# RURAL PEOPLE/PATIENTS HEALTH CONDITION MONITORING AND PRESCRIPTION WITH IOT

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**Abstract**

**The latest trend in the communication era is the Internet of Things (IoT). IoT is no longer a technology of the future. The smartness of the technology is that the end user can access the data is in simple form, whatever the large backend structure of the systems. With our proposed system, the patients are not necessary to move long distances for consulting the doctors. In the village itself, the local doctor will collect the patient diagnostic parameters and update on the internet through its platforms. The expert doctors/physicians can access the data from the Internet, and they can suggest the immediate treatment from the remote location itself. We will use IoT (Internet of Things) platform to communicate and access the data within no-time.**

**With this concept, the time and money will be saved and very helpful for the poor people in the rural areas.**

**Index Terms: IoT, Raspberry Pi3, Cloud, Blood Pressure Sensor.**

## I. INTRODUCTION

Mostly in rural villages where the transport facility is not frequently available to reach the hospitals and real-time examination of the patient or diagnosis reports collecting of a person was problematic for those. Consulting the expert doctors/physicians frequently for the same issues are problematic and cost-effective for the rural people to go to nearby cities or towns. The IoT is the combination of devices, sensors, home appliances, vehicles and other things embedded with electronics, programming software, input devices and output devices like sensors, actuators, and network integrity provides the data to exchange in between the things without human interaction.

In India, for every one thousand (1,000) citizens, there is less than one doctor available. But according to World Health Organization (WHO) standards that the ratio is 1:1000 means one doctor for 1000 citizens. As per the Medical Council of India (MCI), the total number of allopathic doctors associated with MCI as of 31 March 2017 is only 10, 22,859 said by State Health Union Minister Anupriya Patel. Based on these statistics, we are aware of that a maximum number of populations in India are starved of appropriate medical health care and generally in rural or poor people of the country. So the National Medical Commission bill is noted as "anti-poor" and "anti-people" bill by Indian Medical Association (IMA) [1].



Figure. 1. Representational Image.

## II. BACKGROUND AND RELATED WORK

In medicinal the patients, blood pressure, pulse rate will play a vital role in curing the patients. The doctor measures the blood pressure (BP) using a pressure-measuring gauge by placing a hot air balloon arm cuff close the

patient arm and measures systolic pressure and diastolic pressure in millimeters of mercury (mm Hg). The BP Measuring Machine is as presented in Figure 2. The systolic pressure means the pressure in the arteries when the heart beats and diastolic pressure indicates the pressure in the arteries between beats.

To measure the BP with general blood pressure machine, it is difficult to identify the exact values due to our eye measurement. So we are going to use the digital display and digital output BP machines to get the accurate systolic pressure, diastolic pressure, and pulse rate. The three units will be measured by using a single machine as shown in Figure 3. The Digital Blood Pressure Machine is easily interfaced to any microcontroller using UART protocol. Blood pressure values will not be the same at all time. BP will change by different factors together with body position, inhalation or expressive state, workout state, sleep and emotional state. It is preferred to report the blood pressure when the patient is stress-free in lying down or sitting positions. Having a perfectly fitting cuff to the patient is the most important factor to consider because poorly fitting cuffs will not give accurate blood pressure measurements [2].



Figure. 2. General Blood Pressure Machine.



Figure. 3. Blood Pressure Machine with Digital Output [6].

TABLE I.     CLASSIFICATION OF BLOOD PRESSURE FOR ADULTS [2]

| Classification | Blood Pressure (mm Hg) | |
|---|---|---|
| | *Systolic* | *Diastolic* |
| Hypotension | <90 | <60 |
| Normal | 90-119 | 60-79 |
| Prehypertension | 120-139 | 80-89 |
| Stage 1 hypertension | 140-159 | 90-99 |
| Stage 2 hypertension | 160-179 | 100-109 |
| Hypertensive Crisis | >=180 | >=110 |

Table 1 shows the blood pressure levels for the adults (18 years and above). Based on these systolic and diastolic values the doctors can easily understand the patient condition to cure them.

## III.  PROPOSED SYSTEM

The system consists of a Raspberry Pi3 which is a small single board computer with inbuilt WiFi and Blood pressure digital sensor interfaced to it. The proposed system is shown in Figure 4.
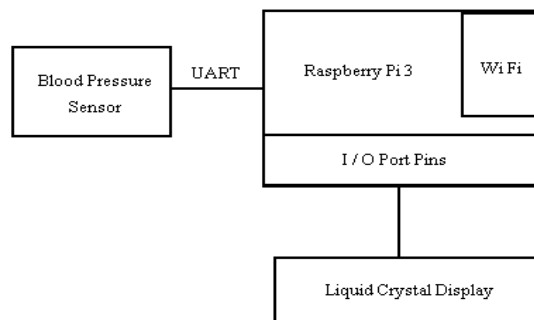


Figure. 4. Block Diagram of Proposed System.

## A. Raspberry Pi3

The Raspberry Pi3 is available at low cost, and credit card or business card sized single board computer CPU, which is connected to a monitor or TV using HDMI cable and can be directly connected to a USB mouse and keyboard. It is very useful for all ages of people to learn the programming and practice from small ideas to big inventions. With this Raspberry Pi, we can do anything that a normal desktop computer can do. The Raspberry Pi connected to the internet using the inbuilt Wi-Fi module. The main things required to use Raspberry Pi are SD Card used as a hard disk for the RPi to load the operating system and programs, Keyboard, mouse and monitor and 5V USB power supply [4]. Figure 5 shows you the Raspberry Pi image.



Figure. 5. Raspberry Pi3 Single Board Computer [4].

Raspberry Pi has grown a primarily used device, which is not only for educational purposes and prototyping, also for invention projects in companies. Contrast to its small size, low cost and fully operational Linux Operating System, the prime difference from our Desktop PC lies in its ability to interact with other peripherals through General Purpose Input/Output Pins (GPIO pins).

## B. Internet of Things

The Internet of Things (IoT) is the combination of devices, sensors, home appliances, vehicles and other things embedding with electronics, programming software, input devices and output devices like sensors, actuators, and network connection provides the data to exchange in between the things without human interaction. IoT is used in wearable devices, home applications, and industrial applications. When it is accessed to the internet world it is used in all segments, from cars to cities and from homes to hospitals.

According to IoT Analytics, a leading source of market strategies, there is only 6% of devices are using in the IoT market and there is growth in more number of IoT devices are coming into the "**Connected Health**" segment. The Figure 6 will show you the share IoT devices in the world [3].
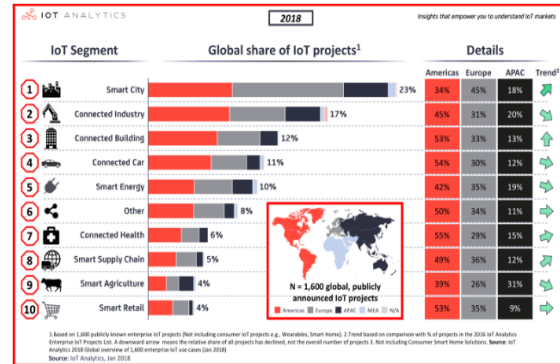


Figure. 6. A share of IoT devices in the world [3].

## C. Programming the Pi

Python is programming flexible scripting language. We will write the scripting language to run the Raspberry Pi according to our requirement. The python program will be saved in the operating system in the form of "*.py*" extension. Python programming is very easy to write, read and understand. The easy English words can be used in the scripting, means Standard English keywords are used in python programming. By using this language we can check every line of execution with a '*print*' command.

Python is an interpreted language elucidate, so you can script the program and make execute the script directly into machine code. These interpreter programming languages you don't need to explain to the computer that what you descript a variable is a number, string, or an array. The python programming we can write using Graphical user interface (GUI) or Command Line Interface (CLI).

## D. Flowchart

It is a process representation in pictures or graphical format. By seeing the flowcharts can easily understand the process with or without any technical knowledge. The flowchart represents the work status from an initial point to the endpoint. With the assist of a flowchart, a

problem can be analyzed in the more effective way. The flowchart to this study is shown in figure 7 in a detailed explanation of raspberry pi connection to the cloud.

### E. Results

With the concept of python programming, we will join the inbuilt Wi-Fi to the available access point. Then using programming concept of Raspberry Pi will read the serial UART values from the digital blood pressure sensor. The same values will display on the Liquid Crystal Display and those values will be modernized in the website using the internet connection. Then the doctor who is very long from the rural village can access the same website in laptop or system with security credentials.
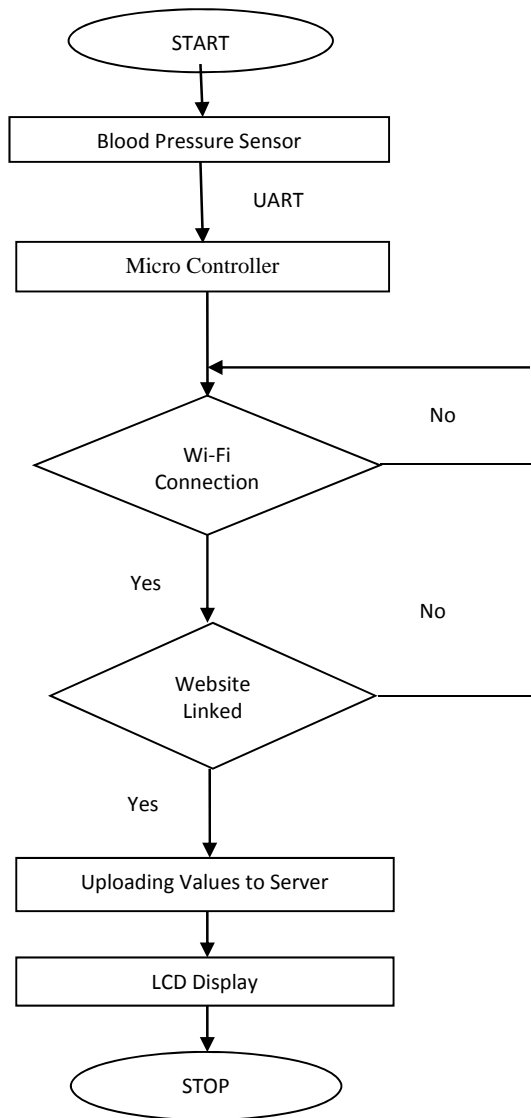
The doctor can see the data in the graphical format as shown in the figures 8, 9 and 10 [6]. Based on this data of Pulse rate and Blood Pressure, the doctor can suggest the prescription to the local doctor or Rural Medical Practitioner (RMP). Then RMP doctor will prescribe the medicinal information or dosage of the medicine to the patients. The IoT and Control Systems are automating our homes, remotely monitoring and tracking assets and resources, and economizing energy consumption. With the work of Ubidots cloud software, we can acquire our personalized data-driven applications. Ubidots propose a Python library which makes it simple to transfer information to Ubidots from Raspberry Pi, or other computers. Let us create a python using our favorite text-editor. We can use "nano" in this case. This script transfers an arbitrary values to Ubidots but it is simply adapted to post values from digital inputs in our Raspberry Pi, or even analog info when using special shields [5].
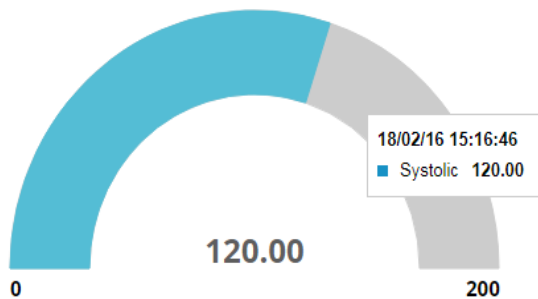


Figure. 8. Systolic Blood Pressure Results (mmHg) showing on the website



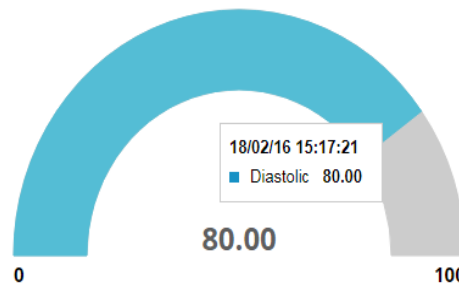Figure. 9. Diastolic Blood Pressure Results (mmHg) showing on the website.
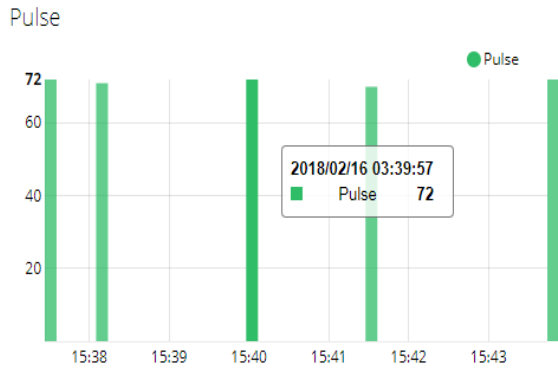


Figure. 7. Flowchart

Figure. 10. Pulse rate showing on the website.

The prototype model, what we designed composed of a digital blood pressure sensor, a raspberry pi3 single computer board with a 16GB SD memory card, and a 2x16 Liquid Crystal Display (LCD).
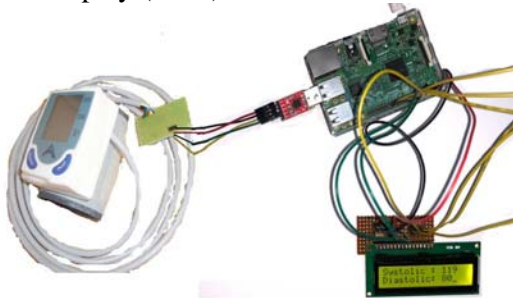


Figure. 11. Prototype model

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