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# BREATH ANALYSIS SYSTEM FOR PRANAYAM USING TEMPERATURE SENSOR

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**Abstract -** Measurement of respiration rate can be a very vital parameter for the health observation system. An abnormal respiration rate can indicate a range of chronic disease like; blood pressure, asthma, COPD, emphysema, respiratory illness and lot more. Here we present a recently developed system for measuring breath with the temperature sensor element, particularly for pranayama and Yoga. Presently while doing pranayama, it is said to learner to observe the breath and take control over it, and this observation is completely done by the learner himself, the yoga trainer is just instructing the learners for taking control on the breathing rate, but the trainer was unable the get the details of breathing rate of his students. If the trainer is capable of observing this kind of details of breathing rate, he will be capable of actual delivery of his instruction to others, so that control of breathe during pranayama can be achieved easily and this paper would like to present a design of system which overcome the problem associated to the learners and instructor while doing pranayama or asanas in which control over breathe is required. The proposed designed system can make measure the temperature distinction between inhalation and exhalation phases of the respiratory cycle. This distinction will assist any yoga trainer to instruct and allow learner to properly acquire the control on his breathe.

## I. INTRODUCTION

Respiration rate is a key parameter of the fundamental functionality out of all the medical health measuring parameters.

The respiration rate or breathing rate is the total number of breaths an individual takes per minute. The normal breathing rate of an adult is 12 to 20 breath per minute. This rate is typically measured manually by counting the movement of the thoracic cavity per minute. Any breathing rate above 20 and below 12 is counted as abnormal respiration. If the rate is higher then 20 then it could be Tachypnea (too high), low then 12 then Bradypnea (too low) or apnea if it is absent. Such Abnormal respiration rate could be a key indicator of physiological disorders which needs an instantaneous attention or consultation of doctor. This Respiration rate is the main core sign that determines that person is alive or not and continuous monitoring causes minimum inconvenience to the person. There are different methods out there to measure respiration rate.

**a)** Thoracic impedance: We measure the electrical impedance change when he chest wall expands and contracts throughout our respiratory cycle. This method is known as thoracic impedance.
**b)** Manual methodology: it's the most common method used for measurement of the breathe rate. It's usually done by counting the number of exhalation per minute, or by listening to the breath sounds. Although, manual strategies are unreliable and vulnerable to error.
**c)** Capnometers: It's a tool that measures the co2 gas concentration in respiratory process gases. A tubing cup is placed across the nasal airways and it collect gases sample that is analyzed by electrocardiography. Capnometry measure of respiration rate is that the most frequent technology utilized by anesthesiologist. By this technique the patients ought to bear the cannula. However, during this technique is not that comfortable and ease of access and this causes dislodging.
**d)** Pulse oximetry is yet another method used for measuring respiratory rate which measures O2 saturation in blood.
Our research project mainly focuses on the development of portable, and highly economical respiration monitoring system for an yoga instructor. Temperature sensor is the principle sensor of this device which allows you to monitor breath and tell you to put control on that. It is a highly user friendly device which could be used by anyone as it doesn't need any skilled training program. A small sensor is to be clipped onto the nose. We have attached an Bluetooth so that we can see the output of breathe rate in our phone as well. If the rate goes high or lowwith respect to our base range then instructor can monitor this easily and warns you to slow down. Our paper is comprises of three main parts. First part explain about our hardware. Second part will explain about real time data collection. The last part detailed about analysis of collected data.

## II. PREVIOUS WORK OR EXISTING SYSTEM

Many existing systems for temperature and pulse monitoring typically use micro-controller ATMEL 89C51 ( µc 8051). Due to using micro controller 8051 the method of designing the entire device becomes not only very complicated however additionally tough and tedious too. For operation it needs A-D device, external clock, micro controller development board consequently, the issues are as follows:-

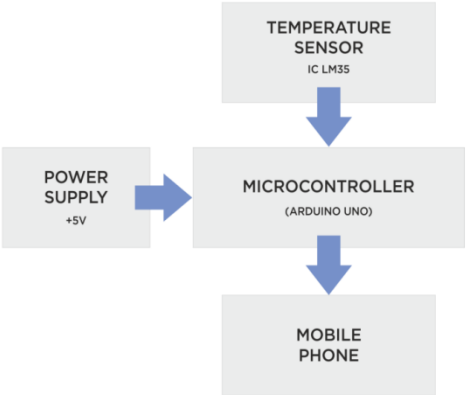
a) It takes relatively longer to the method.
b) It needs further devices for operation.
c) It needs an external clock.
d) Sampling time is too high.
e) Programming for micro-controller 8051 is tough.
f) For programming it needs developmentsystem.
g) Circuit size becomes massive.
h) PCB making becomes complicated, tough and tedious.

## III. OBJECTIVES

The prime objective of our project is to form suchkind of device which can be used for continuous monitoring of a person who is performing yoga or the one who is having any kind of irregular breathing problem. The person who is performing yoga/ pranayama or any kind of strong physical activity need monitoring or breathe. Our project titled will be **"Breath Analysis System for Pranayam using Temperature Sensor."** In the old and previous analysis, we've got to know that we are able to see the data is monitoring through simple screen. However in our prospect system, we will analyze and monitor human respiration temperature at the time of inhale and exhale. We are able to additionally analyze his/her condition by using ARDUINO software. The analyzed information will send to the android phone so that the person can see the breathe rate and control this as per instruction.By analyzing the digital signal, we are able to give alert for respiratory rates through Bluetooth or directly on system. This device may also be used for measuring abnormal respiration rate and sleeping disorder remotely.

## IV. SYSTEM

The proposed system is ultra low cost system based on Arduino. It has a probe which consist of an temperature sensor LM-35 and that has to be placed near nostril region. The respiration rate will be displayed at screen or connected device. If the respiration rate is beyond normal, the instructor can warn the people to slow down. The system will indicate you if the respiration rate is not constant or if there is a sudden abrupt change.




**Block diagram for proposed system:-**

We have used Arduino Uno R3 for this project. It consists of both hardware and software. The hardware consists of a physical PCB (programmable circuit board) which is known as micro-controller and software consist of IDE (Integrated Development Environment) that works on our computer.In this system we used one analog temperature sensors LM35. The LM35 is a widespread and low-cost temperature sensor.The sensor used to measure the ambient temperature change near the nasal region. The rate of inhalation and exhalation gives us different readings. When we inhale the breathe has low temperature but when we exhale then the temperature comparatively high. Because of this temperature difference we will get calibrated reading. The LM35 temperature sensor series are precision IC (integrated circuit) devices with a voltage ranges linearly proportional to temperature (in degree Celsius).The LM35 device has an extra feature over other linear temperature sensors calibrated in Kelvin because the user isn't needed to subtract a large constant voltage from the output to get desired Centigrade scaling form. For sending data to android phones we have used a Bluetooth device HC-05. This Bluetooth module is designed for wireless communication. This module is utilized in a master or slave configuration. The program inside the micro controller calculates the respiration rate and displays it on the screen with time. The controller is also connected to a computer and the signal can be fed to mobile phones through Bluetooth. It also displays warning if the rate crosses the break-even value.

**Implementation:**

In this section we design structure of the system before implementation of circuit. We use advanced microcontroller called Arduino (ATmega328).

It has in built with many components like analogue to digital converter, clock of 16 MHz, shift registers.In this system we use temperature sensor IC LM35 and Pulse sensor, to use to detect temperature and heart beat into appropriate voltage. This voltage is given to Arduino. According to program it process the analog signal into digital and send it via Bluetooth to the concerned people as output (i.e. surroundingtemperature of LM35) in both degree centigrade and Fahrenheit units.

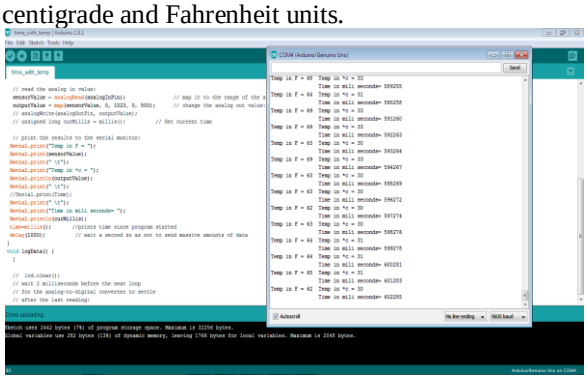


**Image 1: Breath Rate at Serial Monitor with time**

**Analyzed Result:**

We have Analyzed the system in the form of data as well as in the form of graph which will be plotted on local end as well as the reading is transmitted on mobile phone through a Bluetooth module on an Arduino app which is easily available on play store.

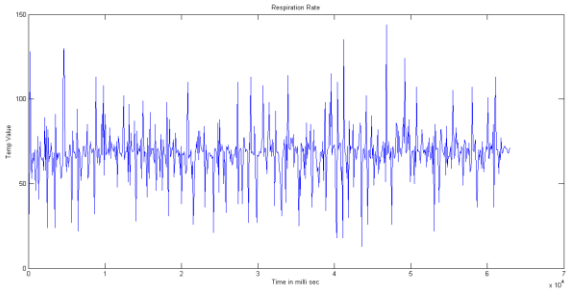



**Image 1: Graphical Data through Serial Plotter**

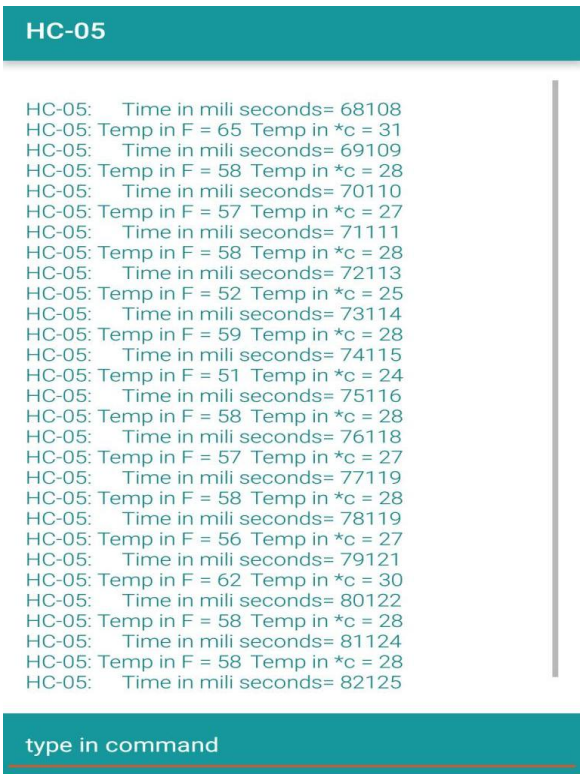



**Image 2: Breath Rate on Phone**

We have attached the analyzed reading and graphs with an alert system on it.

## V. CONCLUSION

We have designed and developed a system to analyze the respiratory signals using a temperature sensor. This system is totally based on Arduino UNO and therefore the system are often simply changed to modify measurement of additional physiological parameters any time, if required. It should also be potential to transmit the measured signals through internet.

## REFERENCE

[1] K.-A. Kim, I.-K. Lee, S.-S. Choi, T.-S. Lee, and E.-J. Cha, "Conductive rubber belt to monitor respiratory changes," in Proceedings of the 5th IEEE Conference on Sensors, pp. 74–76, Daegu, Korea, October 2006.View at Publisher • View at Google Scholar • View at Scopus.

[2] L. Tarassenko, L. Mason, and N. Townsend, "Multi-sensor fusion for robust computation of breathing rate," Electronics Letters, vol. 38, no. 22,pp. 1314–1316, 2002. View at Publisher • View at Google Scholar •View at Scopus.

[3] W. Welkowitz and S. Deutsch, Biomedical Instruments: Theory and Design, Academic Press, New York, NY, USA, 1976.

[4] P. Bonato, "Wearable sensors/systems and their impact on biomedical engineering," IEEE Engineering in Medicine and Biology Magazine, vol. 22, no. 3, pp. 18–20, 2003. View at Publisher • View at Google Scholar • View at Scopus.

[5] Torres-Cebrián A., Sarlabous-Uranga L., Fiz Fernández J.A., Gea Guiral J., Martínez Llorens J.M., Morera Prat J.M., Jané Campos R. Evaluation of the Activity of the Inspiratory Muscles by Mechanomyographic Signals in COPD Patients during a Protocol of Load Experimental. Proceedings of the XXVIII Annual Congress of the Spanish Society of Biomedical Engineering; Madrid, Spain. 24–26 October 2010. [Google Scholar].

[6] Adnane M., Jiang Z., Choi S., Jang H. Detecting specific health-related events using an integrated sensor system for vital sign monitoring. Sensors. 2009;9:6897–6912. [PMC free article] [PubMed] [Google Scholar].

[7] Qiang Zhu Fei Zheng Ying-ying Xie Department of Biomedical Engineering School of Computer and Information Technology, Beijing Jiaotong University Beijing, China.

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