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MULTIPARAMETRIC MONITORING OF VITAL SIGNS IN CLINICAL AND HOME SETTINGS FOR PATIENTS

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Abstract— Since December of 2019 Covid has widely spread throughout the world. Covid is an epidemic which has caused various losses in different fields, and it has majorly impacted on health care system. Covid cases have exponentially increased in second wave leading to lack of medical facilities. Hence to manage these resources efficiently, doctor can know which patient are in dire need as to save more lives. With the issue of shortage of beds being a common issue in every hospital in our country, search for beds & oxygen have proved to be agonizing for attendants and relatives of patients, they rued. Such being the situation in most of the hospital in the city, it's now common for patients leaving the emergency wings of the hospital without getting any treatment due to the paucity of beds. This project concentrates on enabling doctors & hospital staffs to remotely monitor and manage patient, who has mild symptoms and providing a platform to doctors to monitor and manage patients. Which allows them to check vital signs without needing patients to stay in hospitals. Hence saving hospital resource and doctor's time, that can be given to patients who are in immediate need. Hence saving more lives. With this project i.e., monitoring and management system for patients, it is efficient to manage the resources.

I. INTRODUCTION

1.1 Background/context

Covid is a pandemic which has caused various losses in different fields, and it has majorly impacted on health care system. Covid cases have exponentially increased in second wave leading to lack of medical facilities. Hence to manage these resources efficiently, doctor need to know which patient are in dire need. So, it can keep no. of deaths minimum. This project is multiparametric monitoring of vital signs in clinical and home settings for patients so that doctor can check vital signs and can also manage various patients simultaneously via GUI based platform.

1.2 Aim and Objective

The aim of Project is to acquire various parameters like temperature, Oxygen level and pulse rate of the patient. So, that Patient can be supervised all the time while staying at home. And this platform can also help to manage and monitor various patients which can help in early diagnosis of patients. In this project is to detect various parameters like temperature, Oxygen level of the patient. And it has solved problem of limited resource like beds by managing the patient with mild symptoms virtually. Using this platform to manages various resources.

II. THEORETICAL DESCRIPTION

2.1 Theoretical description

The complete project has been divided into two major parts i.e., Doctor and patient side. The doctor side is a python GUI whose purpose is to manage admin, doctor, and patients. In admin login, to manage all the patients and doctors present in the hospital. In doctor login, to manage patients and their reports and all the patients that are assigned to them. Here doctor can view

all the reports and can live monitor the patients. In patient login, they can view all their details and available doctor. The doctor side is a python GUI whose purpose is to display the patients records and history by retrieving data from backend.
The backend of our project is on PostgreSQL and, patients' side is implemented on RPi 3. It is equipped with sensors to monitor patients vital sign and send those reading to IOT cloud. It also has an alert system which can send SMS alert to doctors in case of anomaly in vital sign data readings. It also sends an email to doctors to keep them updated about patient's condition. Also, Role of IOT, Raspberry Pi and GUI becoming integral part of this project.

2.2 Resources required

Hardware Requirements: Patients Side: RPi 3, MLX90614 (Non-Contact IR Temperature Sensor), MAX 30100 (Pulse Oximeter). Doctor side (For hospital or clinic): PC equipped intel i5 7th gen or later processor or equivalent of it. Minimum 4GB RAM
Software Requirements: Patient side, Python 3.8, Thingsboard. Doctor Side: Windows 7 or later, Python **3.7 or** later, Kivy, PostgreSQL

III. ALGORITHM

The complete project has been divided into two major parts i.e., Doctor and patient side. Patient side: Data is acquired via various sensors; temperature, pulse rate and SpO_2 sensor. That are connected to RPi. Data is analyzed on raspberry and then. Simultaneously updated on cloud. In case of anomaly in the data readings of vital signs, an alert is sent via SMS to doctor and hospital staff. An email with patient summary is sent via email to the supervising doctor.
Doctor Side: It will first check whether user is admin, doctor or, patient on authentication. If login user is admin, it will show following options; all doctors, show all patients, remove doctor permanently and remove patient permanently If user is doctor it will show following functions; see all requested patient, see all patients of my specialty, see my patients, see patients report and remove patient. Here doctor can also live monitor the patients via thingsboard. If user is Patient, it will show following options are add Report, see all doctors for my problem, Request Doctor, Remove Request, See My Doctor Stats. This complete process is carried out via a graphical user interface which is installed in the lobby of hospital or clinic.

IV. SYSTEM DESIGN

4.1 Block wise design

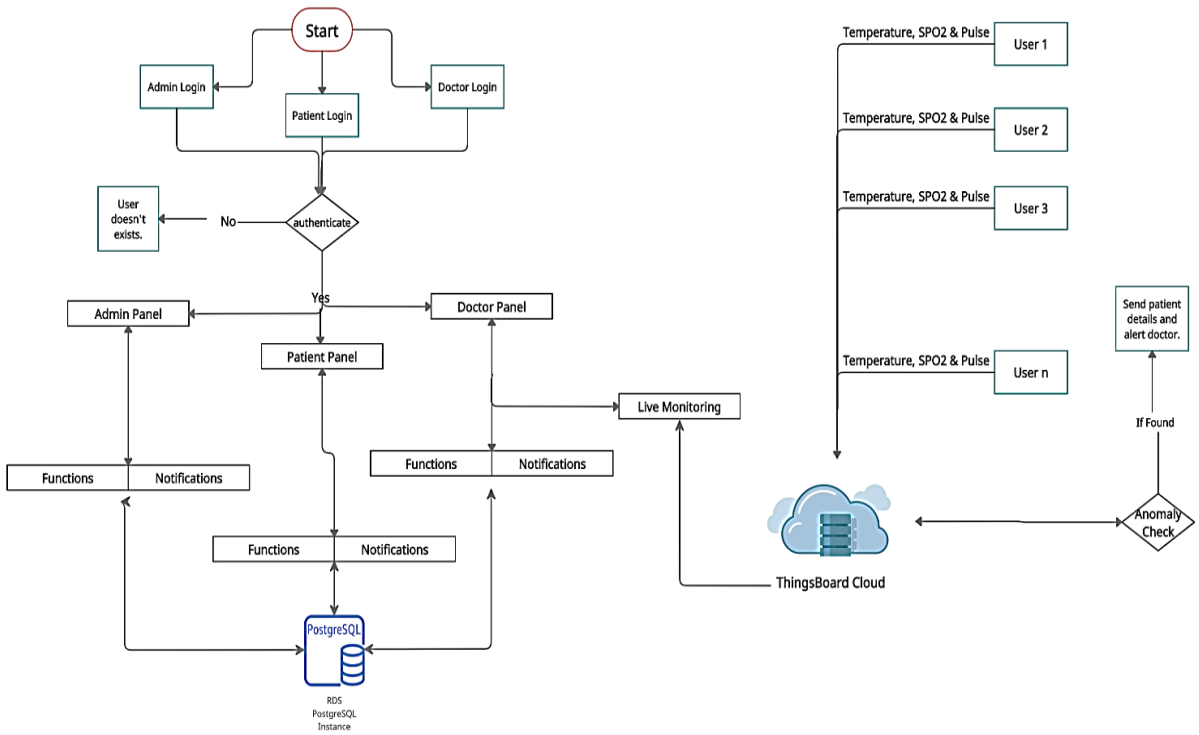

Fig 4.1 Flow chart

In Fig. 4.1 block diagram consists of three parts, that are GUI, data acquisition and Data Processing.

4.1.1 GUI Of System

To display records and to act a medium for users(doctor). After identifying the user, it will perform various operations and these are all used for managing the doctor and patients.

4.1.2 Data Acquisition

This sensor is connected to RPi using I2C communication. Program on RPi uses smbus2 and mlx90614 python libraries to read temperature from the sensor. This sensor is connected to RPi using I2C connection. Program on Raspberry uses max30100 python library to read pulse rate and oxygen saturation level data from the sensor.

4.1.3 Data Processing

Using Nexmo python library to send SMS alert to doctor and hospital staff in case to any anomaly in vital sign. Using the API key and secret code provided on its website after signup, in python nexmo library to send SMS alert via internet.
Data received from the sensor are uploaded on the thingsboard and then doctor can monitor the patient(live) through GUI.

V. IMPLEMENTATION AND TESTING

There are two side i.e., patient and doctor. In patient side sensors will measure all the vital parameters like temperature, pulse and oxygen level. And all these data are uploaded on the thingsboard and all these data can be live monitored by the doctor. And in doctor side, GUI is available through which it will help to manage patients and doctor details.

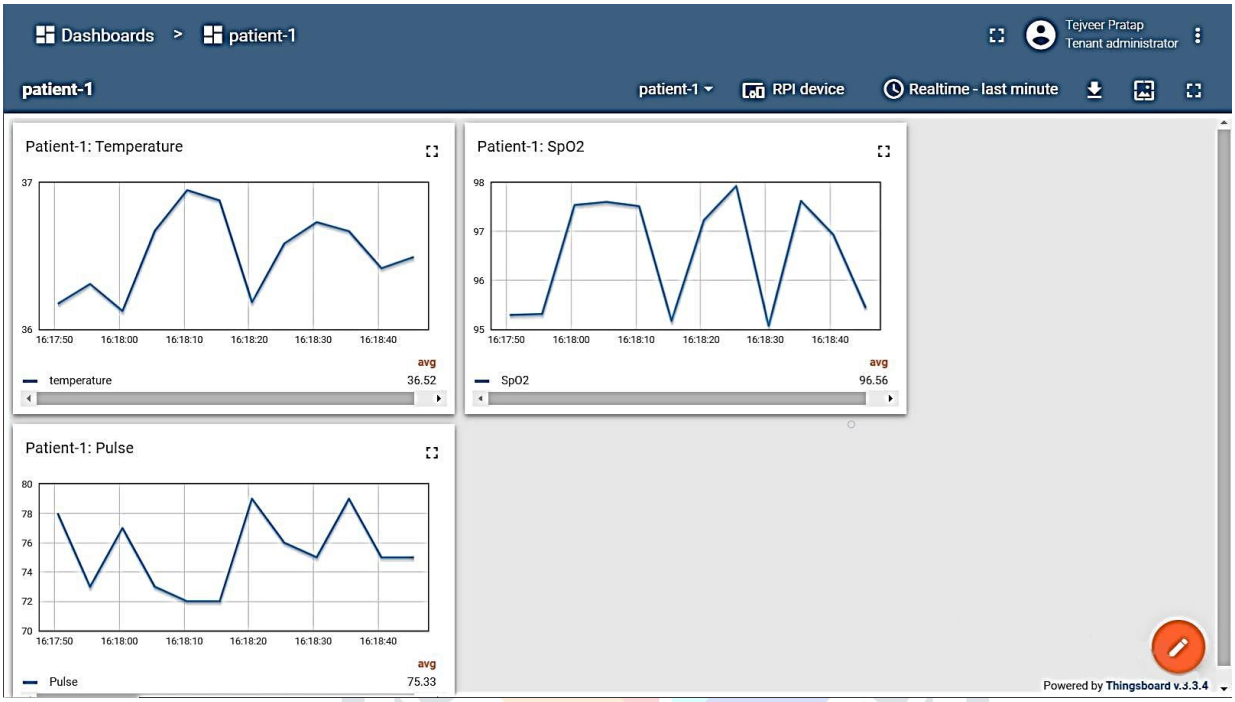

Fig 5.1 Live Monitoring

Fig 5.1 is the snapshot of live monitoring system in thingsboard. It shows the graph of temperature, SpO_2 level and pulse rate of patient. It shows that graph is vary according to live readings

VI. RESULT

Fig 6.1 Start Window

In Fig 6.1 it is start window of our platform. It starts a GUI which can be handle by patients, doctors and admin.

VII. CONCLUSION

As to manage the resource available in hospital, this project solves real world problem. The system proposed above, is the cheapest system that can be used for the same. In this project, understood various functionality of RPi and sensors. And acquire the knowledge about Kivy and PostgreSQL and their various methods and tools to successfully complete this project, gaining the understanding of thingsboard and how its various tools and how data is uploaded and retrieved from thingsboard.

Whether the patient is in the hospital or at home, healthcare companies, or many other places, require a real-time, dependable, and accurate diagnostic monitoring system offered by a low-cost sensor system application. A real time monitoring of body temperature, oxygen level using RPi has been presented in this project.

VIII. FUTURE SCOPE

It can have more optimized GUI and host the same on a website or an android app. Moreover, it can extend this solution with storing data in database for convenience, so to access stored data remotely and add employee in this GUI so that doctor can manage its employee. It can also make server on cloud which may help us to retrieve data from various hospital and unify them. By adding more sensors so that it can get more information like ECG, BP etc extend this to website or app to make sure it is easily accessible to everyone.

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