PM'DROID: **P**atient **M**onitoring on An**droid**

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ABSTRACT
Now-a-days, if we compare the population and number of diseases, we find that, the count of diseases is more than today's population, so death-rate is rising. So as to avoid this, Timely treatment is necessary. This paper explores machine, which gives special care for ambulatory patient, providing immediate message in case of emergency. To indicate emergency treatment, ULN device is used. It reduces human efforts. This system focuses on physiological vital parameter such as temperature and heart rate. Sensors which are used for the patient sends data to android mobile via Bluetooth and also updates database on computer.

Keywords
Bluetooth, ULN device, Sensors

1. INTRODUCTION
In today's ever growing population, everyone is focused on competition and raising standards, they don't have time to manage their stress which gives rise to number of fatal diseases. The majority of patients are ambulatory so they need special care. In the previous version of this system, ZigBee was used so the domain came under Cloud Computing. The main disadvantage of building this system under cloud computing was that, more hardware was required and hence separate computers were required to hold the database for each patient. Also this led to high expenditure [1].

In the next version of this system [2], database was maintained on sever side for every patient so that, rise/fall in patient's health can be easily known. Hence, if patient's health becomes critical, an immediate Email was sent. But, PMDROID does all this along with an alarm and sends text message instead of an Email

The system developed in 2012, comprises of transducer which uses highly cost machine. And android was maintained on the doctor's side. The major disadvantage was that, its hardware cost was high.

Our system provides well monitoring via Android device which is reasonable to all. PMDROID saves patients life, maintaining patient's health database of those patients who are deemed to be most at risk of being physiologically unstable and who are in need of expert review. Our system will work for them. In this system, sensors are connected to microcontroller through which we can send data to android mobile in the graphical form. As well as, it sends data to computer for every second it will update that data. In android mobile, we have one GUI page which contains mobile number of doctor or any relatives when emergency occurs android mobile will send a message to that respective number and patient will be treated in that serious condition. In PMDROID system, we have already set threshold value of temperature. If temperature value rises above threshold, then alarm will buzz. Due to alarm device doctor knows where emergency is needed.

2. EXISTING SYSTEM
Until now, the existing work developed is focused only on platform infrastructure decision, which supports framework and expert system. This reviews found in [1].

In the previous one, only expert systems were available but they were expensive. So, monitoring of patients was not easy. In particular time interval, doctor has to visit every ward. The communication flow between patient and doctor was decreased. After this, new system had generated. That system has fast communication also alarm device was available. So, in emergency condition alarm was buzzed. But it did not introduce use of any sensors. In existing one, we can't retrieve data of previously visited patients. Also we can't update database about negative and positive results of patient. Existing system has domain as cloud computing where they had provided separate computer for each patient. But we can't use Android mobile to display values of temperature, heart beats etc. Graphical representation of physiological values was not available. At low cost, expert system which was available, was not portable. Bluetooth for transferring data was not used. When concerned about security, the previous system used wireless area network which brought network failure and it also used OSI model. Based layering attack on ZigBee/IEEE 802.15.4 stack which may be countered by combining ZigBee/IEEE 802.15.4 and security so this effect on data.

3. PROPOSED ARCHITECTURE
The system we proposed , mainly focuses on special care to be taken for ambulatory patients .Due to raising standards and money , man has turn his heads off of his own health , which has dumped him into many critical diseases. So, our PMDROID is specially built for ambulatory patients. In PMDROID User has to login the application GUI so that he can proceed further. After successfully login, User can connect to hardware and test it to initialize. After successfully testing, user can view real time graph of his body parameters like temperature, heart beats etc.Whereas, on the Android GUI, the standard

threshold values of temperature and heart beats are set, respectively. The data will be sent to the controller, where it verifies whether the value crosses the stipulated threshold (here, user may be a Doctor or Nurse)

For mounting physical of body parameters of patient with controller the patient has to make use of the sensors provided. All the information will be sensed by controller using

3.1 Working

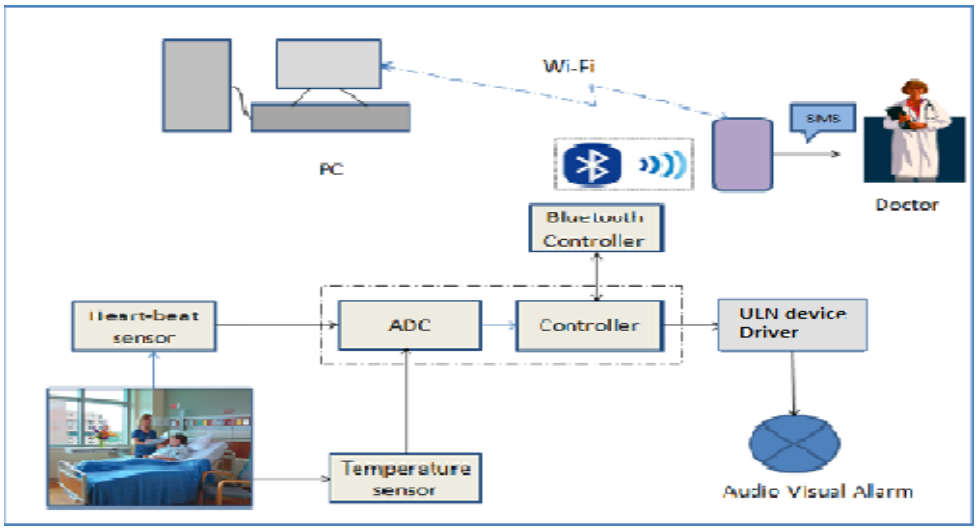

Figure 1: Architecture of PMDROID

AVR (ATMEGA32L), which has inbuilt ADC. ADC reads all this data and sends it to the android device via Bluetooth (HC-05).For Android, we have two GUIs, One showing doctor's mobile number, or any person who is in relation with patient. Another GUI showing, graphical representation of patient's physical parameter. Main server is connected to the android and for this connection; we are using Wi-Fi. For every second, result will be updated and saved at the server side, where it checks that this value rises or falls below the threshold. As the value exceeds the threshold, an immediate message will be sent to the doctor informing the patient's emergency and in case, if needed, ULN device that is ALARM will be buzzed Hence so forth the patient will get immediate major for his treatment and gets prevented from hilarious attack.

3.1.1 PMDROID Hardware:

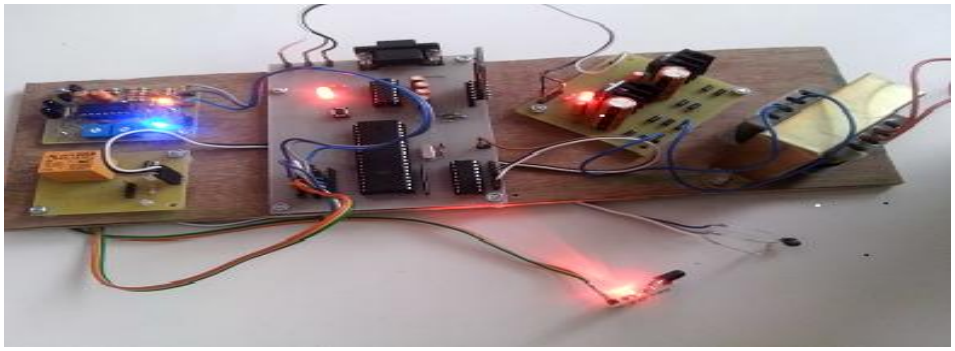

Figure 2 : PMDROID Hardware

3.1.1.1 ATMEGA32L

- 40 pin IC
- 8 bit microcontroller with 32k bytes
- Advanced RISC architecture
- High Endurance Non-volatile memory segment 1024 bytes EEPROM
- 2K bytes internal SRAM
- 8 channels 10 bit ADC
- Byte-oriented 2 wired Serial Interface
- Programmable serial USART
- Power On RESET

  2.7 to 5.5 v ATMEGA32L
- Operating voltage speed grade

  0 to 8 MHz
- Power consumption at 1MHz, 3v,25 degree Celsius

3.1.1.2 Bluetooth (HC-05)

a) Hardware Feature

- Typical 8dBm sensitivity
- Up to +4dBm RF transmit power

- UART interface with programmable baud rate

b) Software Feature

- Supported data controlled baud rate 9600
- Auto-reconnect in 30 minutes when disconnected as a result of beyond the range of connection

3.1.2 PMDROID Software

In PMDROID application this is first form which is known as launcher activity. Figure 3 indicates how to enter in patient's Database, by clicking on proceed button we can go to the next page.

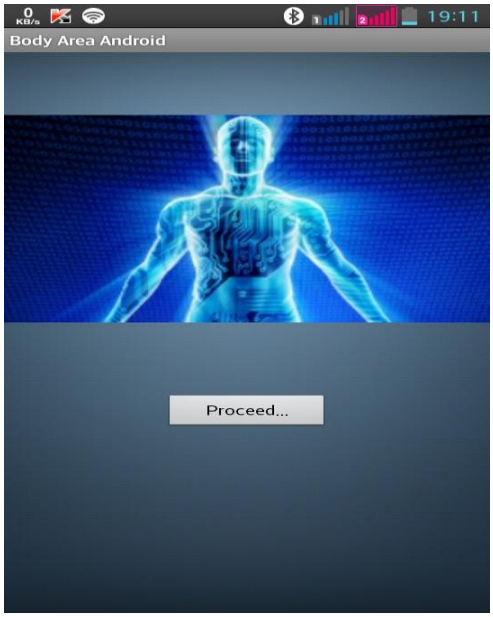

Figure 3: PMDROID Launcher

In figure 4 shows android GUI in which IP configuration have done in first edit text by giving IP address of server side. In second Edit text mobile number of any respective doctor has given. And last email address has been set to send mail in emergency condition.

Figure 4: Setting Activity

In figure 5 scanning devices activity have been done. In PMDROID HC05 Bluetooth chip used so while scanning devices we have to pair with that particular name only.

Figure 5: Scanning Devices

In following two figures we have one seek bar on which we are setting the desired threshold and checkboxes are provided for SMS and email alerts. As sooner, the temperature crosses the threshold respective action will be performed. In addition to this, the heart rate graph shows the effective rise or fall of the patient's hearts beats.

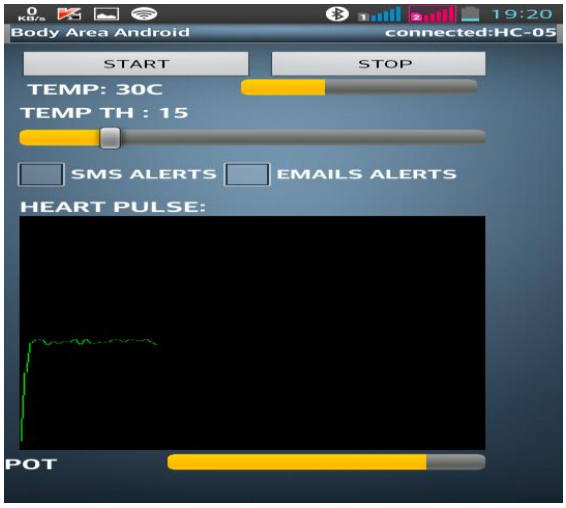

Figure 6: Graphical View

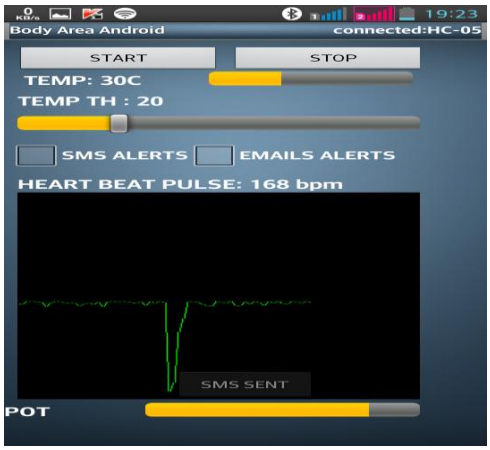

Figure 7: SMS Alert

Figure 8: Welcome GUI

This is first GUI in server side which is Welcome GUI

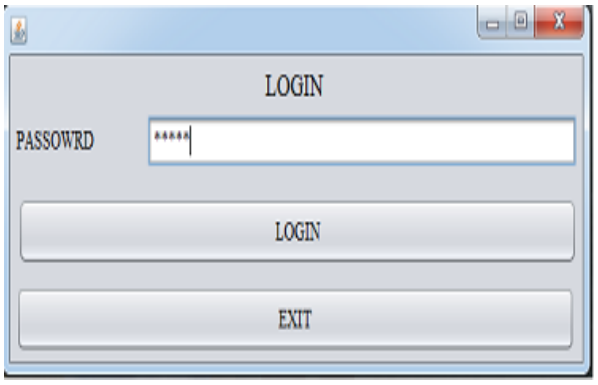

Figure 9: Login GUI

This is Login GUI in which we enter password, if we click on login then we can enter into next GUI otherwise message will display that "entered password is incorrect please enter correct password" . if we click on button 'EXIT' then we exit from server side.

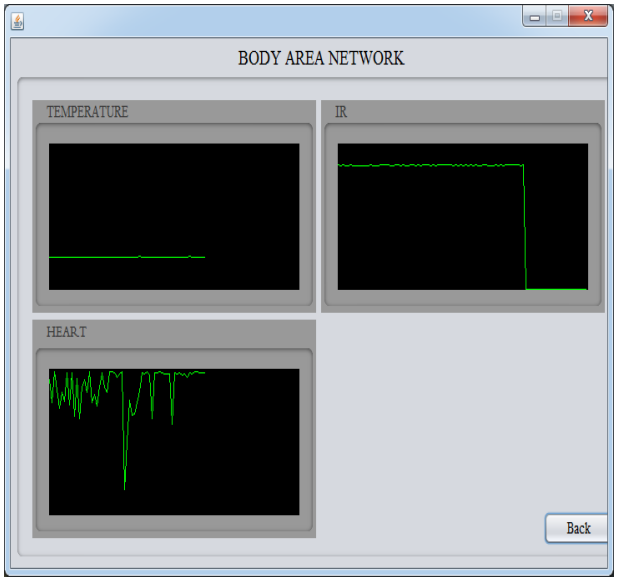

Figure 7: SMS Alert

In this GUI we shows the graphical view of psychological parameter such as temperature, heart rate etc.

When we press button BACK we exit from server.

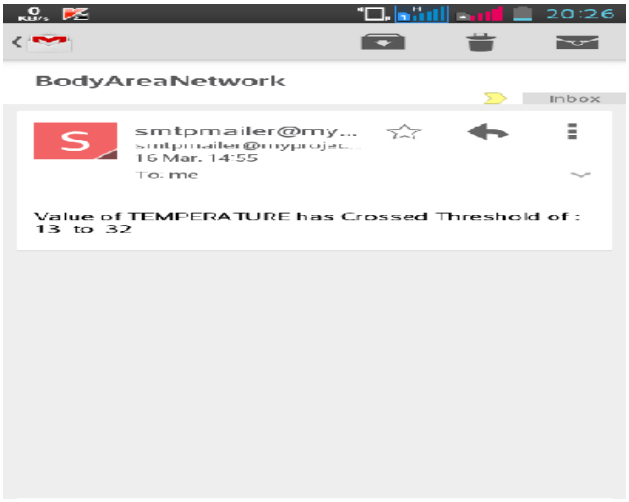

Figure 8: Result of Mail

Above figure 8, shows the experimental result of Email. This result shows current value of temperature and threshold value which is set by the user.

Figure 9: Result of Message

In the above figure 9, shows the experimental result of message. Value of temperature has been crossed threshold value.

4. MATHEMATICAL MODULE

S={P,Hv,Ts,Thr,Checkthr(),Action(),SMS(),SendtoServer(),Mobile()}

Where,

$P = \{P_1, P_2, P_3 \ldots, P_n\}$

$Hv = \{Hv_1, Hv_2, Hv_3 \ldots Hv_n\}$

$Ts = \{Ts_1, Ts_2, Ts_3, \ldots, Ts_n\}$

$Res = Checkthr(S_1, S_2)$

Dev(On/Off)=Action(Res)

Send = SMS(Mobileno , content)

Send1= SendToServer(Hv,Ts)

Mobile(Hv,Ts)

Here, 'P' is the set of patients. 'Hv' is the set of heart rate values. 'Ts' is the set of temperature values. 'Checkthr' is a function which checks two sensors values respective for temperature and heart rate. And it returns Boolean value1/0. Device (Dev (ON/OFF)) is decided depending upon the action. If the result of action is true, then the device is turned ON, otherwise device will be turned OFF. 'SMS' contains two parameters: mobile number and content. 'Send1' is a function which sends data to the server i.e. set of heart rate values and temperature values. Since, the data obtained from the controller cannot be understood by us, so the following procedure needs to be done,

- Temperature in ^{0}C = 0.35*(temperature in digits)

- Time Interval = (End Time – Start Time)

- Heart beat rate = (60 sec*Total heart beat Obtained in time interval)/ (Time interval)

5. CONCLUSION

PM'DROID enables the communication between patient's physiological parameters and android through Sensors.

The main factor to be considered is the IR sensor. It helps to check whether both sensors (temperature, heart-beat) are working and also used as levelling sensor.

The sensors sense the temperature and heart-rate values, thereby sending data to Android mobile via Bluetooth. Here we have used Bluetooth HC05.

It checks threshold value of temperature if current temperature value goes above threshold it will send the message to respective number and email to the respective email ID.

Values of infrared sensors, temperature and heart beats will send to the server and displays them in the graphical form. When these values are changed, server will update with new values.

Glowing LEDs show that respective part of hardware kit is working.

The provision of Alarm alerts the environment invoking an emergency text message or an email.

Thus, PM'DROID takes into consideration all the important and required issues that are needed in emergency. So it is helpful in hospitals to avoid death rate. We can use it at any place other than hospital like home etc.

6. FUTURE WORK

Patients can make use of wearable sensors, only condition is that the manufacturing of controller is done by machine.

If Bluetooth is not used to transfer data from sensors to computer, then the alternative way to communicate would be by using Serial communication (MAX232) cable or supply connection by COM port.

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