Available onlinewww.ejaet.com

European Journal of Advances in Engineering and Technology, 2022, 9(4s):500-502
International Conference on Tech Trends in Science & Engineering (ICTTSE) 2022
Suryodaya College of Engineering & Technology, Suryodaya Polytechnic, Nagpur, Maharashtra, India

Research Article **ISSN: 2394 - 658X**

Iot based Data Analysis and Health Enhancement through Smart Spirometer

[1]Dr. Rasika Chafle, [2]Prof Sumit Chafale, [3]Harsh Daharwal, [4]Neha Katre

[1,2,3,4]Electronics and Telecommunication, Suryodaya College of Engineering & Technology, Nagpur, Maharashtra, India

[1]rasikamanapure@gmail.com, [2]sumit.chafale28@gmail.com

ABSTRACT

Inhalation and exhalation of air by lungs is measured by apparatus called spirometer. Spirometer is the extremely used applied clinical tests to diagnose obstructive and to rule out restrictive pulmonary diseases. In this paper, we demonstrate and detect pattern recognition using spirometer to enhance the spirometer analysis. We bring together data from various patients with the help of IOT Based Spirometer and Things Speak and checked for also online data available. The acquired data then used to predict pattern recognition accuracy. On the basis of all data we collect the patient keep monitor and keep a check their lung activity.

Key words: Spirometry, Pattern Recognition accuracy, Obstructive lung disease, Restrictive lung disease

---

INTRODUCTION

Smart spirometer is a tool that enables lungs to get better after any treatment of lungs illness. The patient's lungs can emerge as susceptible after extended disease. With the assist of a spirometer can maintain them lively and free. The breath incentive spirometer works as such, a piston rises in the tool and measures the extent of breath that is the inspiratory extent. Smart spirometers are particularly used for sufferers of lung surgical treatment. The current styles of smart spirometer is simplest to offer visible remarks which is probably hard for affected person to understand. Thus, there is a need for calibrating the data from the smart spirometer. The present invention of spirometer consists of an IR distance sensor, Raspberry pi which is also acts as the WIFI module for data transfer as the hardware components. The data calibration from the spirometer is done by the sensor which collects the data based on the movement of the balls in the spirometer. Further, the data collected communicates with the patient with the help of IoT. This can be achieved by creating a Web API. Existing System: Already present spirometer might only deliver visual feedback. They unable to show inspiratory volume of sufferer. Proposed System: Offers sufferer with their breathing status. Stores the patient's everyday records and helps them keep track by implementation of IoT.

Typically, the health care system recommended in this study runs on the simple spirometer with a Wifi, Things Speak and Android mobile application. Typically, the system utilizes Android os, Java, MATLAB, and PHP technologies and consists of a spirometer, mobile App, & expert analytic system. A system for remotely monitoring asthma severity includes a remotely located breathing difficulties monitoring station. To be able to evaluate the potency of the system, a potential study was completed in 3 distant primary healthcare organizations. Portable spirometers: employed by medical professionals to acquire measurements of relative parameters needed in COPD/asthma analysis. Thus, it is employed to evaluate different conditions of patient, the system uses different technologies which are described below. The unit mainly subtends three quests: a flow meter, a PCB and a Smartphone. Typically, the flow meter is attached to a control system product composed of a top pass filter, signal amplifier, stabilizer (denoted as trigger), a µ-controller & a Bluetooth module. To get light and lightweight, our spirometer could be a wireless small compact hand-held unit without

any external connecting pipes/tubes, desktop consoles. The lightweight spirometer used in this study can be attached to a mobile telephone using Bluetooth. Any kind of commercially available portable spirometer wit this communication module can be applied for this Tele-health system. Android based mobile app: developed for the Android OS and executed in Java using Android Studio 2.0 IDE (Integrated Development Environment). That is attached to a mobile phone and used for starting SPIR data recording, formatting, and data transmission.

LITERATURE SURVEY

Badnjevic A, Koruga D, Cifrek M, Smith HJ, Bego T The Explained that approach is easy to use and offers specialized consultations for patients inVillage and isolated Places. Which improve the quality of care delivered to patients, it was also found to be very beneficial in terms of healthcare.[1]. **Sussman JB, Kent DM, Nelson JP, Hayward RA.** Improving diabetes prevention with benefit based tailored treatment: risk-based reanalysis of Diabetes Prevention Program. **G. Biagetti, V. Paolo Carnielli, Paolo Crippa, Laura Falaschetti, Valentina Scacchia, Lorenzo Scalise.** We introduce a dataset to provide insights into the relationship between the diaphragm surface electromyographic (sEMG) signal and the respiratory air stream. The data obtainable had been originally composed for a research project jointly developed by the Department of Information Engineering and the Department of Industrial Engineering and Mathematical Sciences, Polytechnic University of Marche, Ancona, Italy. This article describes data recorded from 8 subjects, and includes 8 air flow and 8 surface electromyographic (sEMG) signals for diaphragmatic respiratory activity monitoring, measured with a sampling frequency of 2 kHz [2].

Guwani Liyanage, Bernard Deepal Wanniarachchi Jayamanne Most normative standards for spirometry are established based on height, weight and body mass index. We have investigated chest circumference as an alternative to height for interpretation when accurate height measurements cannot be obtained. [3]

Aarticle by Giorgio Biagetti, Virgilio Paolo Carnielli, Paolo Crippa describe data recorded from 8 subjects, and includes 8 air flow and 8 surface electromyography (sEMG) signals for diaphragmatic respiratory activity monitoring, measured with a sampling frequency of 2 kHz. [5]

Seakale Chandrakar in Design and Development of Low cost spirometer with pc Interface by shows that. Spirometer parameters are derived from pressure and/or flow measurements. The spirometer records exhaled air volume, and produces graphic and numeric information in the form of Spiro metric parameters and tracings that can depict and describe the mechanical properties of the lung. Some possible measurements are like Pressure and gas flows behave during one respiratory cycle in volume controlled.

SYSTEM ARCHITECTURE

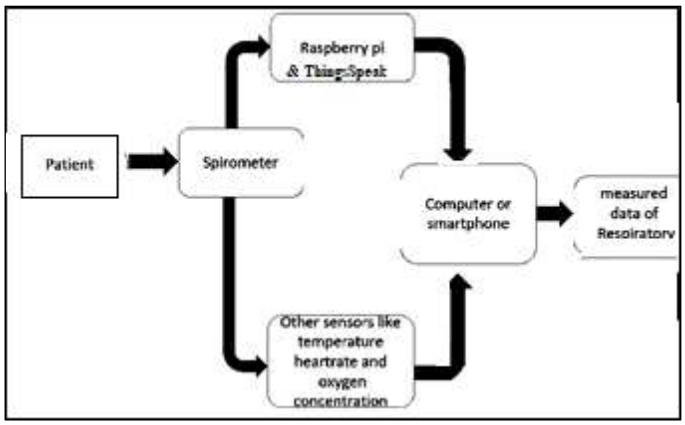

Fig. 1 Block Diagram of the system

METHODOLOGY

The proposed methodology consists of two major sections - one is the user section and other is the spirometer section. Typically, in the spirometer section the input signal i.e, the breathing signal is scored by the IR distance sensors which detect the distance by the movement of the balls in each column of the spirometer. The IR distance sensors only provide analog values. Next, the particular analog values through the sensor is converted into digital form employing a analog to electronic converter. An analog to digital ripping tools is added in order to the setup since the microcontroller we possess used has just one analog in order to digital converter yet we have about three input signals. Therefore, the converted electronic digital values are provided towards the Node MCU. Finally, the digital values are displayed using the Raspberry pi application. Further, a web application on the is created in order to store the values produced by the spirometer to thins speak which helps create a reassurance for patient that their health is improving. The things Speak we have used to collect real-time data.

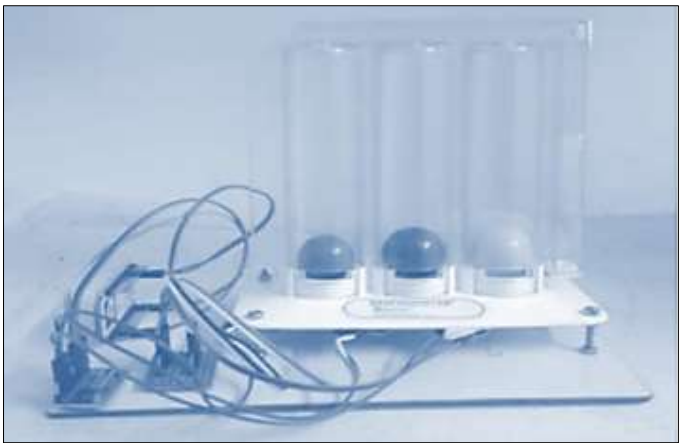

Fig. 2 Overall diagram for this project

FUTURE WORK

The low-cost real time respiratory signal monitoring and processing system was proposed and implemented. Also, this system provides less power consumption compared to traditional technology and useful for the internal village area. The hardware we used here are commercially available and the software programming are described here. The proposed system could be modified and add more functions like ECG, temperature, pulse rate, Analysis for cardiac disorder. And also, we would add some notification system like alerts on inappropriate ECG report and future asthma attack.

RESULT AND CONCLUSION

Each column of the spirometer is employed with a specified volume as 600cc, 300cc, 300 cc which will add up to a total of 1200cc. The output is calibrated as a result of 20 counts of breaths by the patient. So a total average of each column and corresponding inspiratory volume is generated. Further, it displays the data with time and date which helps the patient keep track and keep a check upon their lung activity. The output will be as follows. If the patient can maintain displacement of the balls in first and second columns of device for 4 seconds, the estimated or good condition indication may be around 2.8 liters which is 900cc with the time period of 4 seconds

REFERENCES

[1]. Badnjevic A, Koruga D, Cifrek M, Smith HJ, Bego T, "Interpretation of pulmonary function test results in relation to asthma classification using integrated software suite," 36th International Convention on Information and Communication Technology, pp.: 140–144, 2013.

[2]. Jeremy B Sussman, David M Kent, Jason P Nelson, Rodney A Hayward, Improving diabetes prevention with benefit based tailored treatment: risk based reanalysis of Diabetes Prevention Program;

[3]. Guwani Liyanage1, Bernard Deepal Wanniarachchi Jayamanne. Prediction of spirometry parameters using chest circumference in Sri Lankan boys aged 8-16 years.

[4]. Asaithambi M, Manoharan SC, Subramanian S, "Classification of Respiratory Abnormalities Using Adaptive Neuro Fuzzy Inference System", Int. Inf. and Database System-Lecture Notes in Computer Science, Vol. 7198, pp.

[5]. Giorgio Biagetti, Virgilio Paolo Carnielli, Paolo Crippa, Laura Falaschetti, Valentina Scacchia, Lorenzo Scalise, Claudio Turchetti Dataset from spirometer and sEMG wireless sensor for diaphragmatic respiratory activity monitoring

[6]. Seakale Chandrakar by Design and Development of Low-cost spirometer with PC Interface

[7]. M.L. Duiverman, L.A. van Eykern, P.W. Vennik, G.H. Koeter, E.J. Maarsingh, P.J. Wijkstra, Reproducibility and responsiveness of a noninvasive EMG technique of the respiratory muscles in COPD patients and in healthy subjects, J. Appl. Physiol. 96 (5) (2004).

[8]. Rosenthal M, Bain SH, Cramer D, Helms P, Denison D, Bush A, et al. Lung function in white children aged 4 to 19 years. Thorax.

[9]. Paul Carter, Jakub Lagan, Christien Fortune, Deepak L. Bhatt, Jørgen Vestbo, Robert Niven, Nazia Chaudhuri, Erik B. Schelbert, I Rahul Potluri, Christopher A. Miller, "Association of Cardiovascular Disease with Respiratory Disease", Journal of the American college of cardiology, ISSN 0735-1097, https://doi.org/10.1016/j.jacc.2018.11.063

[10]. Jaime González-Buesa, María L. Salvadora, "An Arduino-based low cost device for the measurement of the respiration rates of fruits and vegetables", Computers and Electronics in Agriculture 162 (2019).