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HEALTHCARE SOLUTION USING MACHINE TO MACHINE COMMUNICATION

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Abstract: -

This paper provides a prototype which uses machine to machine communication to provide healthcare solution. ECG and PPG is an important tool to interpret a wide range of heart conditions. Early warning and patient awareness are critical in preventing permanent heart damage and saving much of the heart muscles. These critical conditions motivated us to develop a prototype that provides a long-term ECG and PPG monitoring. This prototype consists of ECG and PPG sensors at the patient's side, that monitors the ECG and PPG and record the signals, these readings are then transmitted with the help of internet to the hospital server. These readings can be accessed in real time by the doctor's smart phone with the help of android app. Our approach is to provide healthcare solution which can process large number of biomedical signals through the network that is a combination of internet and sensors.

Keywords: *machine-to-machine, android app, ECG, healthcare.*

I. INTRODUCTION:

The design of portable systems for remote monitoring of patients specifically those who are suffering from cardiac diseases are becoming one of the most important fields in telemedicine. This system can be useful especially by patient like senior citizens or having physical disabilities or who are alone. Therefore, this system can be utilized for remote medical systems to assist the elderly patients, for self-testing diagnostics, or for physicians to diagnose diseases of the circulatory system.[2] Also, in recent years mankind has witnessed a revolution in the

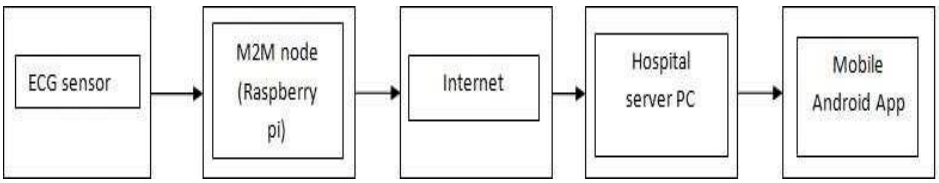

Fig.1. block diagram of overall system.

smart phone industry and emerging growth in the usage of mobile applications that range from entertainment and educational apps to simple games, health care apps and more. The purpose of this paper is to monitor the critical conditions with the help of machine-to-machine communication. Machine to Machine (M2M) refers to technologies that allow both wireless and wired systems to communicate with other devices of the same type. M2M is a broad term as it does not pinpoint specific wireless or wired networking, information and communications technology. The sensors at the patient's side monitor and record the readings, these readings can be accessed at the hospital server PC and the doctor's mobile in real time. With advances in mobile communication, new opportunities have opened up for the development of healthcare systems that remotely monitor biomedical signals from patients. The availability of a new generation of mobile phones has had an important impact on the development of such healthcare systems, as they seamlessly integrate with a wide variety of networks (such as 3G, Bluetooth, wireless LAN, WCDMA and GSM), and thus enable the transmission of recorded biomedical signals to doctors or patients from a central server.

II. System Design.

The overall system architecture of M2M healthcare solution is as shown in fig.1

(i) ECG sensor:

Electrode:

It converts physical signals into electrical voltage. The voltage is in the range of 1 mV ~ 5 mV. The sensor pair is stuck on the right arm (RA), left arm (LA) and right leg (RL) of the subject as shown in fig.2.

Wilson Electrode System: In our project we have used Wilson Electrode system. This system uses the right leg of the patient as "driven right leg lead". This involves a summing network to

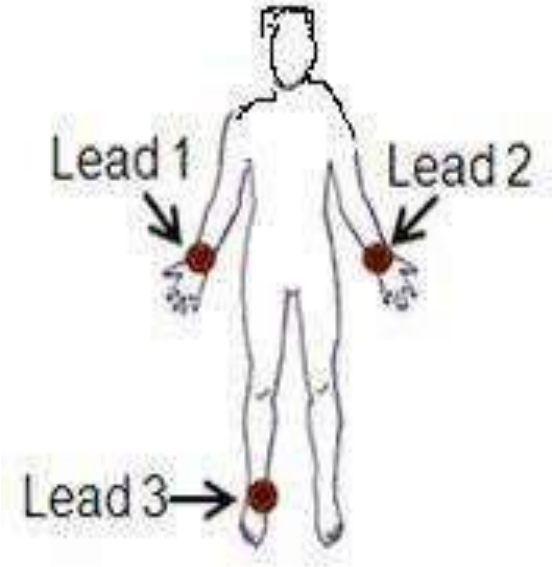

Fig.2. 3-lead connection

obtain the sum of the voltages from all other electrodes and driving amplifier, the output of which is connected to the right leg of the patient. This arrangement is known as Wilson electrode system. The effect of this arrangement is to force the reference connection at the right leg of the patient to assume a voltage level equal to the sum of the voltages at the other leads.

This arrangement increases the common mode rejection ratio of the overall system and reduces noise interference. It also has the effect of reducing the current flow in to the right leg electrode

(ii) Raspberry pi: The Raspberry Pi is a series of credit card-sized single-board computers developed in the UK by

the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools.
The original Raspberry Pi is based on the Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-700 MHz processor, 256 megabytes of RAM, later upgraded Video Core IV GPU,[8] and was originally shipped with

Fig 3. Raspberry pi. Model

The Model B+ is the final revision of the original Raspberry Pi. It replaced the Model B in July 2014 and was superseded by the Raspberry Pi 2 Model B in February 2015. Compared to the Model B it has:
GPIO: The GPIO header has grown to 40 pins, while retaining the same pin out for the first as the model A and B.
More USB: There are 4 USB 2.0 ports, compared to 2 on the Model B, and better hot plug and over current behavior.
Micro SD. The old friction-fit SD card socket has been replaced with a much nicer push-push micro-SD version
Low power consumption: By replacing linear regulators with switching has reduced power consumption by between 0.5W and 1W.
Better audio: The audio circuit incorporates a dedicated low- noise power supply.

(iii) Sever PC and Android Mobile Phone:
The measured biomedical signals are sent to the server PC through the internet by using the Raspberry pi for further processing. The
monitoring and analysis program, written in the C# programming language, monitors, stores, and processes the received data in the server PC, as shown in Fig. 2. Once a data packet has been received through the M2M devices, the packet is processed, and useful data is extracted. When the data is received, an IPv6 address is identified first to ensure that the aggregated data has been sent from the correct M2M device source. Then, the received data is scanned to ensure the data packet is a complete packet. This program continuously monitors not only biomedical signals, such as the PPG signals and oxygen saturation data acquired by wearable sensors, but also information related to M2M devices, such as communication settings and IPv6 addresses, in real-time. Further, it sends the received data to the Android mobile device to support the mobile healthcare monitoring system wirelessly after emulator testing.

III.Results:
The measured values are transmitted and at the server pc and android mobile phone with the help of healthcare app, the values are graphically displayed for the analysis. The Healthcare app is as shown below

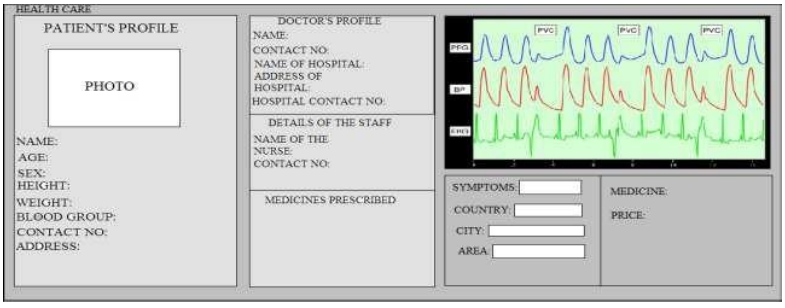

Fig.4. Healthcare App displaying the ECG along with PPG and BP waveforms graphically.

IV. Conclusion

This paper is to design a Raspberry Pi based Monitoring System of ECG Signal. With low cost and less hardware complexity. The system can operate in real time and in future we can to be analysis blood oxygen saturation level and BP.

V. References:

[1].Wireless Machine-to-Machine Healthcare Solution Using Android Mobile Devices in Global Networks

[2].Sang-Joong Jung, Risto Myllylä, and Wan- Young Chung, Member, IEEE G. Z. Yang, Body Sensor Networks, 1st ed. London: Springer-Verlag, 2006, pp. 1–275.

[3].Android Application for Ambulant ECG Monitoring Prerana N Gawale1, A N Cheeran2, Nidhi G Sharma3 M. Tech. Student, Electronics and Telecommunication, VJTI, Mumbai, Maharashtra, India1,3 Associate Professor, Electrical, VJTI, Mumbai, Maharashtra, India

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[5].Sweden PABLO LAGUNA Zaragoza University Spain

[6].INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY Real Time ECG Acquisition System using Raspberry PI Dr. Ganesh V Bhat *1, Anandraddi Naduvinamani 2

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