IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

SMART HEALTHCARE MONITORING SYSTEM USING RASPBERRY PI 4

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***Abstract*—** The development of healthcare is extremely crucial to our daily lives. My project involves obtaining patient information to monitor a few important health parameters of a person which have been measured using an ECG sensor, a MAX30100 pulse oximetry sensor, a GPS sensor, and a SIM900A GPRS/GSM sensor. These input sensors are attached to a Raspberry Pi 4 so that the data can be measured and when a threshold rate is obtained nearby the doctor or caregiver, an alert is sent using the GSM module to facilitate communication between the doctor and patients in the event of an emergency. My project is focused on developing software that would allow doctors to monitor patients without their regular presence. By including sensors, those modules are to ensure that patients receive the opportunity for 24/7 service that the doctor can record and they can receive warning in the event of an emergency service, such as an SMS alert. This platform is very beneficial for patients who require ongoing home care or regular checkups. Furthermore, physiological sensors which I have used, many more sensors can be interfaced to add many other types of health checkups, to be included in the smart health development system.

***Keywords*—** Raspberry Pi 4, ECG sensor, Pulse oximetry sensor, GSM Module, GPS Module and DHT-11.

I. INTRODUCTION

Today, we can observe that the time taken for patients to go to a nearby clinic is very highly risky in a long waiting queue and even after going to a nearby clinic or hospital, the service provided is not assured to the patient. In the absence of a doctor at the right time and qualified medical professionals may lead to a high number of deaths. The time period of curing chronic diseases, heart-rate diseases and its management becomes an important factor. The cost of the system becomes too expensive and a normal person cannot afford it. During pathology detection is very high, the management of chronic diseases cost is the major problem the time taken and during that period there may be certain changes inside our body which becomes very harmful for us and because of this sometimes public awareness is most important because we are not aware that from which disease are suffering and at which stage the disease is going. This leads to many consequences and even leads to sudden deaths.

XISTING SYSTEM

In existing methods, There are several projects based on healthcare monitoring systems by raspberry pi based internet of things (IoT) technology but there is no 24/7 web-camera surveillance service included in some case studies. Those patient‘s lives are made easier by facilitating in diagnosis or checking the patient and doing the treatment by using various parameters monitoring a patient's such as Blood Pressure(BP),heart-

rate, oxygen saturation level of blood, body temperature of a patient and many other parameters are some parameters are to be included.

II.METHODOLOGY

In proposed model, my project by using hardware components such as a Raspberry Pi 4 Model B, a pulse oximetry (SPO2) sensor, a GPRS/GSM sensor, a GPS sensor, an electrocardiogram (ECG) sensor with (Right arm, Left arm, Right Leg) probes, ADC module,web-camera module, buzzer and a 16*2 LCD module are connected with the help of jumper wires is connected with those sensors are to be included.

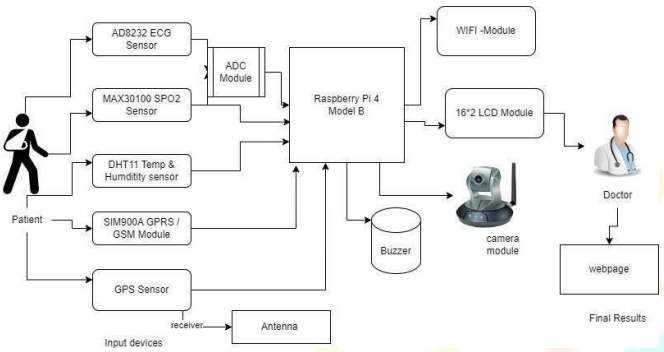

Fig 2.1: System Architecture

MODULES

1. MAX30100 Pulse oximetry sensor
2. AD8232 ECG sensor
3. DHT-11 Sensor
4. SIM900A GSM Module
5. GPS sensor with Antenna
6. Web-camera Module

1. MAX30100 Pulse oximetry sensor:

Pulse oximetry sensor is an integrated and the measurement of temperature, Heart-Rate and percentage of pulse oximetry or oxygen saturation of blood of a person with a variety of acceptable power supplies range from 1.8 - 3.3 volts as well as options to turn off or standby mode by the software.

Figure2.1.1: MAX30100 Sensor

As shown in figure 2.1.1, A pulse oximetry sensor is a normal range that can be measured bythe 95% to 100 %.At danger zone, the person whose oxygen levels fall below 85% will be affected.

2. **AD8232 ECG Sensor:** ECG sensors are used to obtain the patient's analog information. Analog input signals are used by the ECG sensor.Analog output signals from the ECG sensor are fed into an Analog to Digital converter, which converts them into digital signals, then the output digital signals will displayed on the LCD module .

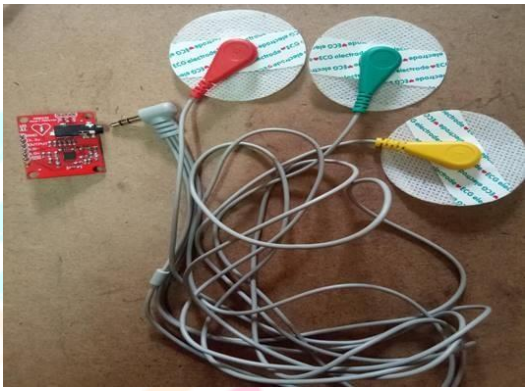

Figure 2.1.2:AD8232 ECG Sesnor

3. DHT-11 Sensor:

DHT11 sensor measures and provides humidity and temperature values serially over a single wire. It can measure relative humidity in percentage (20 to 90% RH) and temperature in degree Celsius in the range of 0 to 50°C.

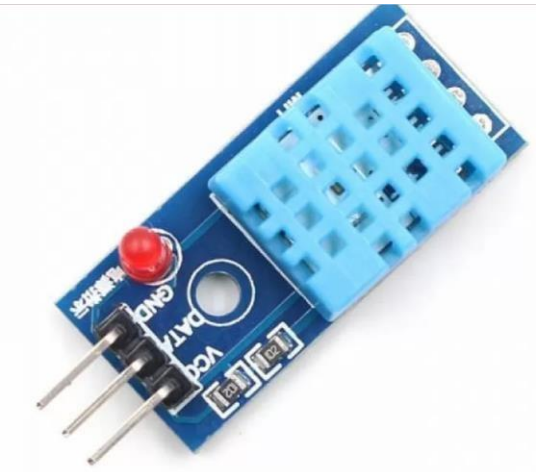

Figure 2.1.3: DHT-11 Sensor

4. SIM900A GSM/GPRS Module:

GSM Module is used to sending a SMS message alerts to respective doctors. This module is requires a sim card just like mobile phone to activate the communication with the relevant network.GSM module is used to the sending the healthcare relevant information into web server.

Figure 2.1.4 SIM900A GSM Module

5. GPS sensor

The GPS sensor consists of a surface-mount chip that analyzes GPS satellite signal using a tiny rectangular antenna which is frequently installed on top of the GPS chip.

Figure 2.1.5: GPS sensor

6. Web-camera module

Zeb-Crystal Pro is a used to web camera that runs on USB power and has a 3P lens that creates sharp videos. And also have inbuilt mic.

Figure 2.1.6: Web-camera module

III.IMPLEMENTATION

As shown in figure 3.1, collect the hardware components such as ECG sensor, MAX30100 spo2 sensor, GPS sensor, GPRS/GSM module, DHT11 Temp & Humidity sensor, ADC Module and Raspberry Pi 4. Those types of sensors are interfacing with R Pi 4 board.Initialization those sensors such as heart-beat (BPM), spo2, ECG probes are attached into the patient's body.GPS Module are attached to the rpi board.Read the position of data by using GPS module.Those parameter values of sensors are read by raspberry pi 4 and then stored in it.The parameter values of those sensors are displayed on the 2*16 LCD Screen.If the parameter values exceeds the critical state, while buzzer will rings then a SMS message is generated to the nearby doctor's mobile through GSM Module.Then doctor will respond to the patient's health condition and immediately will give the treatment to the patient.

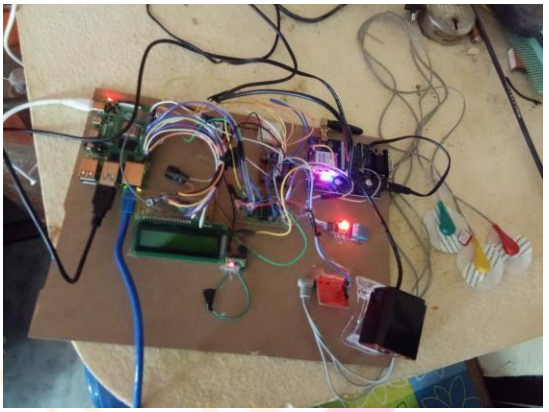

Figure 3.1: Implemenation Kit of developed system

A. Block Diagram

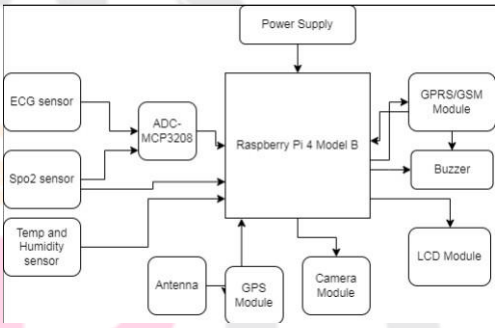

Figure 3.2:Block Diagram

As shown in figure 3.2,overall block diagram is to described as bellows:

ECG sensors are used to obtain the patient's analog information. Analog output signals from the ECG sensor are fed into an ADC, which converts them into digital signals,

then the output digital signals will displayed on the LCD module.

Max30100 sensor is placed on a patient's body on a very thin surface usually an earlobe or fingertip or a foot in-case of an infant

GSM module is used to send the SMS alerts to the doctors/clinic nearby whenever a critical patient health condition is observed by using healthcare parameters measured such as humidity, temperature, ECG, Oxygen (BPM) blood of person etc.

GPS module will find out the position or the location of the patient using the longitude and latitude received.

DHT-11 Temp & Humidity Sensor are used to the patient's temperature will be monitored and the actual values will be displayed on the LCD Module.

Web-camera module is used to display the live streaming from web-page in real-time manner.

When a patient's input sensors rise above the threshold values, a buzzer automatically sounds and the doctor is notified that the patient is in a critical state.A buzzer automatically rings and the doctor is informed that the patient is in a serious condition when the input sensors of a patient exceed the threshold values.

B. Flow Chart

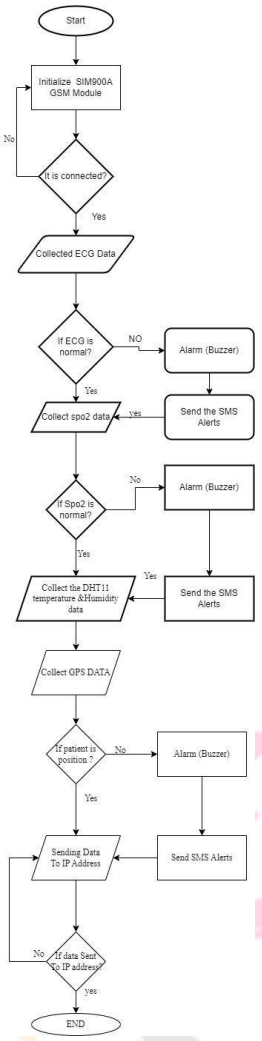

Figure 3.2: Flow chart of developed system

IV. RESULTS

In my project, those parameters actual values are displayed through the Web-screen as well as LCD screen. As shown in figure 4.1,those parameters output normal and abnormal values are sent the SMS alerts through web-server as well as mobile devices at relevant networks.

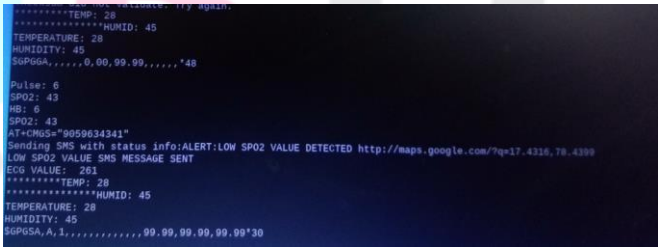

Figure 4.1:Measured those parameters values are displayed by web-server

As shown in figure 4.2, Those parameters is actual values are displayed on the LCD screen.

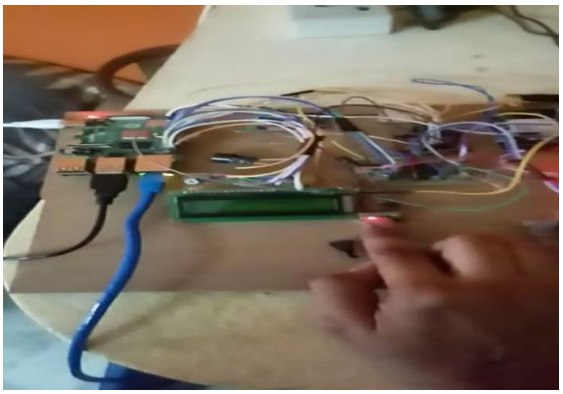

Figure 4.2: measuring those parameters are displayed by LCD screen

As shown in figure 4.3,Capture live streaming image are displayed through Web-page

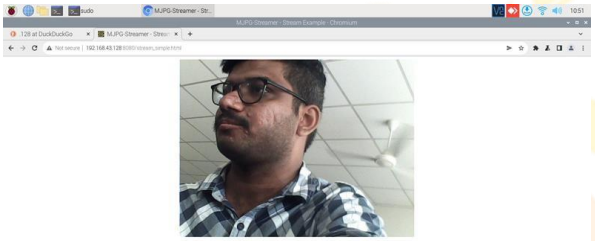

Figure 4.3: Patient live streaming image

CONCLUSION

IoT technology was used in developed system to construct smart health monitoring system, which makes life easier for patients and medical professionals. in my system requires stable internet connectivity at every time so that it can be accessed by doctors all the anytime. Then the actual values of various physiological parameters will be displayed on the Web-server as well as LCD screen. Thus, it is established to keep track of the patient's current condition even when the doctor is not present.

Future Scope:

Many more sensors can be interfaced to add many other types of health checkups, to be included in the smart health development system.

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