

# Embedded Linux and Iot Based Personal Health Care System with Spo2

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## Abstract

*The paper introduced a method to design a system which monitors the health parameters of a patient and send the details through Wi-Fi with which the details will be sent to an android phone. Automation is the most frequently spelled term in the field of electronics. The hunger for computerization brought many revolutions in the existing technologies. This project makes use of an onboard computer, which is commonly called as Raspberry Pi processor. It acts as heart of the project. This onboard computer can able to communicate with the output and input modules which are being used.*

**Keywords:** Raspberry pi, Wi-Fi, Temperature sensor, heart beat sensor,BP,spo2 sensor.

## 1. Introduction

Automation is the most frequently spelled term in the field of electronics. The hunger for automation

brought many revolutions in the existing technologies. This project makes use of an onboard computer, which is commonly termed as **Raspberry Pi** processor. It acts as heart of the project. This onboard computer can efficiently communicate with the output and input modules which are being used. The **Raspberry Pi** is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation. The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB.

It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long-term storage.

The device which is able to perform the task is a **Raspberry Pi** processor. There are different sensors such as Temperature, Heartbeat,BP,ECG. The sensors data is sent to android phone through Wi-Fi. To perform this task, **Raspberry Pi** processor is programmed using embedded 'Linux'.

Wi-Fi (Short for **Wireless Fidelity**) is a wireless technology that uses radio frequency to transmit data through the air. Wi-Fi has initial speeds of 1mbps to 2mbps. Wi-Fi transmits data in the frequency band of 2.4 GHz. It implements the concept of frequency division multiplexing technology. Range of Wi-Fi technology is 40-300 feet.

## 2. LITERATURE SURVEY

### Technologies and resources

#### 1) Patient monitoring using Bluetooth enabled device

Bluetooth enabled device also used for in-home patient monitoring. A Bluetooth enabled in-home patient monitoring system was proposed in [4] to detect Alzheimer disease. In the patient's home, patient carries the Bluetooth enabled monitoring device and an access point is placed in each room then all are connected to the local database. When a patient moves from one room to another, the monitoring device selects any one of the access point with strongest signal strength. Once the connection is established the current location and movement of the patient are traced and stored in a local database with the help of Bluetooth communication. The collected

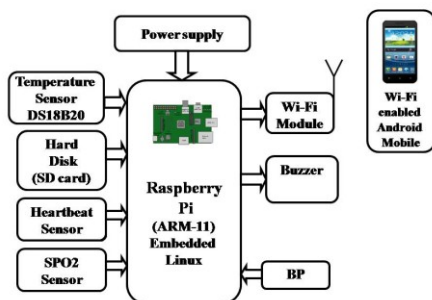
location information and the corresponding timestamps are forwarded to the decision engine which is placed in the hospital. This decision engine has movement recognition software, so that the medical practitioner can perform remote diagnosis to determine whether the patient has Alzheimer's disease or not.

## 2) Health monitoring using WSN

Wireless Sensor Network (WSN) is also used for in-home patient monitoring. It uses Services layers over Light Physical devices (SYLPH) model. It is a service oriented architecture model. The objective of this model was that resources to be distributed among multiple WSN and to execute over different wireless devices independently. Various networks from different wireless technologies can also be connected using this model. In this system, Infrared (IR) sensor based system was used. IR based monitoring system was installed in house to collect motion values of the patient and different feature values like activity level, mobility level and non response level. To differentiate normal and abnormal behaviors, Support Vector Data Description (SVDD) method was used. To classify the behavior patterns, behavior pattern classification algorithm was used here. The need for a PC was eliminated in [13]. The WSN was installed home. These nodes are then connected to the hospital sever through internet. Here number of sensors was used to collect only ECG signals. The ECG signals were first sampled and transmitted to the access point placed in patient's home. Then these signals were transmitted to the hospital through internet and analyzed to detect heart related diseases.

## 3. IMPLEMENTATION:

Embedded LINUX and IOT based Personal health care system with SPo2



From the above figure, we can see that the device which is able to perform the task is a **Raspberry Pi** processor. There are different sensors

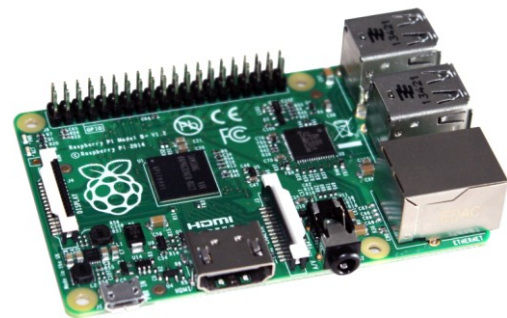
such as Temperature, Heartbeat, BP. The sensors data is sent to android phone through Wi-Fi. To perform this task, **Raspberry Pi** processor is programmed using embedded 'Linux'.

Wi-Fi (Short for **Wireless Fidelity**) is a wireless technology that uses radio frequency to transmit data through the air.

## 4. RELATED WORK:

This system consists of ARM-11 micro processor which is the main controlling part of the system. The sensor will sense the readings from the human body it can shows in mobile by using WiFi. The brief introduction of different modules used in this project is discussed below:

### Raspberry pi processor (ARM-11):



The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor (The firmware includes a number of "Turbo" modes so that the user can attempt over clocking, up to 1 GHz, without affecting the warranty), VideoCore IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long-term storage

### Temperature sensor:



### Description

The DS18B20 digital thermometer provides 9-bit to 12-bit Celsius temperature measurements and has an alarm function with nonvolatile user-programmable upper and lower trigger points. The DS18B20 communicates over a 1-Wire bus that by definition requires only one data line (and ground) for communication with a central microprocessor. In addition, the DS18B20 can derive power directly from the data line (“parasite power”), eliminating the need for an external power supply.



### SPO2 sensor:

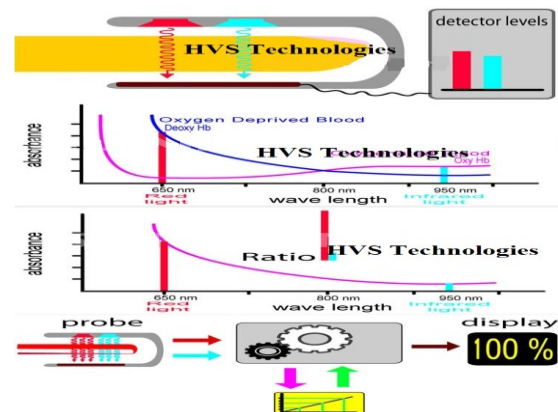


SpO2 stands for tangential capillary oxygen dispersion, an estimate of the amount of oxygen in the blood. More specifically, it is the percentage of oxygenated hemoglobin (hemoglobin containing oxygen) compared to the total amount of hemoglobin in the blood

SpO2 is an estimate of arterial oxygen saturation, or SaO2, which refers to the amount of oxygenated hemoglobin in the blood.

Hemoglobin is a protein that carries oxygen in the blood. It is found inside red blood cells and gives them their red color.

SpO2 can be calculated by pulse oximetry, an indirect, non-invasive method (meaning it does not involve the overture of instruments into the body). It installation by emitting and then absorbing a light wave passing through blood vessels (or capillaries) in the fingertip. A variation of the light wave passing through the finger will give the value of the SpO2 capacity because the degree of oxygen saturation causes variations in the blood’s color.



For a regular healthy person, the normal blood oxygen saturation level (SpO2) should be around 94% to 99%. For patients with mild respiratory diseases, the SpO2 should be 90% or above. Supplementary oxygen should be used if SpO2 level falls below 90%, which is unacceptable for a prolonged period of time.

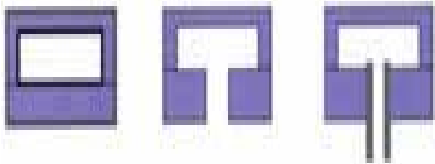
Low O2 in it, notorious as hypoxemia, means that the level of O2 in the it has fallen below regular levels, due to one or more of many different causes. Under the chief part status, pant room air, normal readings range from 95% to 100 %

### Blood Pressure sensor;



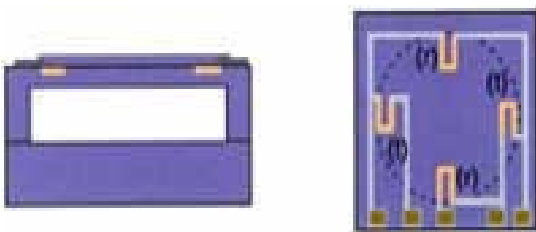
The metrology is the technology of transducing P into an electrical quantity. Normally, a diaphragm construction is used with strain gauges either bonded to or diffused into it, acting as resistive basics. Under the pressure-induced strain, the resistive values change.

In capacitive tech, the diaphragm is one plate of a C that changes its value under pres-induced displacement.



P sensing using diaphragm TECH dealing the difference in P of the two sides of this. Depending upon the relevant p, we use the terms unqualified, where the mention is vacuum (1st picture), gauge, where the allusion is atmospheric P(2nd pic), or discrepancy, where it has two ports for the compute of two different P.

The piezo resistive or silicon cell



This type of consists of a micro-machined silicon with piezo resistive strain gauges subtle into it, combined with a silicon or glass back plate.

The resistors have a value of approx. 3.5 kOhm. P induced strain increases the value of the radial (r) and decreases the value of the resistors (t) transverse to the radius. This resistance change can be high as 30%.

Based on piezoelectric TECH various physical quantities can be unhurried; the most familiar are P and S. For this, a thin membrane and a massive base are used, ensuring that an applied P specifically loads the rudiments in one bearing. For this meters, a seismic mass is attached to the crystal elements. When it experiences a bid, the invariant seismic mass loads the essentials conferring to Newton's second law of action.

### Heart beat sensor:

This heart beat sensor is designed to give digital output of heat beat when a finger is placed inside it. When the heart detector is working, the top-most LED flashes in unison with each heart beat. This

digital output can be connected to microcontroller directly to measure the Beats Per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.

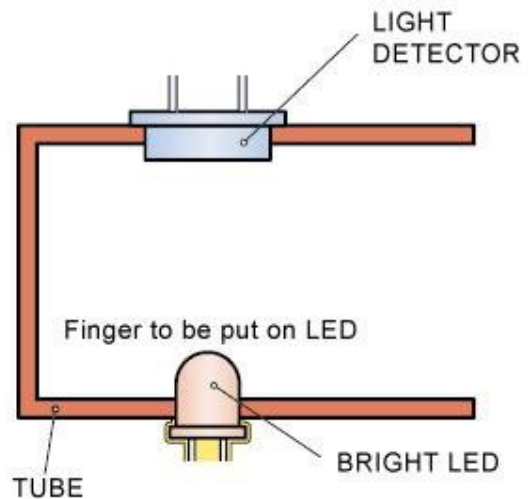


FIGURE 1 SENSOR CONSTRUCTION

### WIFI MODULE:

Wi-Fi or WLAN as it is commonly known is fast becoming the preferred mode of connecting to the internet. Many people are not aware of the descriptions and explanations related to it. Wi-Fi gets its name from a certification called Wireless Fidelity given to networks operating under 802.11 standards. Wi-Fi allows computers, PDAs and other devices to connect to a broadband connection in a wireless mode. The 802.11 standard defines the wireless communication operating via electromagnetic waves. While reading the descriptions and explanations related to Wi-Fi, one should remember there are different modes for wireless networks like Infrastructure mode and Ad-Hoc mode that can be used for different criteria.

### BUZZER:

Basically, the sound source of a piezoelectric sound component is a piezoelectric diaphragm. A piezoelectric diaphragm consists of a piezoelectric ceramic plate which has electrodes on both sides and a metal plate (brass or stainless steel, etc.). A piezoelectric ceramic plate is attached to a metal plate with adhesives. Applying D.C. voltage between electrodes of a piezoelectric diaphragm

causes mechanical distortion due to the piezoelectric effect. For a misshaped piezoelectric element, the distortion of the piezoelectric element expands in a radial direction. And the piezoelectric diaphragm bends toward the direction. The metal plate bonded to the piezoelectric element does not expand. Conversely, when the piezoelectric element shrinks, the piezoelectric diaphragm bends in the direction. Thus, when AC voltage is applied across electrodes, the bending is repeated, producing sound waves in the air.



Fig: Picture of buzzer

#### Pressure Sensor:

The MP3V5050 series piezoresistive transducer is a state-of-the-art monolithic silicon pressure sensor designed for a wide range of applications, but particularly those employing a microcontroller or microprocessor with A/D inputs. This patented, single element transducer combines advanced Micromachining techniques, thin-film metallization, and bipolar processing to provide an accurate, high level analog output signal that is proportional to the applied pressure.

#### 4. ACKNOWLEDGEMENT

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