Patient Monitoring System Using Raspberry PI

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Abstract: *In India, everyday many lives are affected because the patients are not observed and properly treated. Also for realtime parameter values are not efficiently measured in clinic as well as in hospitals. In some situations it becomes hard for hospitals to frequently check patients conditions. Also continuous monitoring of ICU patients is not possible. To overcome these situations , our system is designed to be used in hospitals for measuring and monitoring various health parameters like temperature, humidity, heart beat etc. The results is being shown with the help of Raspberry Pi . Also the results can be sent to the proper faculty or doctor using GSM module. Doctors can login to a website and view those results. A live video can be streamed and, the doctors and relatives are able to monitor the patient from any distance. And also the parameters of the patient can be compared with threshold values and if there is any variations immediate alert messages could be sent to doctors.The main advantage of this system is that it provides realtime video and health parameter of the patient .*

Keywords: Raspberry pi, GSM, Sensors, Streaming

1. Introduction

Health is one of the big challenges for humans. In the last few years the healthcare has drawn considerable amount of attention. The prime goal is to develop a reliable patient monitoring system so that the healthcare professionals can take care of the patients, who are either hospitalized or executing their normal daily life activities I their own homes.

Recently, the patient monitoring systems is one of the major changes in the health care system because of its improved efficient technology. Currently, there is a need for a modernized approach. In the traditional methods the healthcare professionals play the major role. They need to visit the patient ward periodically for necessary diagnosis and advising the treatment. There are two main problems associated with this method. Firstly, the healthcare professionals must be physically present on site of the patient all the time and secondly, the patient remains admitted in the hospital, bedside the biomedical instruments, for a period of time. To solve these two problems, the patients are given knowledge and information about disease diagnosis and prevention. Secondly, a reliable and readily available patient monitoring system (PMS) is required .In order to improve the above condition, we can make use of technology in a smarter way. In recent years, health care sensors along with raspberry pi play a major role in health department. Wearable sensors are placed in contact with the patient' body and it monitor his or her physiological parameters. We can buy variety of parameter sensors in the market today such as ECG sensors, temperature sensors, pulse meter etc. The cost of each sensors varies according to their size, flexibility and accuracy.

The Raspberry Pi is a cheap, flexible, efficient, fully customizable and programmable minicomputer board provides the advantages of a PC to the domain of sensor network .In our system we are measuring patient parameters (temperature, heart rate, pulse, etc.) through different available sensors. This sensor collected data i.e. biometric information about the health statistics is given to raspberry pi and then it is processed and transferred to server. Gathered biometric information can be wirelessly sent using different options available such as Wi-Fi, 3G, GSM, Bluetooth, 802.15.4 and ZigBee depending on the need of the application .The data is stored in a database and can be displayed in the website that can be accessed only by authorized personnel. The doctors, RMOs, patient or his family members can be given authorization.

2. System Design and Implementation

The real time parameter reading will be taken from the patient through four sensors. The sensors used are heartbeat sensor, pulse rate sensor, temperature sensor and the blood pressure sensor. The data will be constantly transferred continuously to the web page, through the web page the parameter reading and the live video streaming could be viewed. For that webcam is attached on the patient's room. The webpage is a secured one, there are two login in the webpage one for the doctors to monitor and other for the relatives to observe the live visuals that is being send through the webcam. There is a GSM unit to give alert or notification to the doctor whenever there is a unstable value of parameter is found. Also there is a command control feature that will let the doctors to inject insulin from some another location. For this purpose there is a solenoid valve which is an electric valve which lets a dose of insulin when it is activated. And all these units are coordinated and connected by a mini computer Raspberry pi. Raspberry pi 3 model is being used here. It is the most flexible and cost efficient way of implementing this system.
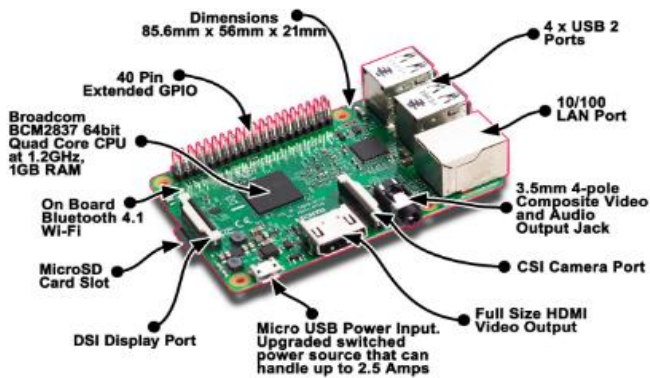
Figure 1: Raspberry Pi 3 Model B

3. Modules of the System

The modules of the system include: sensor module, GSM module, login module, streaming module.

a) Sensor Module

This Module gives the idea about the wearable sensors being given to the patients. These sensors help to measure and monitor the parameters of the patient. In our project we are using DHT sensor for sensing both temperature and humidity. And also a pulse oximeter sensor is used to measure systolic, diastolic pressure and pulse rate of the patient.

Figure 2: DHT Sensor

b) GSM Module

GSM is used to send alert message to the authorities if it crosses the threshold values. In our project we are using SIM 300 GSM module.

Figure 3: GSM Module 300

c) LOGIN MODULE

This module describes about those who have access to the system. It includes doctors and relatives of the patient. There is a separate login Id and password for both doctor and relative. This module helps them to view the live video and patient status easily. They could also login into the website from anywhere in the world.

d) Streaming Module

This module describes how the live video streaming is being done. The Webcam is connected to the Raspberry Pi and images are taken frame by frame so that video can be displayed.
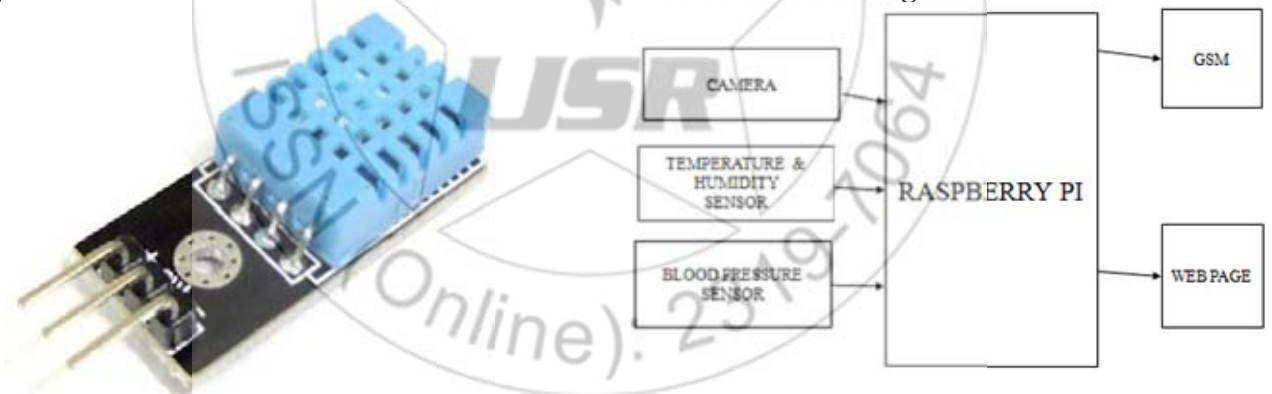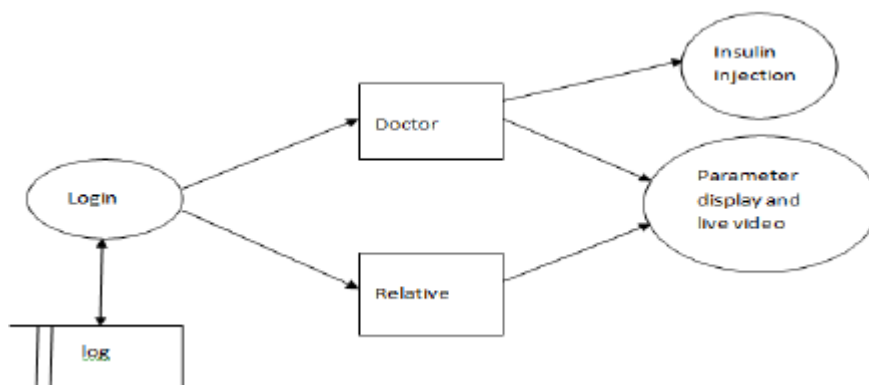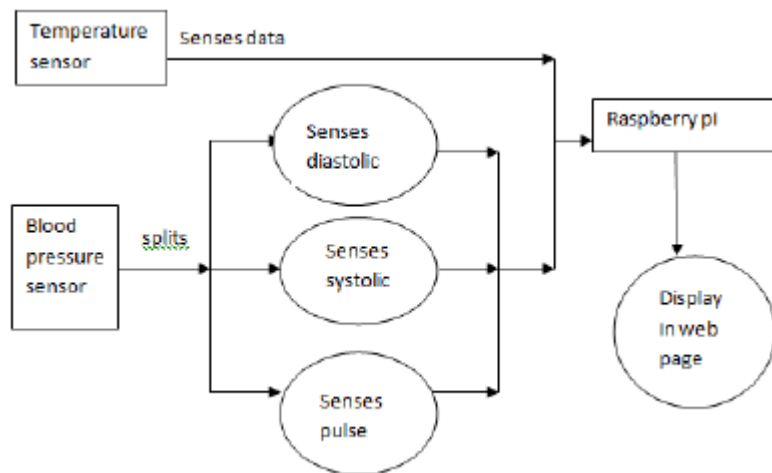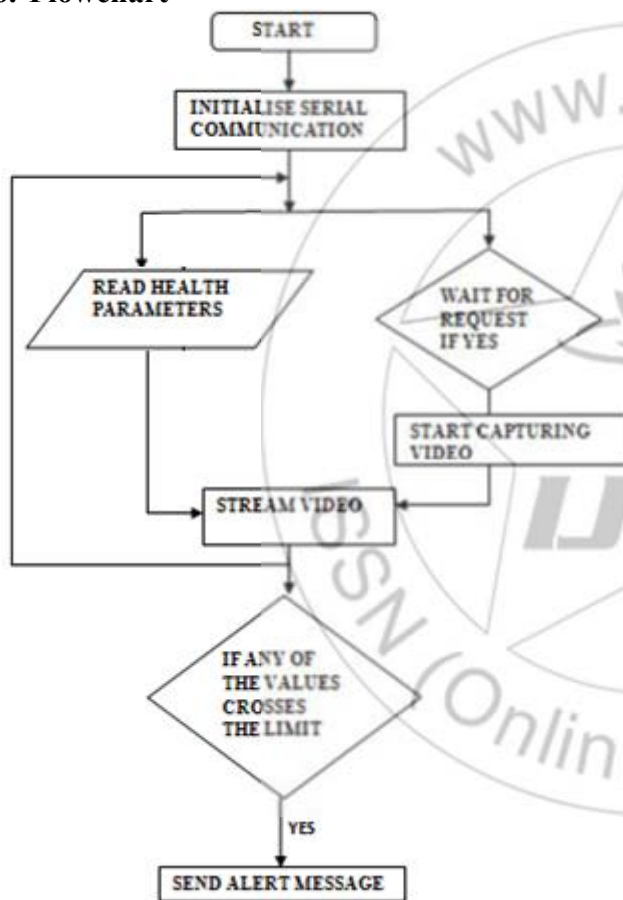
4. Architectural Diagram

5. Dataflow Diagram

6. Flowchart

7. Conclusion

Our project proposes a method for monitoring the present condition of the patient in an ICU. Our project help the patient to be monitored by both doctors and relatives by giving them login id and password .For efficient monitoring live video streaming is also included. And also parameters are displayed in the web page. Database will give us the periodic values of the health parameters like temperature, pulse, blood pressure. If there is any unstable health situation an alert will be send to the concerned doctor.

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