RASPERRY PI BASED PATIENT HEALTH STATUS OBSERVING METHOD USING INTERNET OF THINGS

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Abstract—In the advancement of Internet technologies all machineries are inter related. Using the technology improvement, we can make many things in high effective and simple for human life. There are several places of Internet of Things (IOT) is used. Such as smart environment, smart home, smart city, smart parking, agriculture fields and medical fields. In medical field also, there are several process are used internet. In this paper, monitor patient’s heart rate, body temperature, Respiration rate and body movements using Raspberry Pi. After connecting Internet to the Raspberry Pi board it act as a server. Then the server is automatically sends data to the webpage. Then these parameters are monitor using webpage anywhere in the world using laptops, smart phone etc. If these parameters are goes to abnormal, it will automatically sends alert message to the doctor.

Keywords—Raspberry Pi board, Heartbeat sensor, Temperature sensor, Respiration sensor, Accelerometer sensor, Internet of Things.

I. INTRODUCTION

From the development of technologies (Internet of Things) is changing the human life into a new level. IoT is change the normal human life to smart life with new technology level. There are several process such as smart home, smart city, health monitoring systems are monitor using Internet of Things. Internet of Things is used for monitor all patients in any level. In this paper, patient’s heart rate, body temperature, breathing rate and body movements are monitoring using Raspberry Pi.

Raspberry Pi is a processor for used in many IoT applications. Raspberry Pi is works on linux platform. The cost is also very low. The GPIO pins are used for connecting between sensors and Raspberry Pi.

Raspberry Pi and internet connection is a new innovative technology in healthcare systems. After connecting Internet to the Raspberry Pi it act as a server. Then the server is automatically sends data to the webpage. Then these parameters (Heart rate, Body temperature, Breathing rate and Body movements) are monitored. If these parameters are goes to abnormal it will automatically sends alert message to the doctors and relatives.

II. LITERATURE SURVEY

M. Wcislik et al [2] monitors patient’s body temperature, pulse rate, ECG wave and patient’s body position using ARM cortex M4F micro controller. Android app is created for monitor these values. Bluetooth connection is used for connecting microcontroller and Android phone. In my paper monitor patient’s body temperature, Respiration rate, heart rate and body movements using Raspberry Pi board and sensors. Android app is support only android phones. Bluetooth is very short distance for communication. It supports only within 100 meters. In my project webpage is created. Using IP address anybody can monitor patient’s health status anywhere in the world.

Amir-Mohammad Rahmani et al [3] monitor ECG wave using panda board. Ethernet connection is used for connecting internet to the panda board. In my paper monitor body temperature, Respiration rate, heart rate and body movements using Raspberry Pi board. Panda board is very difficult to operate compare to Raspberry Pi board. Ethernet connection is also very short distance. So i use USB modem for connecting internet to the Raspberry Pi board.

Hoi Yan Tung [3] et al monitors body temperature, ECG, heart rate using DRZHG micro controller. A Dual Radio ZigBee Homecare Gateway (DRZHG) has been proposed and implemented to support remote patient monitoring. The idea of remote patient monitoring is to simultaneously track the status of long-term patients at home by using mobile medical sensors. The sensors collect medical data from patients and feedback the data to the doctors. Zigbee module is used for connected to the micro controller. Zigbee module is used for transfer the values to the receiver side. It is send data to only nearest place. But my project internet is connected to the Raspberry Pi board. So using IP address anybody can monitor patients health status anywhere in the world.

Joao Martinhoea [4] et al describe the design and successful implementation of a remotely operated physiological
monitoring device. The prototype performs acquisition of three types of physiological measurements electrocardiography, finger photoplethysmography, and blood pressure plethysmography. Atmega 328 microcontroller is used for connecting these sensors. Wifi connection is used for connecting internet to the atmega 328 microcontroller. After connecting Wifi connection it will transfer the values. If wifi hotspot is no means it is not transfer the values. Wifi is also works on short distance. In my project USB modem is used for connecting internet to the Raspberry Pi board. So it is easily connect to the internet in any place.

III. METHODOLOGY

![Architecture for Patient Monitoring System using Raspberry Pi](image1)

In this paper we have temperature, respiration, patient’s body movements and heart beat reading are monitoring using Raspberry Pi. These sensors signals send to the Raspberry Pi via amplifier circuit and signal conditioning unit (scu), because the signals levels are low (gain), so amplifier circuit is used to gain up the signal and transmit the signals to the Raspberry Pi. Raspberry pi is a Linux based operating system works as a small pc processor system. Here patients body temperature, body movements, respiration and heart rate is measured using respective sensors and it can be monitored in the monitor screen of computer using Raspberry Pi as well as monitoring through anywhere in the world using internet source.

The proposed method of patient monitoring system is monitor patient’s body temperature, heart rate, Respiration rate and body movements using Raspberry Pi. After connecting internet to the Raspberry Pi it act as a server. Then the server is automatically sends data to the website. Using IP address anybody can monitor the patient’s health status anywhere in the world using laptops, tablets and smart phones. If these parameters are goes to abnormal it will automatically sends alert mail to the doctors and relatives.

After full hardware completion process, then putty software is used for completion of full project. Sakis 3g is used for install a USB device. Then apache server is used for transfer these parameters (Patient’s body temperature, Heart rate, Respiration rate and body movements) from Raspberry Pi to website.

After installing Putty Software install Sakis3g software. USB modems are not possible for install directly to the Raspberry Pi. So after installing Sakis3g install USB modem device to the raspberry Pi. After installation then type lsusb in the linux terminal for whether the USB modem is detected or not. After detection modem connect to the internet.

IV. RESEARCH AND DEVELOPMENTS

![Hardware connection setup for Patient Monitoring system using Raspberry Pi](image2)

Install Apache server to the Raspberry Pi for internet monitoring. Apache server is used for transferring the values from Raspberry Pi board to web server.

PHP server is used for run the webpage coding. After creating web page coding saved it on Raspberry Pi desktop. After installing PHP server webpage is run. The parameters values is also display in the webpage. To allow your Apache server to process PHP files, you will need to install PHP5 for Apache. Type the following command to install PHP server.

```
Sudo apt-get install php5 libapache2-mod-php5 –y
```

V. CONCLUSION AND FUTURE WORKS

Technology plays an important role in today's world like industries, personal life's, environment and agriculture fields. Among these fields health care process is the most important field and crucial also. The improvement of medical equipments and devices also plays a significant contribution for technology development in health care devices. This process is produces doctor's for new technology to monitor private use. Patient's also connect video conference to the physicians for improving their health status. It also reduces patient’s money and waiting time at hospitals. Using this technology development, patient's record their health status in their own mobile phone and then store the data.
Then again open one \textit{linux} terminal. Then type \texttt{username} and \texttt{password}. After registering Airtel network, type \texttt{ifconfig} in the \textit{linux} terminal. There are three types of IP addresses are displayed. In that process choose ppo IP address. If we disconnect the USB modem, then again register with network means the address is changed. Now the ppo IP address is 223.236.0.92.

Then type \texttt{python main.py} in the \textit{linux} terminal for run these parameters Patient’s (heart rate, Respiration rate, body movements and body temperature) codings. Then type this address 223.236.0.92 in browser. After that anybody can monitor the patient’s health status anywhere in the world.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure1.png}
\caption{Patient health status are monitoring using IP address}
\end{figure}

These parameters values are goes to abnormal it will automatically sends alert mail to the doctors and relatives. Human beings normal body temperature is 35º C. The temperature value is goes to 40º C the mail is sent. Normal heart rate is 72, if it goes to 85 it will automatically send mail. At the same respiration rate is goes to 40 it will automatically send mail to the doctors and relatives.

In future add more parameters for monitor patients health status. Add EEG, ECG and more parameters are add for monitoring patients health status. Web cam is also possible connect to the Raspberry Pi. After connecting webcam to the Raspberry Pi anybody can monitor patient’s directly anywhere in the world. Wifi adapter is also available for Raspberry Pi. So after connecting wifi adapter it act as a server. So within a small circle there is no extra internet connection for monitor patient’s parameters. Switch on to wifi in your laptop, mobile phone and connect wifi internet from Raspberry Pi and monitor these values using the IP address.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure2.png}
\caption{Abnormal values are send to mail}
\end{figure}

In my previous work, I have done my hardware side only and I got output from all the sensors. Now I have completed my full project and got output by monitoring output through internet and if these values go abnormal it will automatically send alert message to doctors and relatives mail.

\section*{ACKNOWLEDGMENT}

I thank the Department of Electronics and Communication Engineering of Kalasalingam University,(Kalasalingam Academy of Research and Education ), Tamil Nadu, India for permitting to use the computational facilities available in Centre for Research in Signal Processing and VLSI Design which was setup with the support of the Department of Science and Technology (DST), New Delhi under FIST Program in 2013 (No.SR/FST/ETI-336/2013).

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