Smart Portable Device for Monitoring Dyspnea

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Abstract: **Asthma is a respiratory condition marked by attacks of spasm in the bronchi of the lungs, causing difficulty in breathing it is usually connected to allergic reaction or other forms of hypersensitivity. About 3 million people suffer from Asthma worldwide and annual death from asthma is about 250,000 die annually it is estimated that more than 100 million people will be there at the end of 2025 affected by asthma. Asthma is an incurable disease so what have to done is control the disease. Real time monitoring is the solution to avoid the intensity of this chronic disease.Self monitoring is an important tool that help both physicians and patients to jointly control it.Spirometry is the classic and preeminent way to diagnose the severity of lung functions and their response to treatment but it not portable and continuous manly supervision is needed so more convenient techniques are required for real time monitoring . portable device is currently available to monitor the Peak Expiratory Flow, but it is expensive and inconvenient to use. The proposed system namely ''Smart Portable Monitoring Device for Dyspnea'' helps to monitor the real time symptoms of dyspnea and to provide instant changes in medications and prescription if necessary. The developed system overcomes the drawbacks of existing system by remotely monitoring the lung functions and patient's environmental factors in the delayed time without any supervision as in standard spirometry test. The proposed system includes portable hardware unit to check the carbon dioxide content, air flow,environment temperature of the asthma patient and a accelerometer is included to monitor the chest movement . The system also comprises of Cloud storage access through which physician can have real time track on parameters. Physician can send the results of medical evaluations through messages, which can be viewed by patients in their remote area. The design and results shows that using sensors and Cloud storage access in mobile phones, we can have a sufficient and real time monitoring on the symptoms of the asthma patients.**

I.INTRODUCTION

The primary objective of this project work is to develop a flexible system characterized by low-cost sensing nodes that assures robust and continuous monitoring of air conditions in order to analyze the asthma trigger factors. Asthma is a chronic condition that mostly affects adolescents. It is a condition that requires continuous monitoring of the symptoms in order to provide an effective course of treatment. It also requires a strict adherence to medication prescribed by the physician. However, the aim of this study is to develop a system, which is based on a periodical data collected by the different sensors. For the proposed system is designed around a PIC microcontroller and different sensors, Temperature, Humidity & gas sensor for gathering, sending and receiving information from different sensors and external servers. The aim of the architecture design is to provide an easier access to information and services, better patient healthcare services, transparent and efficient use of healthcare resources, and a fast response by the hospital side in case of Asthma attack. This system permits to establish correlations between the air quality parameters and the appearance of respiratory diseases such as asthma as part of environment medicine approach. After being processed the information and, depending of the results obtained, the system will display the messages if their range is beyond the required limit. In this way a self management system is designed for asthmatic patient. So the system is very efficient for patient as they can monitor their asthma level at their residential place. People in villages having their financial problem then for them the system can be installed to their central clinic which can help them to diagnose their asthma at local place.

III.SYSTEM DESIGN

System Architecture

The Dyspnea Monitoring System is designed around a raspberry pi and audrino for acquiring, sending and receiving information from various sensors and external servers. The aim of the architecture design is to ensure an easier access to information and services for better patient healthcare services and efficient use of healthcare resources, and a fast response from physician in case of a Dyspnea condition.

II.HARDWARE ARCHITECTURE

The proposed system is designed by combining the following hardware modules shown in Fig 1. As the figure shows, the system consists of Raspberry pi integrated with a sensor array (Temperature sensor, Flow sensor ,Accelerometer& CO2 sensor) using analog ports and digital ports.

PATIENT SIDE MODULE

The module consist of various sensors including co2 sensor,air flow sensor, temperature sensor and a accelerometer sensor embedded in to a arduino were the results are displayed in a local display for patient monitoring.the whole module is connected into a raspberry pi through a local wireless network which automatically sends the sensor values to the cloud storage of physician.

PHYSICIAN SIDE MODULE

The module consist of simply a android device with a Internet access and the cloud storage application DROPBOX installed in it .the connection with the raspberry pi and the android device is made earlier.

IV.BLOCK DIAGRAM

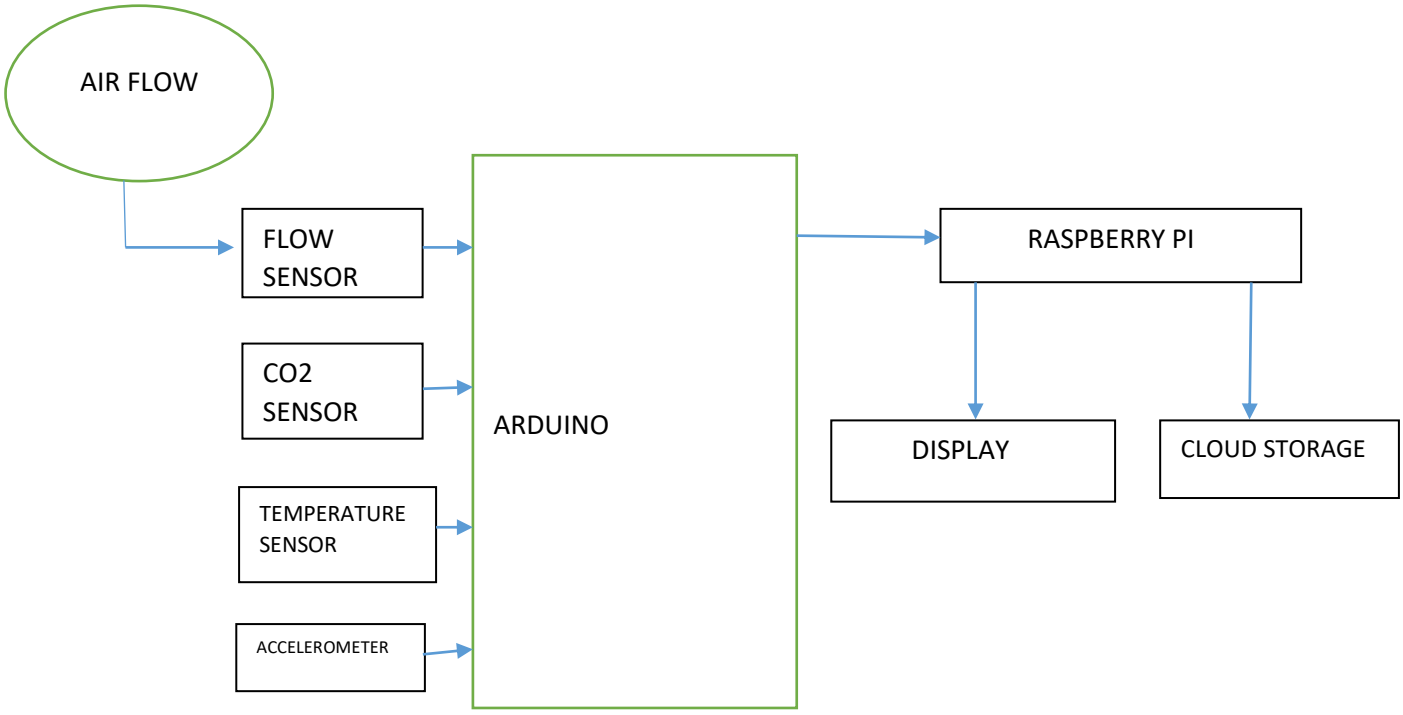


FIG 1

SOFTWARE OF THE PROPOSED SYSTEM

ARDUINO IDE:

Arduino IDE is the coding platform used to code the arduino were the sensors are connected onto it. The coding for sensors are saved into arduino by connection it into a computer

MATLAB:

MATLAB is used to plot the graph of the sensors, different graphs are displayed for each of the sensor the MATLAB program runs when each of the sensor of selected and its values are displayed separately

PYTHON:

PYTHON is used to code the raspberry pi were it is coded to automatically send the results to the physicians cloud storage,a delay time is also set in the raspberry pi program so that the results are sent to the physician at a time interval for multiple times a day.

V.RESULTS

The proposed system ‘’Smart Portable Monitoring Device For Dyspnea” was developed and the results were made, Out of the two modules the patient side monitoring module’s result was obtained as a graph in the display unit and the physician module results were showed in the android devices cloud storage application

Patient side module result

The graphs for each sensor was shown when each of the sensors are selected from the option in MATLAB program selector (fig 2). different graphs were plotted for Flow sensor(fig3) and CO2 sensor(fig4)

Physician side Android result

The results were showed in the DROPBOX of android device at a time interval(fig 5) and among that one result was checked(fig6)

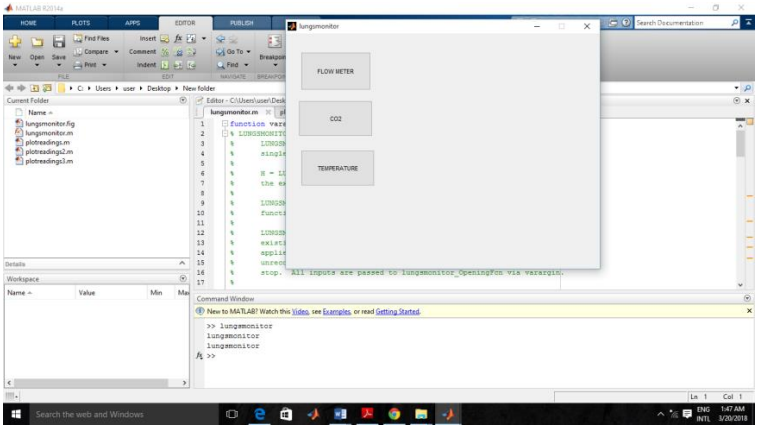


Fig 2- MATLAB sensor selector for plotting graph

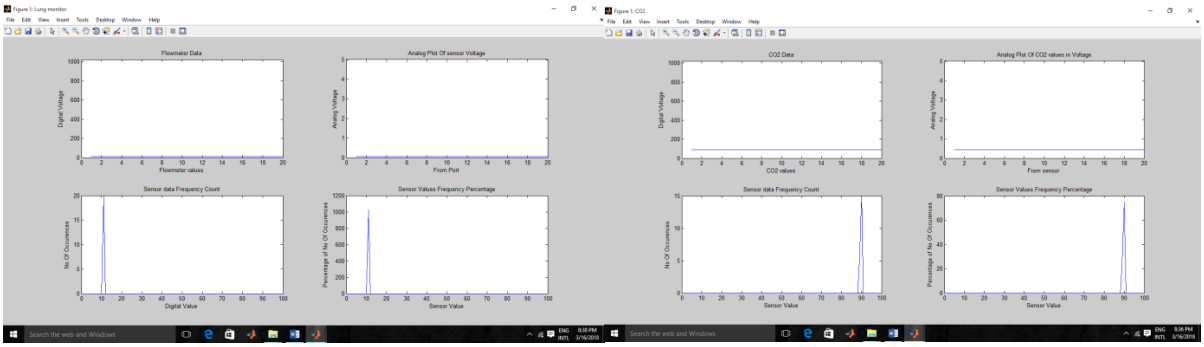
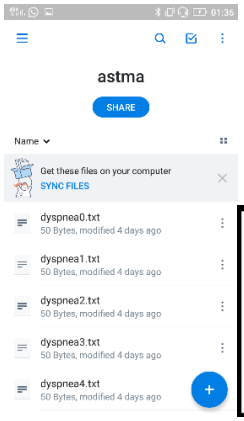


Fig 3- Flowsensor graph

Fig 4-CO sensor graph



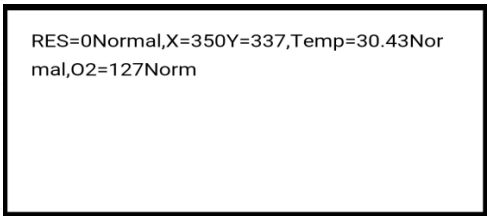


Fig 5-Result at DROPBOX Fig 6-Result from android device

VI.CONCLUSION

The project named Smart Portable monitoring device for Dyspnea was made and the results were checked and it was found that the system was working and helping the Asthma patients a lot in controlling this incurable disease. The system also send the patient condition to the physician at different time intervals to physicians android device through a local wifi network

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