

Smart Health Monitoring and Controlling using Raspberry Pi3

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Abstract: In the recent growth of Technology Internet of Things (IOT) makes all Devices connected to each other and the it can be monitored via internet as well as can be controlled. In latest technologies IOT gives a platform where the user can access anything from anywhere. Some of the applications of Internet of Things are Smart Home, Smart Grids and Health monitoring System. Health monitoring is the procedure in which the Patient Data (Temp of body, Heartbeat, E.C.G, Respiration etc.) is continuously updated on the internet website via sensors which are connected to Patient. By IOT the patient data is easily access by doctors and doctors can treat well. By Health monitoring System the major advantage is that it reduces human error. In this paper discuss about, monitoring Heart Beat, Temperature of Body and Blood Pressure using Arduino, Raspberry pi and updated on GUI. If any parameter goes above or below of predefine levels, status will be updated and doctor can activate button of respective tablet so the Medication Box get open and patient have crisis tablets on Real time.

Keywords: Raspberry Pi3 board, Graphic User Interface, Temperature Sensor, Blood Pressure Sensor, Arduino, Internet of Things.

1. INTRODUCTION

The Internet of Things (IOT) is the inter-Connect of physical devices, Industries and other items embedded some software's, some sensors, actuators, and internet connectivity which enable these Devices to collect and exchange data. The IOT allows Devices to be sense/control remotely across network infrastructure, creating Direct Interaction with sensors via network Infrastructure, and results in improve accuracy of system and Reliability of system with reduce human Interaction.

One of the Platforms which connect devices with internet is Raspberry pi. The combination of Raspberry pi and IOT made innovation technology in Health care monitoring system. Raspberry Pi act like Nurse of Clinic which take the Data of (Temperature, Heartbeat, Blood Pressure) Sensors and send these details periodically on internet page. To make system portable a bracelet is made which consist of Temperature, Heart rate Sensor connected with Arduino Uno which takes the sensor data and send it to raspberry pi via Bluetooth module. This bracelet is fixed on hand of Patient. The Raspberry pi receives these data and send to GUI (Graphic User Interface) via Internet connection. According to data is temp/Blood pressure/Heart rate goes above or below the

range the doctor triggers button on GUI which dispatch medicine from Medicine Box and this will be update on Page. In medication box daily Dose of medicine will be available so at predefined time (10Am) buzzer rings to notify that come and take medicine. Patient press button and Box open in which morning tablets are available. The data is available on the Page with the help of this Technology the Doctor can easily monitor as well as control Patients anytime and anywhere.

2. LITERATURE SURVEY

Author Prosanta gope [1] proposed Bsn-care: A secure iot-based modern healthcare System using body sensor network model provides ECG, EMG, EEG, blood pressure data over internet . If any Abnormality detects it gives notification to user as well as server where emergency message is forward to family local hospital and doctor.

Author Geng Yang [2] proposed and implemented iHome Health-IoT. he platform involves an open-platform-based intelligent medicine box (iMedBox) with enhanced connectivity and interchangeability for the integration of devices and services; intelligent pharmaceutical packaging with communication capability enabled by passive RFID and actuation capability enabled by

functional materials; and a flexible and wearable bio-medical sensor device (Bio-Patch) enabled by the state-of-the-art inkjet printing technology and system-on-chip. The proposed platform seamlessly fuses IoT devices with in-home healthcare services.

Author Punit Gupta [3] proposed methodology consist of ECG, Heart rate, Blood pressure sensors which is connected with Intel Galileo board. It receives the data from the sensor and with the help of Internet Patient data is send to the web Server and display on website. The patient family as well as Doctor and Hospital staff can monitor Patient status via website.

Author B. Sneha [4] proposed methodology consist of sensors, alarm, ATMEGA controller, Bluetooth module and android based mobile phone. This module monitors heart rate, ECG, Temp and send the sensed data to android mobile via Bluetooth which is connected with ATMEGA controller.

Author R.Kumar [6] proposed methodology consist Temp, Respiration, Heart rate, Accelerometer Sensors connected to Raspberry pi which receives the patient data and send to the web data base. So the doctor can monitor status of patient anytime from anywhere.

3. PROBLEM STATEMENT

- In traditional System Patient must report to the Doctor every three days to check up so Doctor can treat well. But real time doctor not able to check the patient health status.
- Health monitoring system are Adopted to provide Patient health care data on Internet/Android Mobile, with the help of this data doctor can easily monitor the patient health parameter. It helps Patient in emergency time. But the drawback was the patient health cannot be control in Real time.

4. PROPOSED MODEL& HARDWARE

Smart Health monitoring and controlling that collects automatically patient's Pulse rate, Temperature, Blood pressure and display the information on Web page. This would help the doctor to monitor his/her patient from anywhere and also to the patient and his/her family to send status directly to the doctor without going to hospital. Depend on the status doctor can dispatch medicine if any parameter of patient goes beyond the normal range. Medication Box also consists of Daily routine tablets as Prescribed by Doctor. At predefined time Buzzer will on which take attention of patient to come and have Medicine.

Proposed model consist of following Hardware:

- Raspberry Pi3
- Arduino
- HC-05 Bluetooth
- LM-35 Temperature sensor
- Sunrom-1437 Blood Pressure sensor
- L293d Motor driver

5. BLOCK DIAGRAM & DISCRPTION

In this project, there are two parts:

1. Smart Bracelet.
2. Controlling unit.

Smart Bracelet:

- It consists of Temperature sensor (LM35), whose output is in analog form and it provides output voltage 10mV/Celsius. First with the help of internal ADC of Arduino Output is converted into Digital form which shows Temp in Celsius. The output is in the form of Celsius to convert into Fahrenheit, calculation is used:

$$Far = (Temp * 9 / 5) + 32$$

- Blood Pressure sensor (SUNROM-1437) which provides digital serial output to the Arduino Uno. Output frame consist-

Systolic, Diastolic, Pulse

- Arduino make the frame of data to be transmitted send this data to Raspberry pi3 via Bluetooth module (HC-05), which is connected to Arduino on 9600 Baud rate.

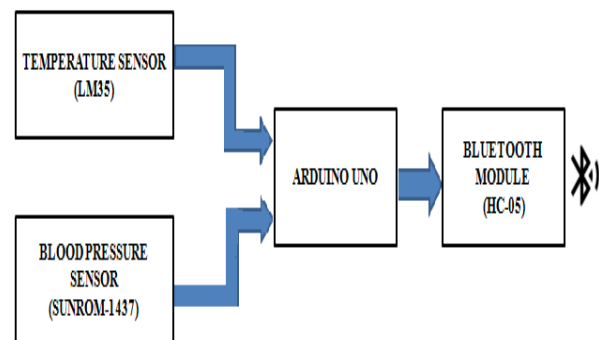


Figure 1. Block diagram of Smart Bracelet

Controlling unit:

- In controlling Unit Brain that is Raspberry pi controls all over operation. Raspberry pi receives Bracelet data via inbuilt Bluetooth and send it to the GUI (Graphic User Interface) Page. The GPIO pins are also connected to the Medication Box.
- If the any parameter of Patient goes above & below the set values the Status is updated along with result like (B.P is Low, Body Temp Is High etc.).

- According to real-time data the doctor can trigger the button on GUI which will open the box of respective medicine. So with the help of this Patient can have Emergency medicine easily.

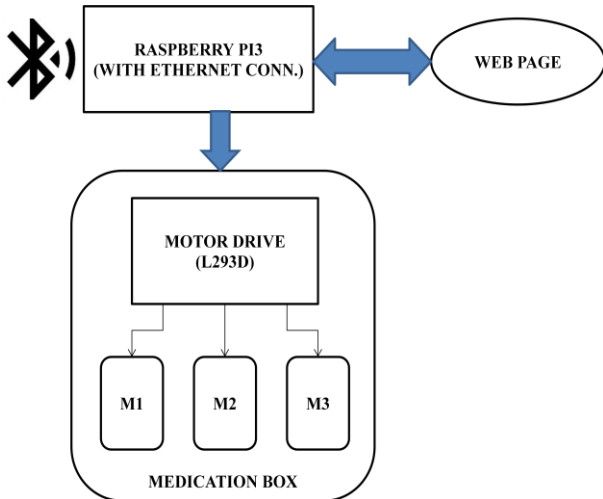


Figure 2. Block diagram of Controlling Unit

- In Medication Box Daily Prescribed tablets are available. Raspberry pi3 On the buzzer at Predefined time so the Patient can come and press the Button so the Medicine box get open as Prescribed by doctor and take the medicines and turn Box Close

6. CIRCUIT DIAGRAM

Circuit Diagram of Smart Bracelet

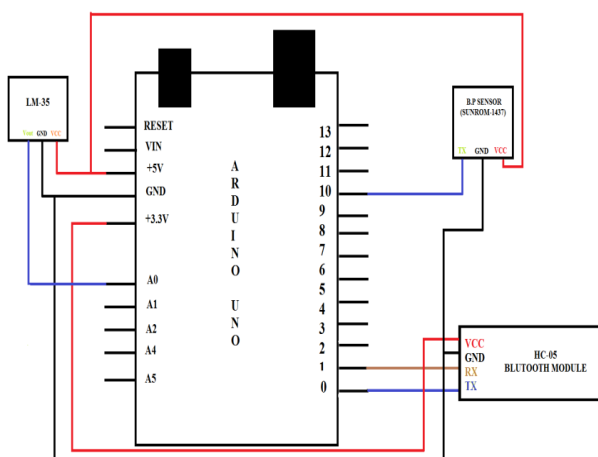


Figure 3. Circuit Diagram of Smart Bracelet

Description:

- LM35 Output voltage is connected to A0, Arduino converts analog data into digital form which is

proportional to the Deg C then it is converted into Farh with the help of program.

- Blood Pressure Sensor-1437 gives serial Output to the Arduino pin-10 at baud rate of 9600. It consist (Sys, Dia, Pul) with the help of program data are extracted.
- Data frame is made and send to Raspberry pi3 via HC-05 Bluetooth Module. Tx of HC-05 is connected to pin-0 and Rx is connected to pin-1 of Arduino. HC-05 is programmed at baud rate of 9600.

Circuit Diagram of Controlling Unit

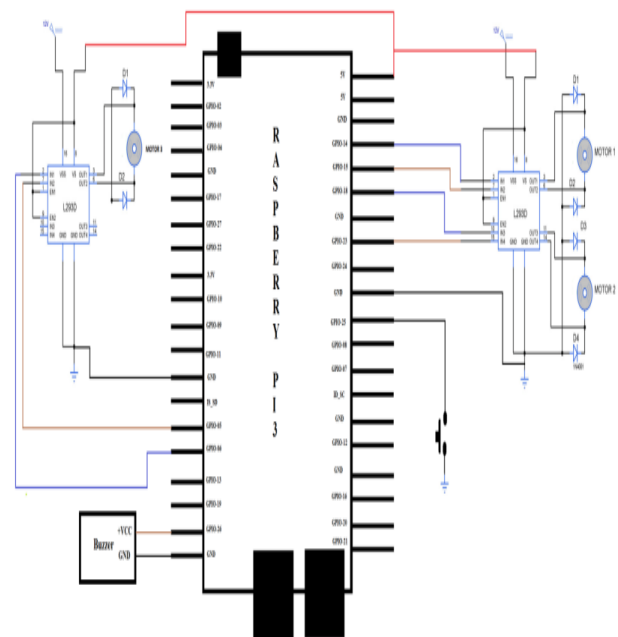


Figure 4. Circuit Diagram of Controlling Unit

Description:

- Raspberry pi3 receives the Serial data over Bluetooth and send to GUI Interface. Raspberry pi3 Is programmed to check the data if value become low or high of predefined level the status is updated like (Low B.P, Fewer etc).
- L293d Input lines are connected to GPIO-05,06,14,15,18 & 23. Enable of L293d is connected to +Vcc.
- Buzzer is connected to notify the Patient to come and have Medicine, which is connected on GPIO-26 with active HIGH Output.
- Switch is connected at GPIO-25 with active LOW Input, when Patient Press the Switch the respective medicine box gets open.
- Daily routine medicine are also available depend on real time Raspberry pi trigger buzzer so the patient come and press Switch to receive medicines.

7. SOFTWARE IMPLEMENTATION

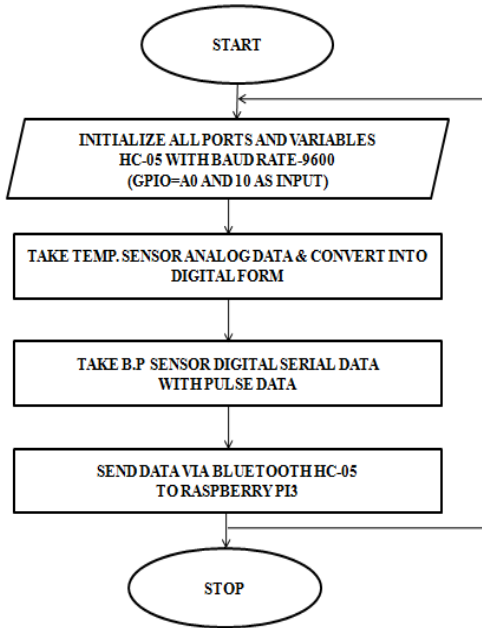


Figure 5. Flow Chart of Smart Bracelet

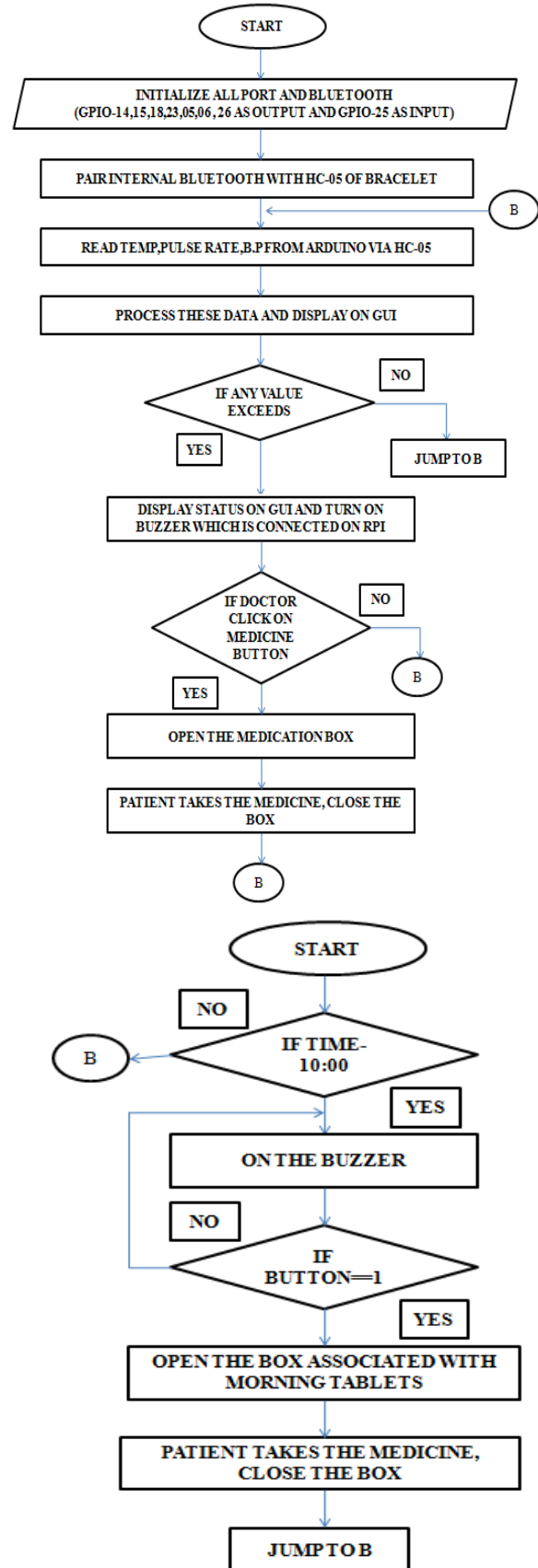


Figure 6. Flow Chart of Controlling Unit

8. EXPERIMENTAL RESULT

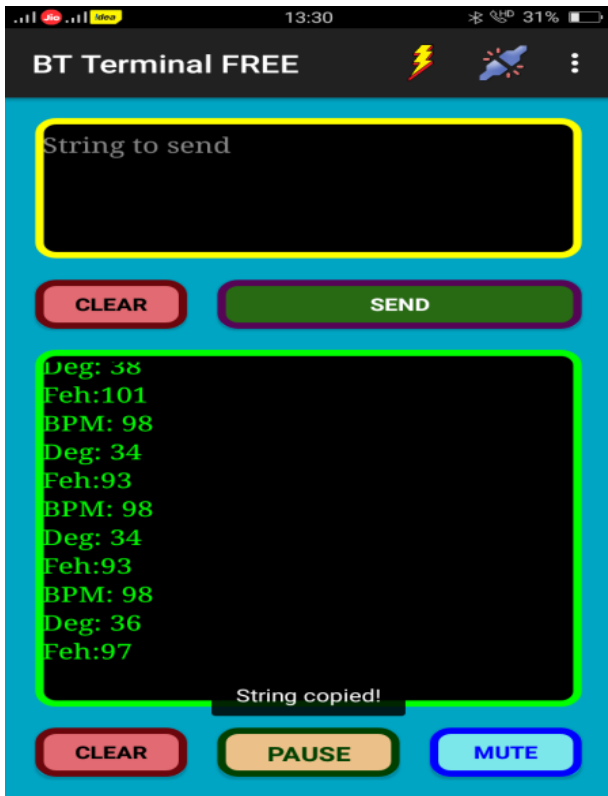


Figure 7. Output of Smart Bracelet on BT serial Terminal

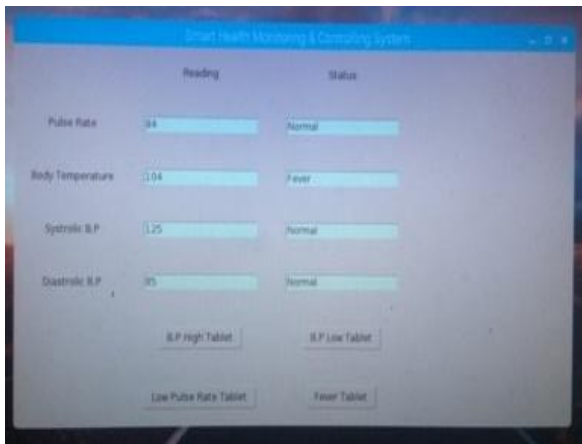


Figure 8. Output GUI of Raspberry pi3

9. CONCLUSION

An efficient Health monitoring and controlling is developed to monitor the up to date status of the patient irrespective of the presence of the doctor. The system collects information like temperature, blood pressure and pulse rate of the patient and updates on GUI. If any parameter of patient health goes beyond the limit

notification is generated and doctor is able to provide medication by clicking on respective button of tablet. Medication box provides tablet when ever Doctor click button on Internet Page. The system is evaluated experimentally and collected the sample data to verify the status of patients successfully.

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