DOCTOR PATIENT INTERACTION USING ANDROID MOBILE ON CLOUD

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Abstract

Worldwide, cardiovascular diseases are the major cause of death. Unobtrusive long term monitoring of patient's vital signs shows great promise for the prevention and management of such diseases. Home monitoring, for instance, can help to reduce mortality rates, the amount of time spent in hospitals, and the overall costs of treatment. Fetal mortality rate is considered a good measure of the quality of health care in a country or a medical facility. If we look at the current scenario, we find that we have focused moreon child mortality rate than on fetus mortality. Even it is a same situation in developed country. Our aim is to provide technological solutions to help decrease the fetal mortality rate. Also if we consider pregnant women, they have to come to hospital 2-3 times a week for their regular checkups.A key requirement for the acceptance of such a system is that it does not reduce the patients comfort nor increase the burden on the hospital staff.

Keywords–Raspberry Pi 2 Model B, Wi-Fi Module, Cloud, Android, Database.

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1. **Introduction:**

Improving the efficiency of healthcare infrastructures andbiomedical systems is one of the most challenging goals ofmodern-day society. In fact, the need of delivering quality careto patients while reducing the healthcare costs and, at the sametime, tackling the nursing staff shortage problem is a primaryissue. In fact, nursing staff often manually execute current procedures for patient monitoring, care, management, and supervision. This represents, defacto, an efficiency bottleneck, which could be cause of eventragic errors in practices.Recent advances in the design of Internet of Things (IoT)technologies are spurring the development of smart systems to support and improve healthcare and biomedical-related processes. Automatic identification and tracking of people and biomedical devices in hospitals, correct drug-patient associations, real-time monitoring of patients' physiological parameters for early detection of clinical deterioration are only a few of the possible examples.

In fact, RFID-based sensing in healthcare enables zero-power, low-cost, and easyto-implement monitoring and transmission of patients' physiological parameters. Nevertheless, the main drawback of RFID tags stems from the fact that they can operate solelyunder the reader coverage region, i.e. up to 15 m and 25 m. Currently, most WSN motes are batterypowered computing platforms integrating analog/digital sensors and an IEEE 802.15.4 radio enabling up to 100-m outdoor communication range (single hop). Compared to UHF RFID tags integrating sensing and computing capabilities, WSN motes consume significantly more power, thus making the overall network lifetime the major limitations of such technology. To the best of authors' knowledge, only few attempts have been done to leverage the combined use of UHF RFID and WSN technologies in healthcare application scenarios.

Furthermore, none of the available solutions realizes a seamless integration of different technologies, according to the so-called Internet of Things (IoT) vision. Basing on this concept, IoT devices will be remotely accessible through the Internet, thus allowing the development of innovative applications able to exploit pervasive collected data and advantage on the new control possibility offered by the IoT enabling solutions. In this work, a novel IoT-aware Smart Hospital System (SHS) will be presented and discussed. It is able to guarantee innovative services for the automatic monitoring and tracking of patients, personnel, and biomedical devices within hospitals and nursing institutes, by exploiting the potentialities offered by the jointly use of different technologies.

2. Block Diagram :

The Systems consist of Raspberry Pi 2 Model 2 with Broadcom 900 MHz Quad core processor. In this project, we are going to develop wireless health monitoring system data transmission using Ethernet, Wi-Fi and cloud/server. The Block Diagram consist of the processor, sensors for recognition, Ethernet Port, Wi-Fi, LCD, Cloud/Web Server as well as Android Mobile for displaying these values in digital form continuously. In this block diagram, we are going to attach sensors to the ADC MPC3008 that is interfaced with Raspberry Pi 2 GPIO ports. ADC MPC 3008 will convert all the analog values of sensors into digital one and send these values to GPIO Port to Wi-Fi. Wi-Fi has IEEE standard as 802.11g.

We have cloud/Web server in between doctor module and patient module for the transmission of data, interaction between both .It has a two-way data flow .The values from the two sensor via Heart Beat Sensor, and Temperature sensors are given to the Raspberry Pi 2 via ADC as input. The processor is interfaced with LCD and Ethernet port. Ethernet port is connected to the Wi-Fi. Input values taken from sensors are sent through Wi-Fi to the cloud. Through cloud, the doctor mobile, which contains the android application, will get the continuous values of heartbeat. If there is an increase than the critical limit or certain limit, the doctor will receive the notification. Doctor can prescribe the medicine to the person who has cross the certain limit and through cloud again Wi-Fi get the value and it is displayed on LCD present at the patient's module.

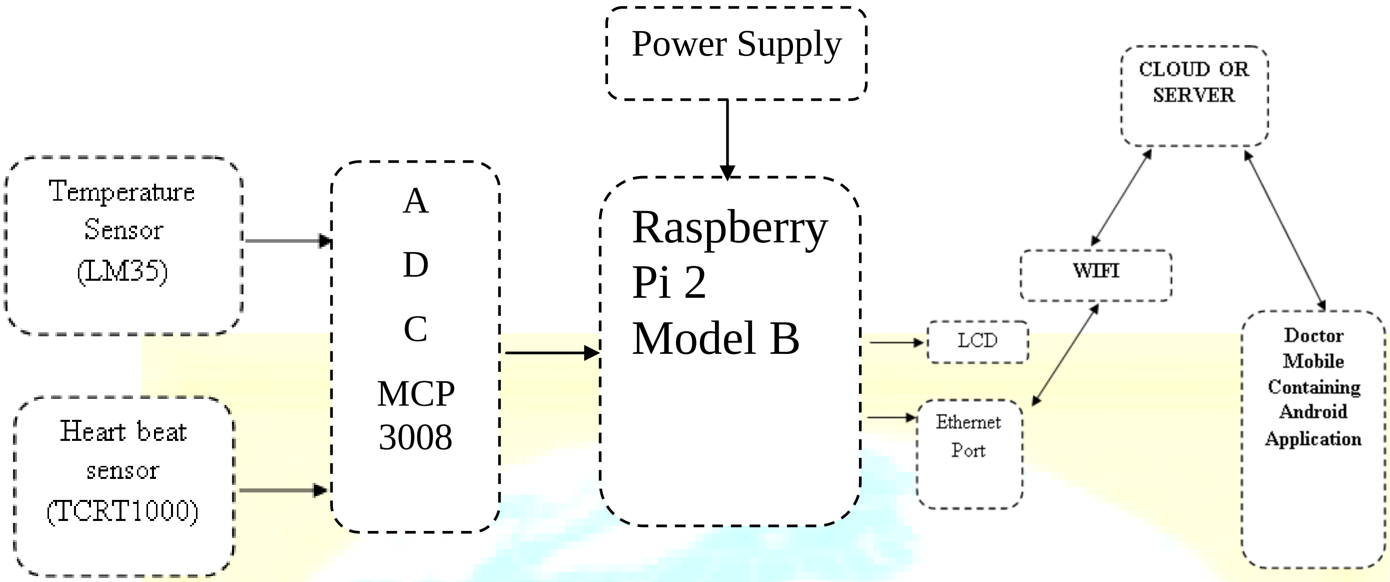


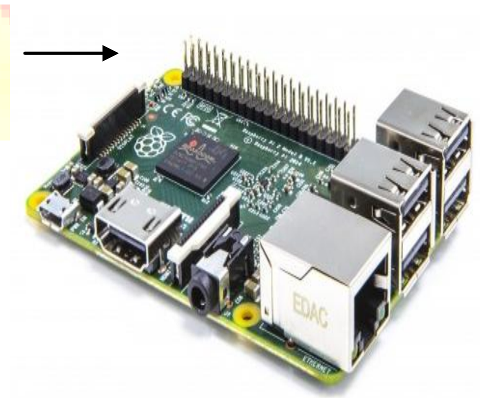
Fig 2 Block Diagram

3. Hardware Description :

a) Raspberry Pi 2 Model B :

The Raspberry Pi 2 Model B is the second generation Raspberry Pi. It replaced the original Raspberry Pi 1 Model B+. It has

- 900MHz quad-core ARM Cortex-A7 CPU
- 1GB RAM
- Like the (Pi 1) Model B+, it also has:
- 4 USB ports
- 40 GPIO pins
- Full HDMI port
- Ethernet port
- Combined 3.5mm audio jack and composite video
- Camera interface (CSI)
- Display interface (DSI)



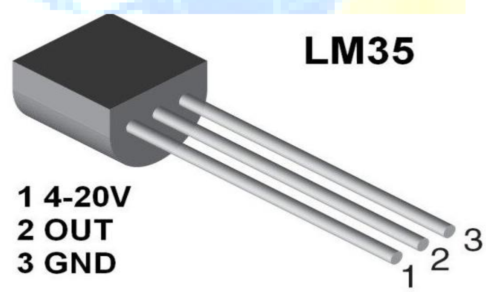
- Micro SD card slot
- Video Core IV 3D graphics core

Because it has an ARMv7 processor, it can run the full range of ARM GNU/Linux distributions, including Snappy Ubuntu Core, as well as Microsoft Windows 10.

b) LM 35 Temperature Sensor :

LM35 is a precision IC temperature sensor with its output proportional to the temperature (in °C). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With **LM35**, temperature can be measured more accurately than with a thermistor. It also possess low self-heating and does not cause more than 0.1 °C temperature rise in still air.

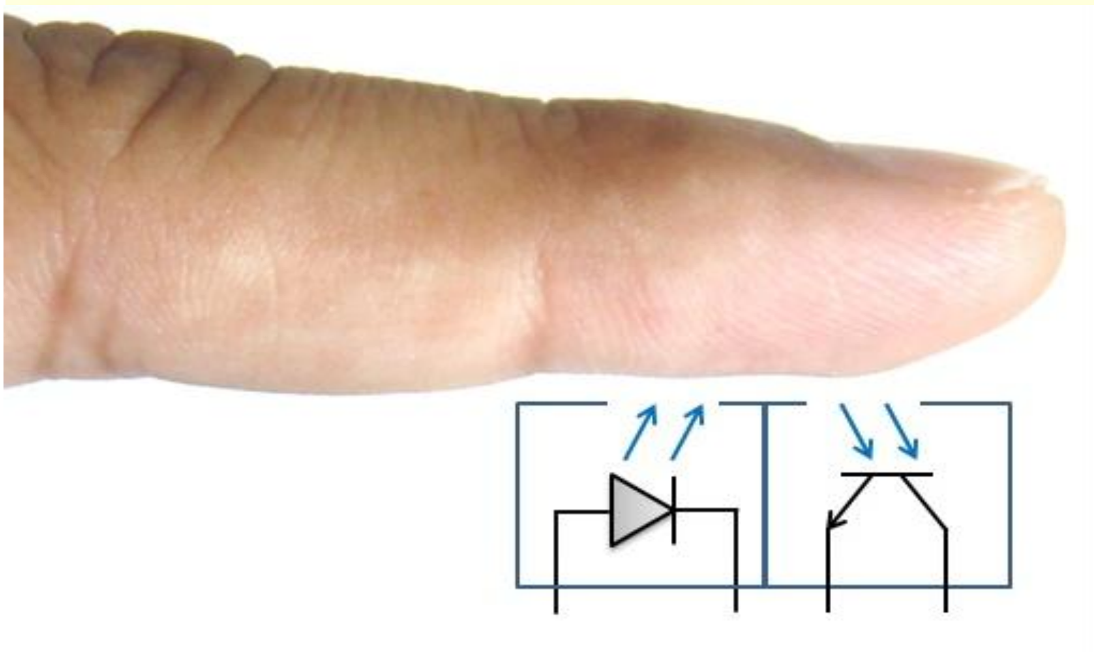
Pin No	**Function**	**Name**
1	Supply voltage; 5V (+35V to -2V)	Vcc
2	Output voltage (+6V to -1V)	Output
3	Ground (0V)	Ground



The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every °C rise/fall in ambient temperature, *i.e.*, its scale factor is 0.01V/ °C.

c) TCRT100 Heart Beat Sensor:

This project is based on the principle of photoplethysmography (PPG) which is a non-invasive method of measuring the variation in blood volume in tissues using a light source and a detector. Since the change in blood volume is synchronous to the heart beat, this technique can be used to calculate the heart rate. Transmittance and reflectance are two basic types of photoplethysmography. For the transmittance PPG, a light source is emitted in to the tissue and a light detector is placed in the opposite side of the tissue to measure the resultant light. Because of the limited penetration depth of the light through organ tissue, the transmittance PPG is applicable to a restricted body part, such as the finger or the ear lobe. However, in the reflectance PPG, the light source and the light detector are both placed on the same side of a body part. The light is emitted into the tissue and the reflected light is measured by the detector. As the light doesn't have to penetrate the body, the reflectance PPG can be applied to any parts of human body. In either case, the detected light reflected from or transmitted through the body part will fluctuate according to the pulsatile blood flow caused by the beating of the heart.



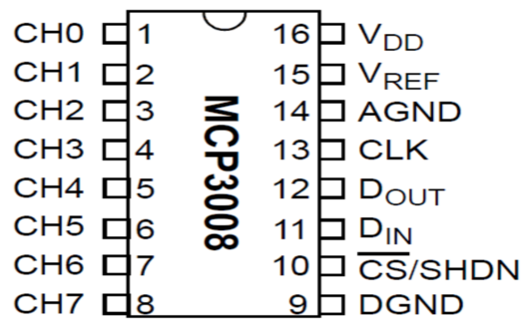
Finger photoplethysmography (reflectance approach)

d) ADC MCP 3008:

The MCP3008 10-bit Analog-to-Digital Converter (ADC) combines high performance and low power consumption in a small package, making it ideal for embedded control applications. The MCP3008 features a successive approximation register (SAR) architecture and an industry-standard SPI serial interface, allowing 10-bit ADC capability to be added to any Raspberry Pi. The MCP3008 features 200k samples/second, 8 input channels, low power consumption (5nA typical standby, 425µA typical active), and is available in 16-pin PDIP and SOIC packages. Applications for the MCP3008 include data acquisition, instrumentation and measurement, multi-channel data loggers, industrial PCs, motor control, robotics, industrial automation, smart sensors, portable instrumentation and home medical appliances.

Features :

- 10-bit resolution
- Eight single-ended channels
- SPI interface
- ±1 LSB DNL
- ±1 LSB INL
- 200 ksps sample rate at 5V
- -40 to +85°C temperature range



4. Software Description:

Doctor has the android phone with the latest Android OS . An application is designed using the Android Studio 1.5 bundle, JDK 1.8 x64. Java is used as language for development of .apk application. Given below are the application made us. U can design as per your requirements. The coding for Raspberry PI for ADC and making self-server I used python coding. Python server is stable than any other language.

a) Below image has the name of some patients in the application made . The values for the temperature and heart beat are fixed for minimum and maximum limit . If the values of specific patient crosses that maximum or minimum limit then the doctor on its mobile gets the notification of the particular patient. Doctor can immediately have communication regarding health conditions with the patient by giving alerts via LCD situated at patient side. Thus patient can do as doctor prescribed details which can help at most extent without visiting or having regular checkup to the doctor.

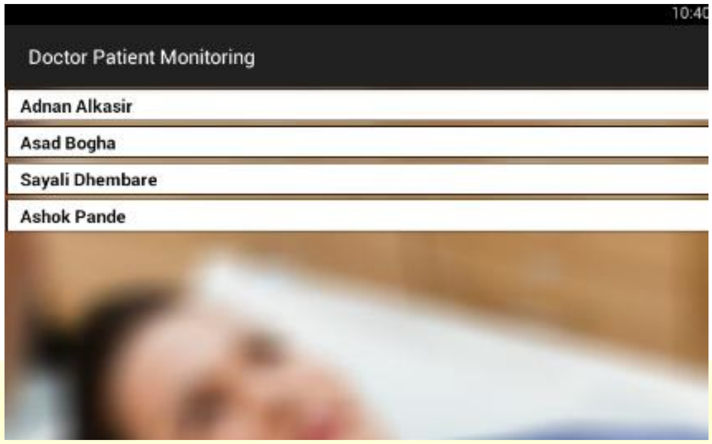


Fig 4 (a) Patient names

b) After clicking any one patient name it give the details of that patient with current date and time as shown below:

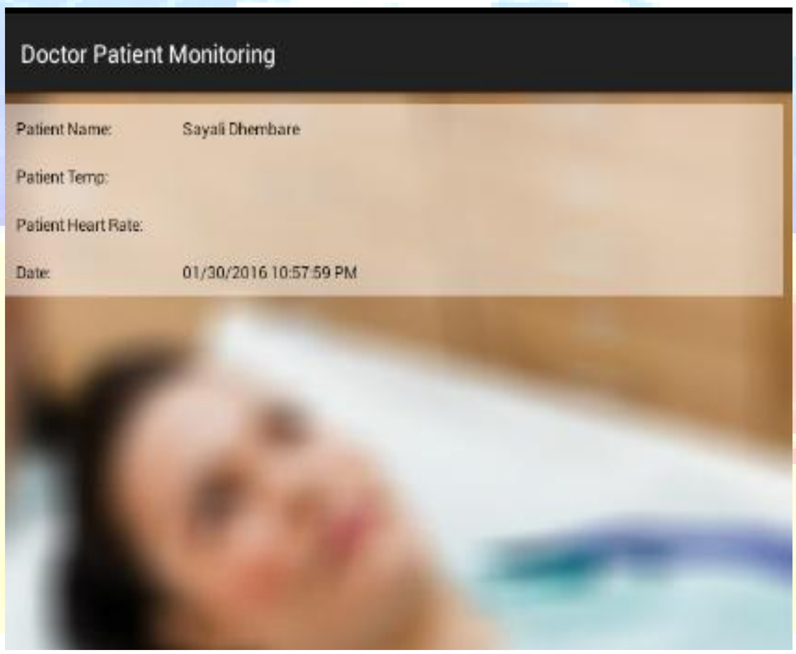


Fig 4 (b) Patient Details

5) Interfacing with temperature sensor:

Here the interfacing is done between the temperature sensor, ADC channel and Raspberry Pi 2 Model B. The values of the LM 35 Temperature sensor value from PIN 2 are transferred to ADC channel 0 and using SPI ports the communication takes place between

Raspberry Pi 2 through that it goes to the Wi-Fi module through Ethernet port available in kit and through google cloud to the doctor's app. Similarly, for the heartbeat you can use the any one remaining channel of ADC.

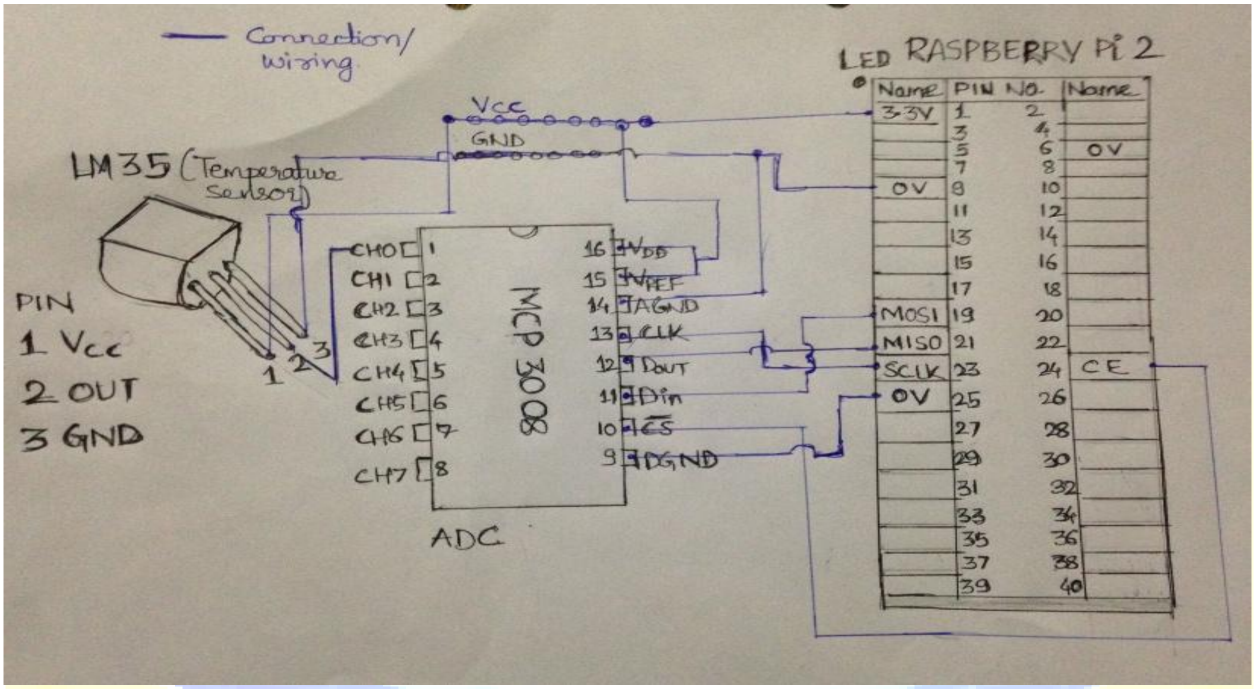
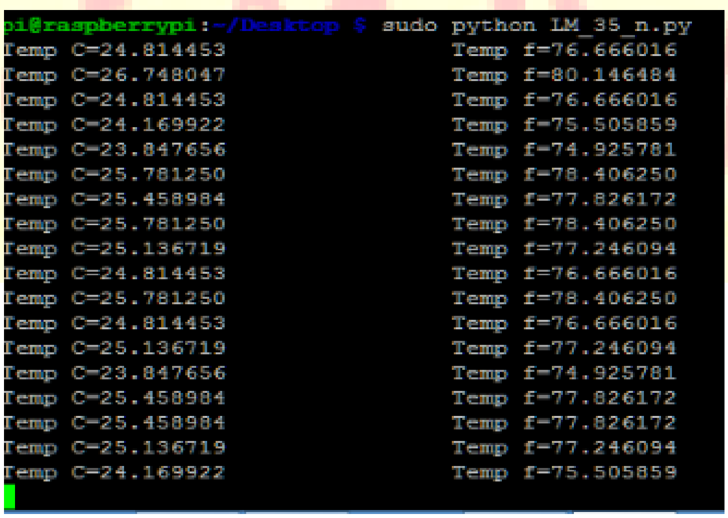


Fig 5 (a) Interfacing

Here is the figure showing the values of Temperature that can be seen at Raspberry Pi 2 :



```
pi@raspberrypi:~/Desktop $ sudo python LM_35_n.py
Temp C=24.814453          Temp f=76.666016
Temp C=26.748047          Temp f=80.146484
Temp C=24.814453          Temp f=76.666016
Temp C=24.169922          Temp f=75.505859
Temp C=23.847656          Temp f=74.925781
Temp C=25.781250          Temp f=78.406250
Temp C=25.458984          Temp f=77.826172
Temp C=25.781250          Temp f=78.406250
Temp C=25.136719          Temp f=77.246094
Temp C=24.814453          Temp f=76.666016
Temp C=25.781250          Temp f=78.406250
Temp C=24.814453          Temp f=76.666016
Temp C=25.136719          Temp f=77.246094
Temp C=23.847656          Temp f=74.925781
Temp C=25.458984          Temp f=77.826172
Temp C=25.458984          Temp f=77.826172
Temp C=25.136719          Temp f=77.246094
Temp C=24.169922          Temp f=75.505859
```

Fig 5 (b) Temperature in Celsius and Fahrenheit

Similarly to test whether the server is working properly or not we can check it by using the Postman extension provided in Google Chrome where we can see the above temperature values at other PC connected in that network. It is as shown below

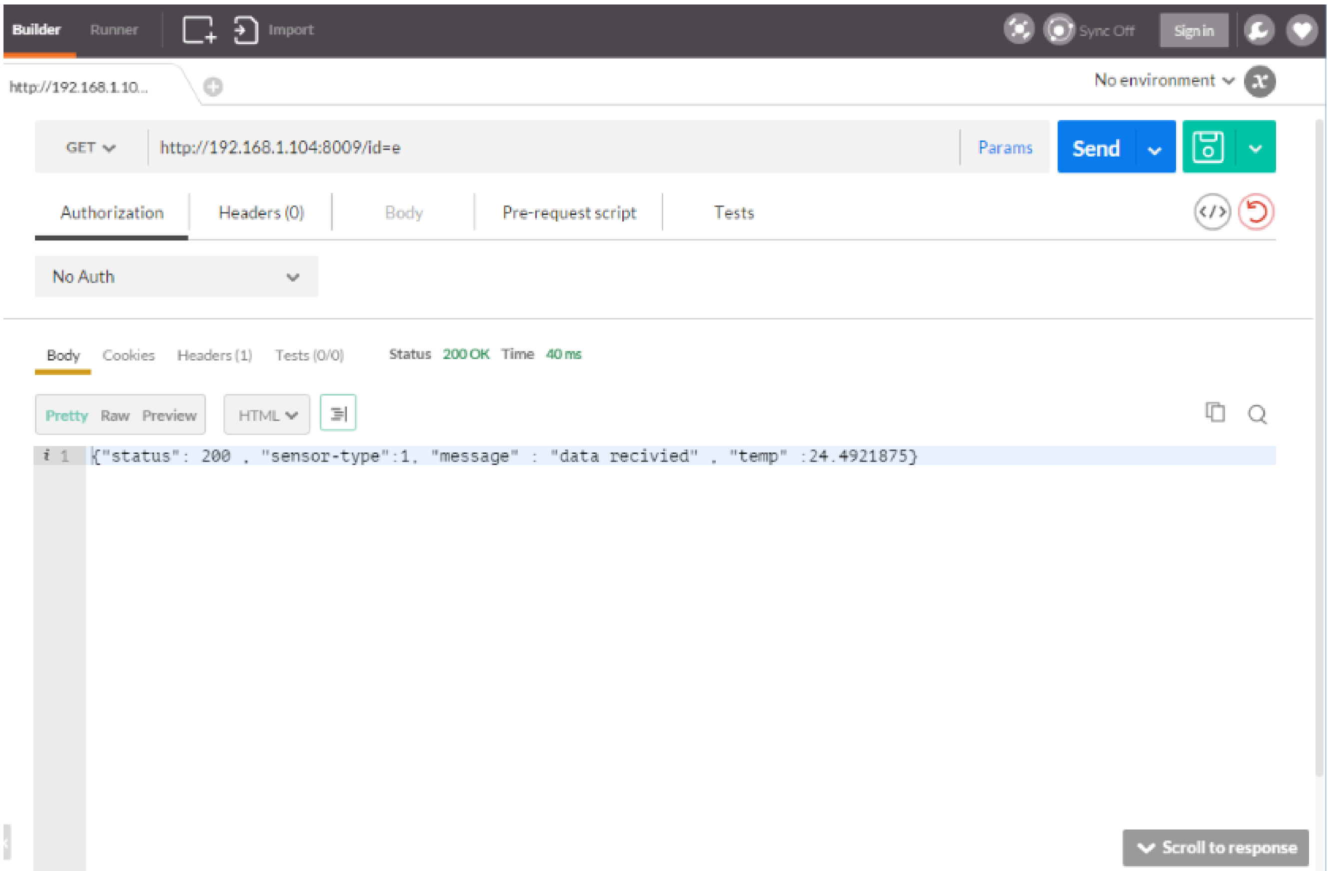


Fig 5 (c) Postman showing the values received at other PC via wireless means

6) Advantages:

- One key point of all critical care for elderly patient is the continuous monitoring of their vital signs.
- Monitoring the electrical activity of heart of the patient under critical care more conveniently and accurately for diagnosing.
- Accuracy is more, because it uses wireless network.
- Frequent visit to hospital reduces .
- The wireless alert system notifies physicians of critical results on their cellular phones.

- With online recoding of medical parameters, the workload of the case providers and the nursing staff is reduced.
- The clinical information database contains all data regarding the patients in electronic form.

7) Applications:

- Intensive Care Units.
- Ambulance services.
- Traditional pulse diagnosis system.
- Operation theaters.
- Monitoring of oxygen levels.
- It can be also used in old age homes to monitor the various parameters of a sick person in old age homes.
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8) Future Scope:

- The human body scanning system could be made more sophisticated by incorporating blood pressure and EEG sensors.
- Hospitable –wide wireless capability would allow doctor to occur the patients' database using their word held computers.
- We can decrease the patient module to a wearable watch size sensors called as Smart Watch.
- All the patient information can be stored in database and can be accessed through the cloud.
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9) Conclusion:

- In this work, a novel, IoT-aware, Smart Hospital System (SHS) architecture for automatic monitoring and tracking of patients, personnel, and biomedical devices within hospitals and nursing institutes has been proposed .
- The monitoring system is small, portable, low-cost and easy-to-use without the limit of time and places.

- Physiological parameters can also be transmitted between Android smartphone and the remote server via WiFi or 3G, this makes a very important significance for mobile health care.

10) References:

- An IOT Aware Architecture For smart healthcare System IEEE Reference 10.1109/JIOT 2015.2417684, IEEE Internet of Things Journal.
- A Wireless Health Monitoring System based on Android OS IERI Procedia 4(2013) 208-215 Science Direct Journal.
- Heart Attack Detection System Using Android Phone, ISSN: 2321-8134 IJFEAT Journal.
- Heart Beat sensor working from http://embedded-lab.com/blog/?p=5508
- http://electronicsclub.info/powersupplies.htm
- http://www.instructables.com/id/Make-a-simple-12-volt-power-supply/step4/Make-it/
- Raspberry Pi 2 Model B - https://www.raspberrypi.org/education/