbeat, boby Temperature) of the patient in the ICU remotely and also control over the medicine dosage will be provided according to the repot of Survey. The objective of this project is to design and implement a reliable, cheap, low powered and accurate system that can be worn on a regular basis and monitors the vital signs based on IOT technology. The device detects if a person is medically distressed and receiver unit that is connected to a computer plot graph for monitored physiological parameters of a human body [8].

III. BLOCK DIAGRAM AND DESCRIPTION

Figure-1 shows a simple block diagram that explains IoT Based Patient Health Monitoring System using ESP8266 & Arduino. Pulse Sensor and LM35 Temperature Sensors measures BPM & Environmental Temperature respectively. The Arduino processes the code and displays to 16*2 LCD Display. ESP8266 Wi-Fi module connects to Wi-Fi and sends the data to IoT device server. The IoT server used here is Thing speak. Finally the data can be monitored from any part of the world by logging into Thing speak channel.

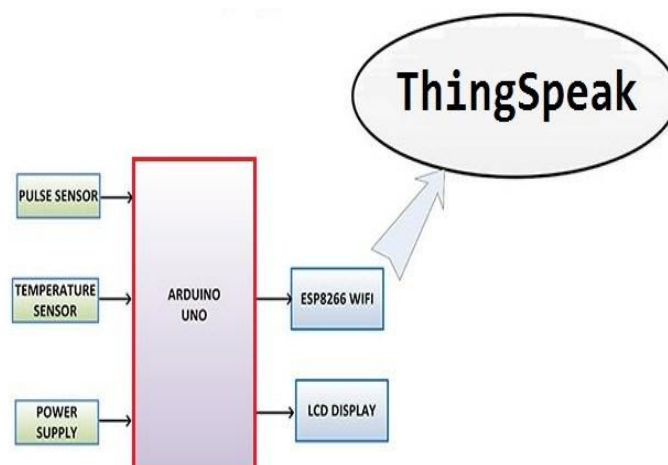


Fig 1- Block diagram [2].

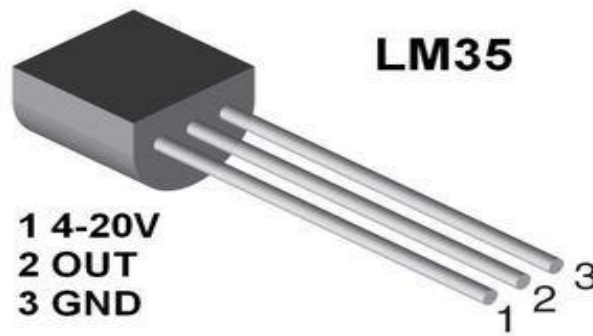


Fig 4- LM35 Temperature Sensor [1].

The ESP8266 is a very user friendly and low cost device to provide internet connectivity to your projects. The module can work both as a Access point (can create hotspot) and as a station (can connect to Wi-Fi), hence it can easily fetch data and upload it to the internet making Internet of Things as easy as possible. It can also fetch data from internet using API's hence your project could access any information that is available in the internet, thus making it smarter. Another exciting feature of this module is that it can be programmed using the Arduino IDE which makes it a lot more user friendly.

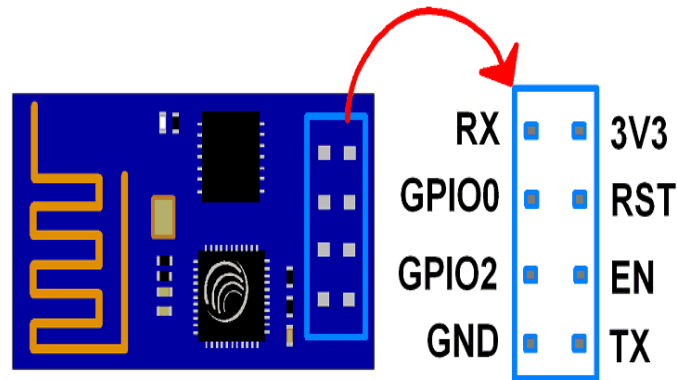


Fig 5- ESP8266 [2].

Thing Speak provides very good tool for IoT based projects. By using Thing Speak site, we can monitor our data and control our system over the Internet, using the Channels and web pages provided by Thing Speak. Then create a new channel and set up what you want. Then create the API keys. This key is required for programming modifications and setting your data.



Fig 6- Thing Speak window.

Then upload the code to the Arduino UNO by assembling the circuit shown above. Open serial monitor and it will automatically connect to Wi-Fi and set up everything. Now click on channels so that you can see the online data streaming, i.e. IoT Based Patient Health Monitoring System using ESP8266 & Arduino as shown in figure-7.

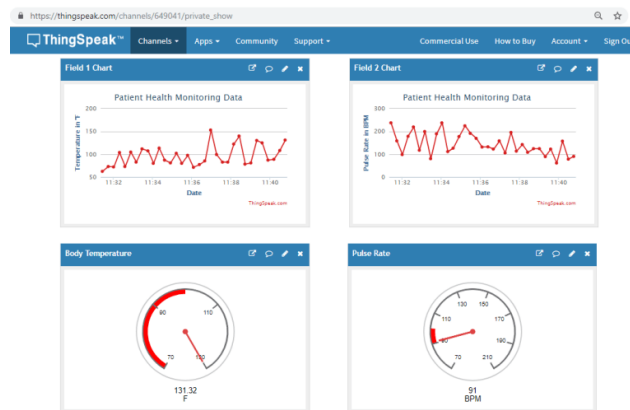


Fig 7- Output results.

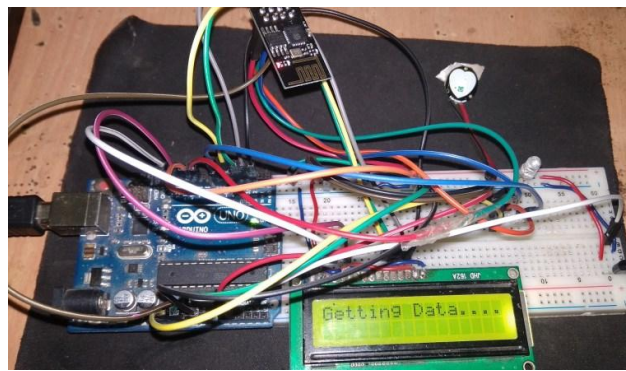


Fig 8- The system arrangement.

V. CONCLUSION

The main idea of this Project is to provide better and efficient health services to the patients. This paper proposes an intelligent Real-time patient monitoring system that monitors the different parameters such as Body temperature, Pulse rate, breath activity. In this proposed system a mobile physiological monitoring system is presented, which is able to continuously monitor the patient’s heart beat, blood pressure and other critical parameters in the hospital. The health precision system based on bulk region set-up and smart sensors be capable of be manage to drop the measure of drop the measure of death. The system enables the clinicians to optimize the usage of available medical resources and minimize the costs in monitoring the patients. The Arduino Sketch running over the device implements the various functionalities of the project like reading sensor data, converting them into strings, passing them to the IoT platform and displaying measured pulse rate and temperature on character LCD.

REFERENCES

- [1] D. Kajaree and R. Behera, “A Survey on Healthcare Monitoring System Using Body Sensor Network,” *Int. J. Innov. Res. Comput. Commun. Eng.*, vol. 5, no. 2, pp. 1302–1309, 2017.
- [2] M. S. S. P and M. P. V. N, “A Survey Paper on Internet of Things based Healthcare System,” *Internet Things Cloud Comput.*, vol. 4, no. 4, pp. 131–133, 2017.
- [3] M. Pustiek, A. Beristain, and A. Kos, “Challenges in Wearable Devices Based Pervasive Wellbeing Monitoring,” in *Proceedings – 2015 International Conference on Identification, Information, and Knowledge in the Internet of Things, IIKI 2015*, 2016, pp. 236–243.
- [4] Giovanni Baldus, "Design of IOT Based Smart Health Monitoring and Alert System" 2, Center for TeleInFrastuktur, Aalborg University, Denmark, 2016.

- [5] Franca Delmastro, "Pervasive communications in healthcare", Computer Communications Vol.35,pp.1284-1295,2017.
- [6] Majer, L., Stopjaková, V., Vavrinský, E., "Wireless Measurement System for Non-Invasive Biomedical Monitoring of Psycho Physiological Processes", Journal of Electrical Engineering. - ISSN 1335-3632. - Vol. 60, No. 2 (2009), pp. 57-68.
- [7] Rajesh, M., and J. M. Gnanasekar, "Congestion control in heterogeneous wireless ad hoc network using FRCC."", Australian Journal of Basic and Applied Sciences 9.7 (2015): 698-702.
- [8] Ovidiu Apostu, Bogdan Hagi, Sever Paşca, "Wireless ECG Monitoring and Alarm System Using ZigBee", The International Symposium on ADVANCED TOPIC IN ELECTRICAL ENGINEERING 2068-7966/ATEE 2011.