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Review on IOT Based Remote Medical Diagnosis System using Node MCU

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Abstract: ***Internet of things (IOT) is networking of physical object that contain electronics embedded within architecture in order to make contact and sense interaction amongst each other or with respect to external environment, In upcoming years IOT based technology offers advance level of service in medicine, power, agriculture, smart cities, home automation and many others. In this paper we have analyzed about Remote Medical Diagnosis system, which can come to help for people in many circumstances. Frequently, people fall sick in locations where there are no hospitals or healthcare facility nearby, in such cases people sometimes even die due to lack of proper treatment and diagnosis. In countryside areas of third-world countries, this problem is even more intense. For affirmation purpose, heart rate and body temperature of a person is determined and rendered over the internet. Health figure is uploaded instantaneously and can be viewed through a web browser. The motto of RMDS is to remotely provide health information of a patient to a medical practitioner in life-threatening situations. It can also be used for remote patient monitoring of regular patients of a health professional.***

Keywords: IOT, Heart beat sensor, Temperature sensor, Microcontroller.

I. INTRODUCTION

Internet of Things (IoT) has a very close relationship with embedded systems, where a smart system consisting of various sensors and modules is connected to the internet. The modules can either be connected to each other through the internet or they can be inter-connected through a local network and the local network can further be connected to the internet. IoT opens doors to numerous possibilities and smart solutions to complicated problems. From agriculture to home automation to smart cities to healthcare, application of IoT is beyond limits. The research in this field has gained a lot of popularity recently. Utilizing IoT in healthcare gives us a lot of benefits. Firstly, it reduces the cost of treatment as diagnosis is performed remotely. Also, it saves valuable time of both doctors and patients while maintaining descent accuracy. It also has the potential of reducing the burden of manual data collection. In life-threatening situations, it can provide image of the patient's health in real-time so that the doctor can make an informed and reasonably quick decision from a remote location. Keeping these facilities in mind, we proposed an intelligent system consisting of a microcontroller, a Wi-Fi module, a button, two sensors (heartbeat and temperature), a Wi-Fi router and a website. The raw sensor figure is first collected and processed by the microcontroller and then it is passed on to the Wi-Fi module. The Wi-Fi module then pushes the data to a remote webserver through a Wi-Fi router. The server stores the data and displays it through the website. A doctor can easily view all the health information by visiting this website and logging in with his/her credentials, which will be provided by the system administrators.

II. LITERATURE REVIEW

In [1], the paper emphasizes about the remote pateint monitering system consisting of microcontroller, three sensor and a radio module which can successfully obtained temperature of petient body, ECG and heart rate. Whenever there is an increasing of petient body temperature and heart rate the authorized care givers gate massage so that they can take some immediate reaction.

In [2],They proposed system of patient health monitoring using IOT can be highly used in any emergency situations as it can be daily monitored, recorded and stored as a database.This system also enables doctor to monitor usefulparameters like body temperature, heart rate, acceleration and saline level of patients in remote areas of hospital and also he can monitor patient when he is out of the premises. If any parameter goes to abnormal this system sends alert (Popup message) to the doctor so in future this IOT device can also be combined with the cloud computing so that the fact can be shared in all hospitals for thorough care and treatment. In [3], they proposed a mobile physiological monitoring system, which is able to continuously monitor the patient's temperature, blood pressure, heart beat, blood glucose level and other critical parameters in the hospital. This paper indicates the use of smart healthcare system.

This new technology has likely to offer a broad range of benefits to patients, supervised rehabilitation, reducing of long waits, early detection of abnormal conditions, continuous sufferer monitoring, and potential knowledge discovery through data mining of all collected information.

In [4], they proposed the physiological parameters of the patient will be monitored continuously with this system. The measurements are made continuous time. The patients framework will be displayed in the LCD display and also in the GUI (Graphical User Interface) which is running in the host PC. The body temperature, body lean movements and heart rate in (BPM) will be exhibited and updated in the GUI. If any affliction is detected by this system the alarm will be triggered to the co-ordinator system.

In [5], they proposed the security andthe privacy issues in healthcare applications using body sensornetwork (BSN). Subsequently,we found that even though mostof the popular BSN based research projects acknowledge theissue of the security, but they fail to embed strong securityservices that could be preserve patient privacy. lastly, we put forward a secure IoT based healthcare setup using BSN,called BSN-Care, which can efficiently accomplish varioussecurity requirements of the BSN based healthcare syste.

III. METHODOLOGY

Remote Medical diagnosis system (RMDS) is capable of measuring two types of health data, first is heart rate or BPM and another one temperature of the body in Celsius. The most prominent part of this setup is the accurate measurement of heart rate. Photoplethysmography is implied to identify heartbeats.

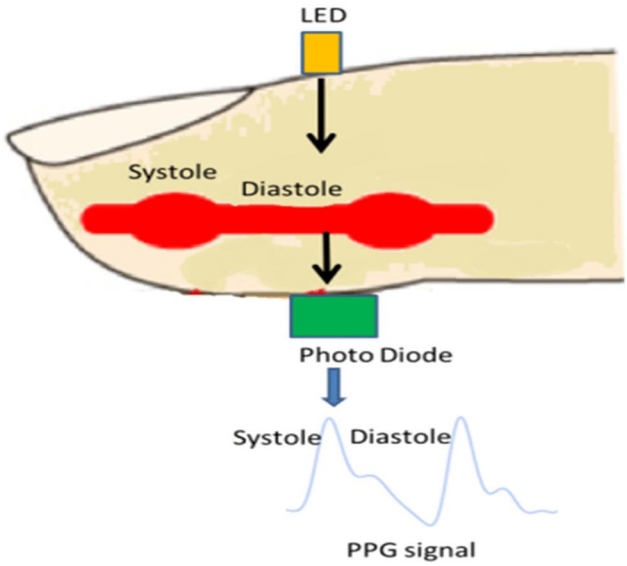

Figure1: Schematic illustration of the photoplethysmography

Photoplethysmography (PPG) is a simple ocular methodology used to recognize volumetric changes in blood in peripheral motion. It is a cost efficient and non-interfering process that makes quantification at the surface of the skin.

The technique gives valuable information related to our cardiovascular system. Recent advances in technology have resuscitated interest in this technique, which is widely used in clinical physiological measurement and observation.

PPG applies low-intensity infrared (IR) light. When light travels through biological tissues it is engrossed by bones, skin pigments and both venous and arterial blood. Since light is more strongly engrossed by blood than the surrounding tissues, the changes in blood flow can be identified by PPG sensors as changes in the intensity of light. The voltage signal from PPG is corresponding to the quantity of blood flowing through the blood vessels. Even small difference in blood volume can be found using this method, though it cannot be used to measure the amount of blood. A PPG signal has many components including volumetric changes in arterial blood which is linked with cardiac activity, variations in venous blood volume which modulates the PPG signal, a DC component showing the tissues' optical specification and subtle energy changes in the body. Some major elements affecting the recordings from the PPG are site of quantification and the contact force between the site and the sensor. Blood flow difference mostly occurs in the arteries and not in the veins.

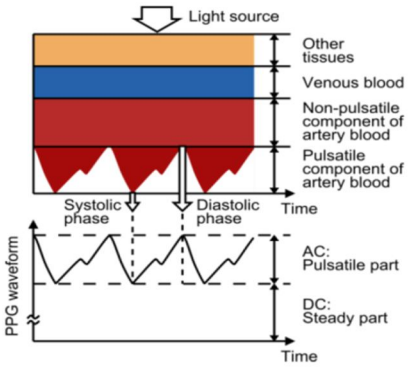

Figure 2: Variation in light attenuation by tissue.

PPG exhibits the blood flow changes as a waveform with the help of a bar or a graph. The waveform is having an alternating current (AC) component and a direct current (DC) component. The AC component corresponds to variations in blood volume in harmony with the heartbeat. The DC element arises from the optical signals reflected or transmitted by the tissues and is set on by the tissue structure as well as venous and arterial blood volumes. The DC component exhibits minor changes with respiration. The primary frequency of the AC component varies with the heart rate and is overlaying on the DC baseline.

IV. RESULT AND DISCUSSION

Many experiments were performed to make sure proper use of this setup. This helps to precisely identify any complication that will arise in future that may happen in actual field. RMDS exhibited success rates while testing. Instantaneous temperature and BPM are uploaded in real time. We compared RMDS with exiting heart rate calculating machines to check the accuracy of our system. We employed an android based equipment which was heart rate programmed and utilized it for the comparison. 'Heart rate plus" is the name of the application which can be downloaded from Google play store. This program uses Photoplethysmography technique for heartbeat detection and BPM measurement.

V. CONCLUSION

The Internet of Medical Things (IoMT) is an implementation of the IoT for medical and health related issues, data assembling and inspection for investigation, and monitoring. The IoMT has been cited as "Smart Healthcare" as a technology to create a digitized healthcare structure, connecting obtainable medical resources and healthcare services. However our motto was also to develop a lifesaver. Heart rate (BPM) and temperature of a person was identified and uploaded on the internet through a Wi-Fi network. Uploaded data was stored in a remote webserver and displayed on RMDS website. Comparisons were also carried to check the precision. Finally advantages and scope of improvement were also discussed. RMDS equipped with IoT technology has benefited in accessing increasing frequency of patient's health data, helped in reduced hospital stays. It enabled patient monitoring even after discharge. It is a more cost efficient which provides real time interventions and support while reducing diagnosis time. These systems have potentially increased the level of transparency and efficiency by the instantaneous upload of data, and accessibility across anywhere around the world.

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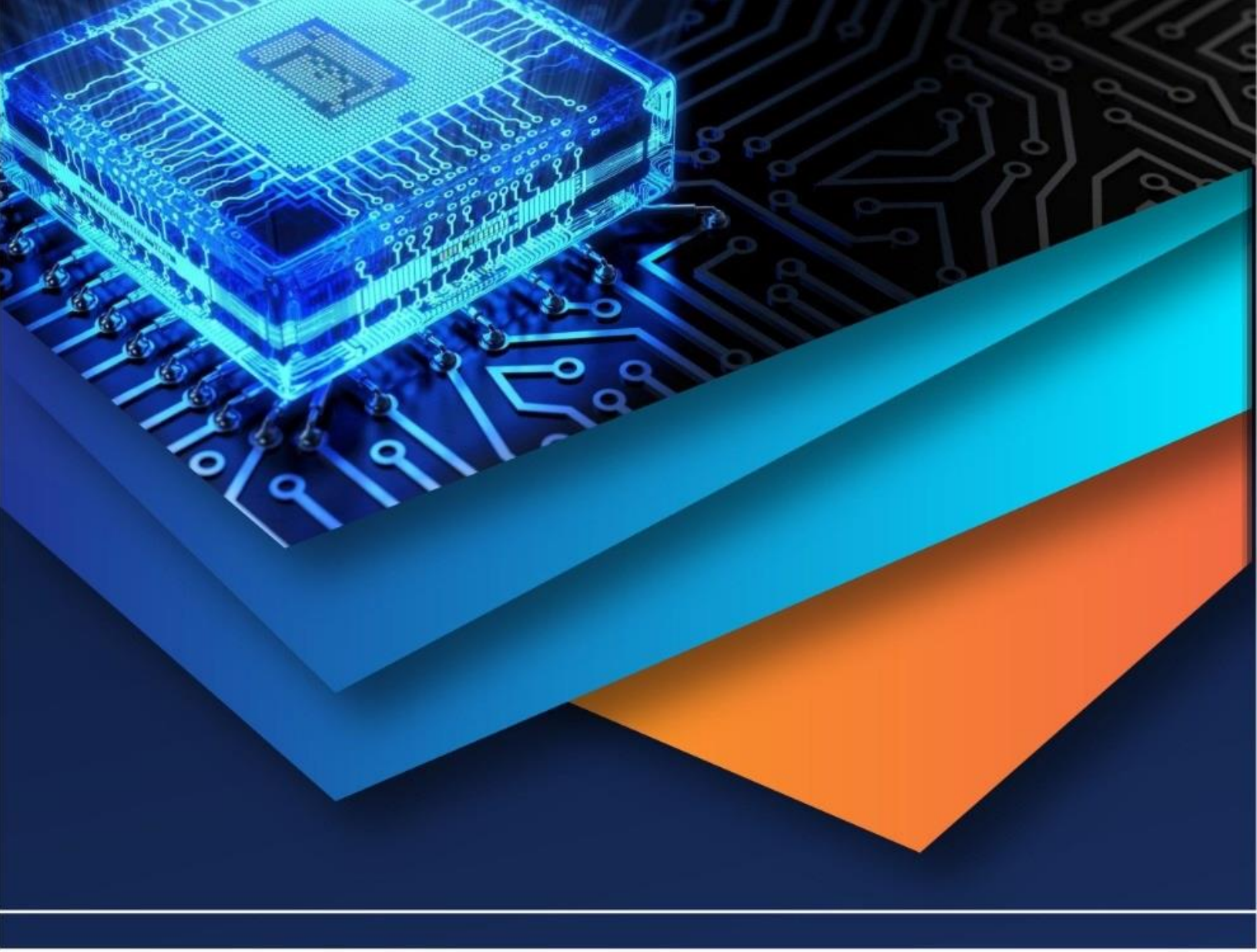

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