Smart Wearable System For Patients With Respiratory DisordersUsing IOT

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Abstract - *An Smart Wearable System For Patients With Respiratory Disorders using IOT was developed with the system to analyse the trigger factor of Breathing Disorder and a device that can use by Breathing Disorder patients, which can perform multiple functions that enable a physician to monitor the patient's condition and to provide continuous care. The different functionalities in a point of care device that are considered vital in caring for patients with Breathing Disorder. The idea behind this work is to develop a point of care device with the controller which can ideally be integrated with an alarm to remind the patients to take care of their health condition and also a memory which stores all the test results, patient's perception of their condition and the regularity with which the different health monitoring sensors are used so that the physicians can later use these data to accurately assess the condition of the patient.*

Key Words*: *Breathing Disorder, controller, IOT

1. INTRODUCTION

Respiratory Disorders is characterized by episodic respiratory symptoms and intermittent exacerbations. The symptoms, airflow obstruction, and exacerbations in Respiratory Disorders vary greatly in both frequency of occurrence and severity. Monitoring these events is crucial to the care of patients with Respiratory Disorders and is directed at the early detection of exacerbations and monitoring of the day-to- day control of Respiratory Disorders.

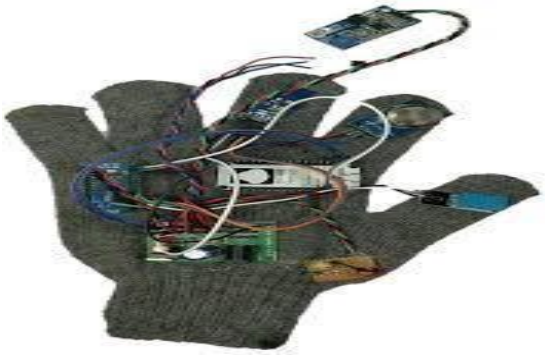

Fig -1: Health monitoring system on Gloves

Monitoring can also be extended to investigate reasons for poor control and reasons for exacerbations, such as noncompliance and exposure to triggers. It is important to identify who will perform the monitoring because this has implications for the type of data that are collected, their validity, and their accuracy.

Respiratory Disorders can be monitored by the following people:

- The patient with Respiratory Disorders because self-monitoring allows the early detection of exacerbations.
- The treating physician to assess control of Respiratory Disorders and investigate reasons for poor control.
- Health care managers to assess the quality and cost of care for patients with Respiratory Disorders.

2. METHODOLOGY Working Process

- ADXL337 sensor monitors the position of patient and it will send to the ESP32 Microcontroller
- LM35 give the temperature
- MAX30100 is used to measure BPM and SPO2.
- DHT11 sensor is used to measure the temperature and humidity.
- MQ135 is used to measure the air quality.
- Panic button used at emergency situation
- ESP32 contain inbuilt wifi it will update all sensor data to a cloud.
- Android app to monitor the status of patient and getalert notifications.

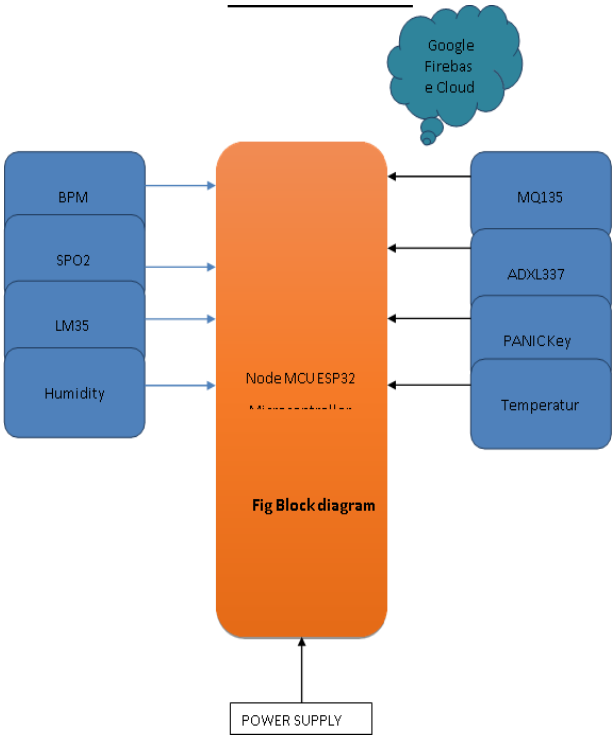

Fig -2: Block Diagram

Google Firebase cloud

Fig -3: Google Firebase clouds icon

Firebase is Google's mobile application development platform that helps you build, improve, and grow your app. Here it is again in bigger letters, for impact: Firebase is Google's mobile application development platform that helps you build, improve, and grow your app.

Functional Requirements:

- System should scan & Detect the Breathing Disorder patient condition.
- System should measure the heart beat & temperature.
- System should self-monitoring allows the early detection of exacerbations.
- System should automatically investigate reasons for poor control.

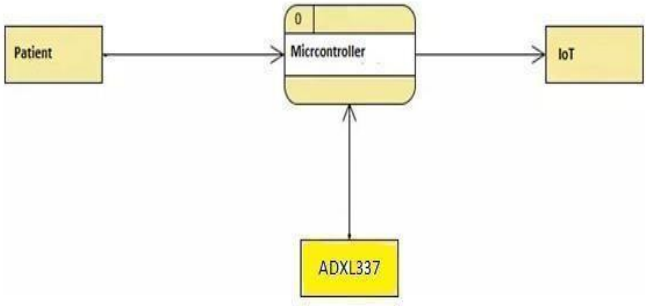

Fig -4: Main Functional requirements

HARDWARE REQUIREMENTS

- Node MCU ESP32
- Humidity Sensor
- Temperature Sensor
- Pulse Sensor
- SPO2 Sensor
- Accelerometer Sensor
- Air Quality Gas Sensor
- Power Supply

SOFTWARE REQUIREMENTS

- Embedded C
- Arduino Suite
- Google Firebase Cloud
- Doctors App

Arduino IDE

The Arduino is a single-board microcontroller solution for many DIY projects, we will look at the Integrated Development Environment, or IDE, that is used to program it. Once the installer has downloaded, go ahead and install the IDE. Arduino IDE is an open source software that is mainly used for writing and compiling.

It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.

MIT APPLICATION

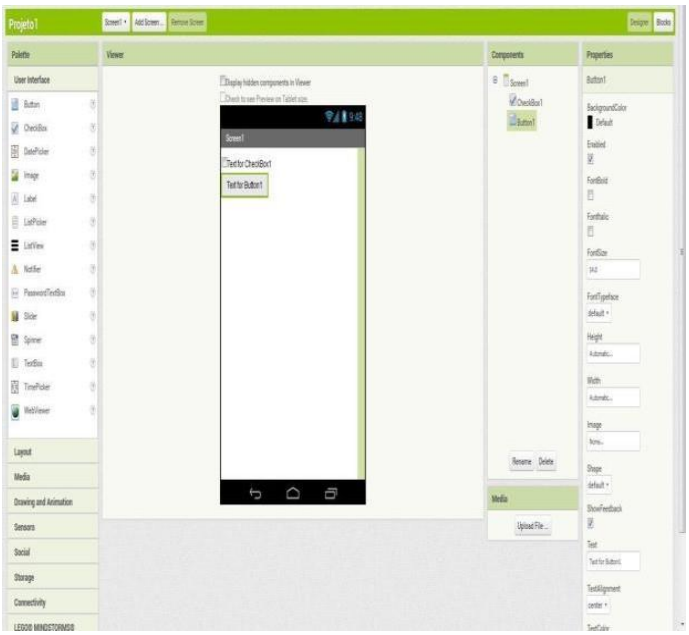

Fig -5: MIT App Inventor

MIT App Inventor is a web application integrated development environment originally provided by Google, and now maintained by the Massachusetts Institute of Technology (MIT). It allows newcomers to computer programming to create application software (apps) for two operating systems (OS): Android (operating system) Android, and iOS, which, as of 8 July 2019, is in final beta testing. It is free and open-source software released under Multi-licensing dual licensing: a Creative Commons Attribution Share Alike 3.0 Un ported license, and an Apache License 2.0 for the source code.

3. ARCHITECTURE

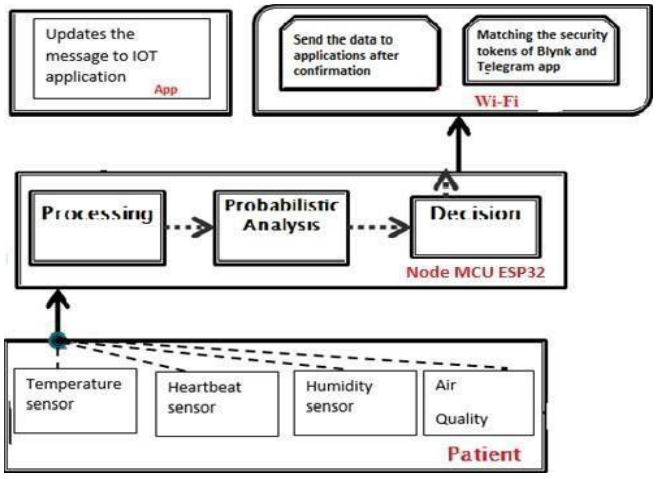

Fig -6: System Architecture

The architecture consists of three major layers which act as the backbone for our system. The first layer at the bottom of the hierarchy consists of various types of sensors which collect real time data. These wearable sensors are embedded in and around the environment surrounding the patient and in his/her body as well. They can be broadly classified into two types, viz. medical sensors and environmental sensors. The medical sensors monitor vital parameters of the patient like heart beat and body temperature whereas the environmental sensors monitor parameters of the room including room temperature and airquality.

The second layer of the system is a terminal layer offering Processing the monitored data. This layer offers analysis sensor conditions according to the patient well-being. This process involves predefined threshold in microcontroller for the patient correlating to the values of parameters that are being received from the sensors.

This layer is the pivotal layer of the system consisting of various APIs (Application Programming Interfaces). The Google Firebase Cloud stores the medical history of the patient as well as current records of the monitored parameters. It can also be used which would fetch the patient emergency situation to patient guardian.

4. RESULT

MIT application on Android mobile phone and its parameters readings.

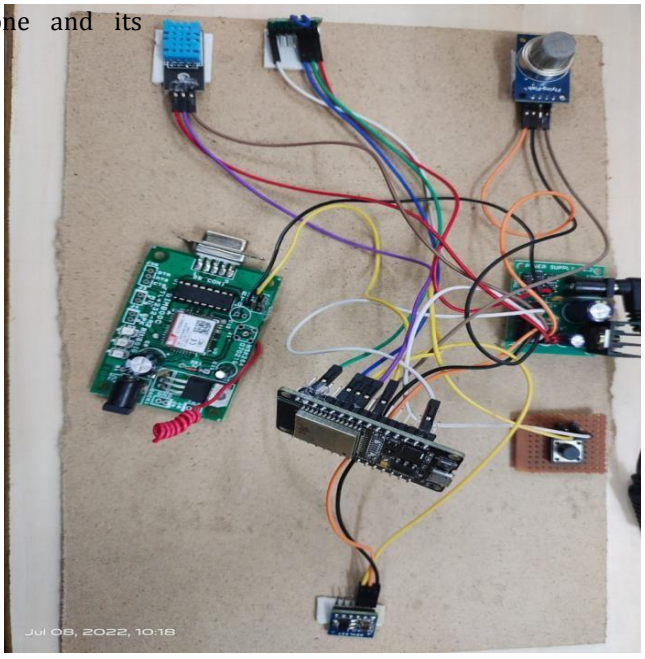

Fig -7: Final Model of System For Patients With Respiratory Disorders Using IOT.

MIT app displays the real time data to doctor or care taker of the patient and gives emergency alerts if the panic key ispressed.

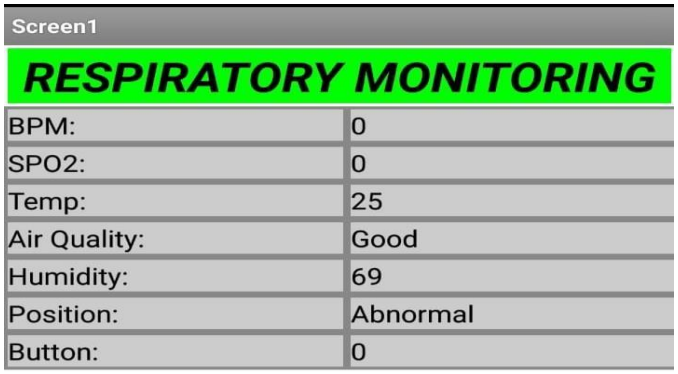

Fig -8: MIT Android App

Google Firebase cloud

We have used Real time database cloud for sending the real-time data to MIT app.

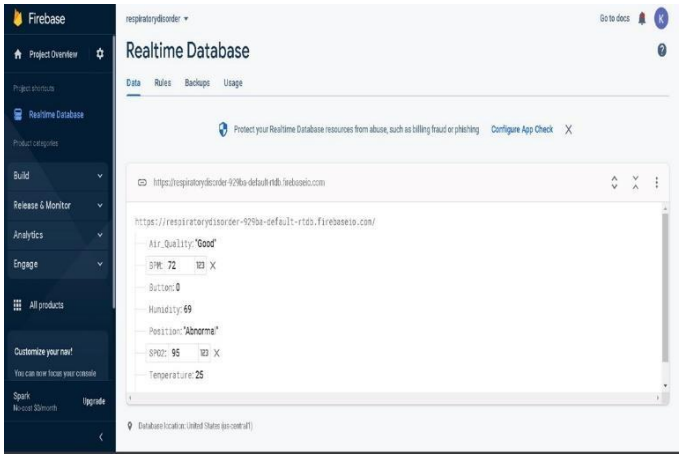

Fig -9: Real time data in Firebase cloud

SMS alert by the use of GSM module in our project.

Care taker or the Doctor gets the Emergency alert and real time data of patient's health conditions measured by the sensors

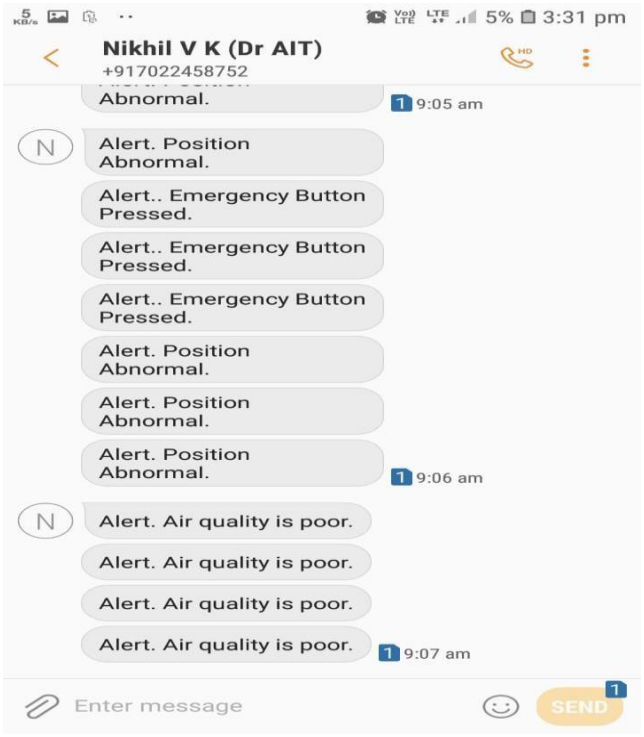

Fig -10: SMS notifications in mobile phone

6. CONCLUSION

In this paper we proposed prototype for asthma irritant monitoring device. The designed prototype is portable with a reliable hardware and all data needed by patients and physicians. The device was successfully tested for preventing asthma attacks by measuring and recording symptoms and triggers, and by sharing multiple online accounts with the patient's doctor, a smartphone would automatically connect to the hardware and display the current result measurement whilst history of the measured values are synchronously emailed to the doctor using Google Firebase Cloud application.

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