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A BLOOD OXYGEN SENSING ARDUINO-BASED VENTILATOR DEVICE FOR THE COVID PANDEMIC

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Abstract: The human lungs use the back pressure created by the contracting motion of the diaphragm to draw in air for breathing. A ventilator uses a reverse motion to inflate the lungs through a pumping motion. The ventilation mechanism should allow him to take a range of 10 to 30 breaths per minute, with 2 sets of increasing increments. The ventilator must also be able to adjust the amount of air pumped into the lungs with each breath. The final, but so far least, is the setting for adjusting the duration of inhalation to exhalation ratio. Apart from that, the ventilator must be able to monitor the patient's blood oxygen level and expiratory lung pressure to simultaneously avoid over/under pressure. The ventilator we are designing and developing here with Arduino incorporates all of these requirements, allowing him to create a reliable and affordable home-made ventilator that will come in handy during the pandemic. Here we use a silicon resuscitator driven by a servo motor with two side-push mechanisms to push the resuscitator. Use the toggle switch and Bluetooth module to toggle and the variable pots to set the patient's breath length and their BPM. Our system uses a blood oxygen sensor and a highly sensitive pressure sensor to monitor and display the patient's vital signs on a LCD screen. It also has a built-in emergency buzzer alarm that sounds an alarm as soon as an abnormality is detected. The entire system is controlled by an Arduino controller to achieve desired results and support patients during the COVID pandemic and other emergencies.

Keyword: Arduino Uno, Pulse oximeter sensor, BMP 180 Pressure Sensor, Servo Motor, Bluetooth module Hc-05

I. INTRODUCTION

We recently faced a dangerous disease outbreak called COVID-19 which spreads via airborne particles and droplets. Not only covid there are other viruses which spreads through air from person to person. In this situation the basic need is ventilators because as air spread viruses which majorly attack human lungs. Human lungs are the respiratory organs for human beings. So, in order to receive the required oxygen, we need ventilators. As during this outbreak, the shortage of ventilators is the major issue in the hospitals and many health camps. This model helps patients to receive the oxygen. To find the solution for problem we are developed an open-source ventilator at low-cost with use of less resources. Which can provide the high reliability and can be affordable to people who not receiving during the covid times. This project can be easily available for both urban and rural areas.

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II. OBJECTIVES

The primary objective of the project is to deliver the oxygen and varies the blood oxygen levels to covid patient. As per toggle setting the pressure is supplied to the patient So when oxygen is supplied to patient then we are taking vitals from patient from blood oxygen sensor and displaying the bpm in LCD.

III. LITERATURE SURVEY

Previously various modules ventilators have been proposed. [1] They implemented wooden frame around the ventilator with much weight for carrying, [2] using switches and knobs to control the ventilator which can become difficult when doctor is away. [3] Since they are using both the Arduino and raspberry pie. So, by which can be increase the cost of the project and complexity in algorithm. [4] And they implemented the small lcd which can make difficult to read the data. [5] They are using a normal push mechanism whereas roller can form rust or may become ineffective while operating.

IV. PROPOSED SYSTEM

The project we are proposing where by using toggle and Bluetooth module are setting the BPM usually 10-30 Beats By using blood oxygen sensor, we are able to measure the oxygen levels of the patient. So, then microcontroller will be able to control the rpm of the stepper motor. and controls the coordination between the motor and shaft which uses to generate pressure. By pressure, this oxygen is generated which is supplied to patient, and it is also low cost and small size where ever we can travel with us.

V. MATERIALS AND METHODS

Materials or Requirements

Software Requirements

For application develop, the following are the Software Requirements:

- Embedded C

Technologies and Languages used to develop

- Embedded C
- C++

Debugger and Emulator

- Any Browser

Hardware Requirements

For application develop, the following are the Hardware Requirements.

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- Micro-controller and Bluetooth module

METHOD

Following are the steps to develop the proposed project

- Studying about sensors & gathering the components required
- Knowing the specification of each component
- Developing the software
- Combing the components
- Testing if it working
- Result

Libraries Used

Liquid Crystal Library: A 20x4 LCD is a display it has 4 rows and 20 columns. It allows an Arduino uno board to manage LCD based on Hitachi HD44780 which is most widely used in text-based LCD. this library operates in either 4 or 8-bit mode. As it contains Rs, enable, and additionally rw as control line.

VI. FIGURES AND TABLES

BLOCK DIAGRAM

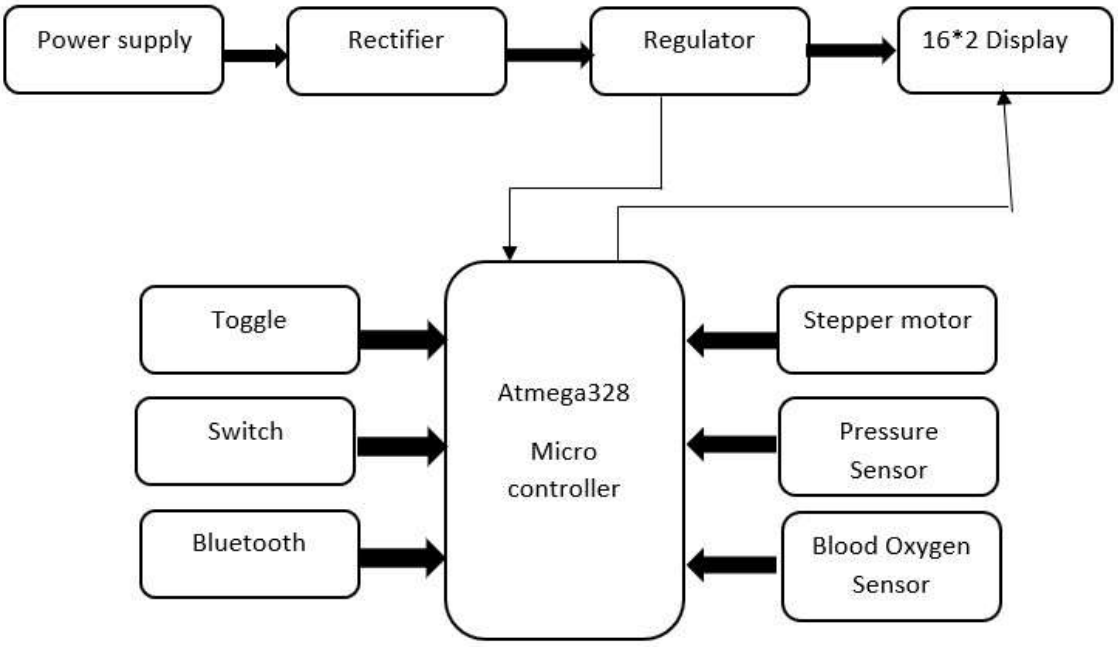

Fig.6.1 Block diagram of the DIY ventilator

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PROJECT PHOTOGRAPHS

Fig 1: ventilator model.

Fig 2: Supplying oxygen through ventilator

VII. FLOW CHART

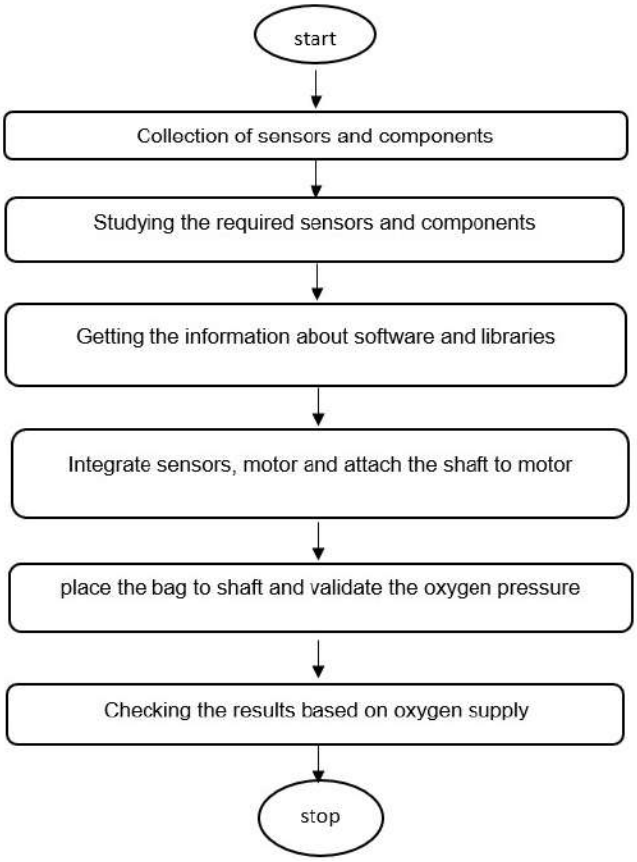

Fig 6.3: Flow chart of Ventilator

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VIII. RESULT

Here we propose a design model as a smart ventilator using Arduino with blood oxygen measurement that can rescue patients in need of emergency ventilator. Based on the source code we uploaded in the Arduino the movement of the motor will be in action. Based on the SpO2 level observed from the Blood oxygen sensor the motor movement will be activated. So, by using the Bluetooth module we are able start the motor according to different SpO2 level i.e.,97-99% for kids, ~99 for adults, ~95 for old people. So, the final result is to support the patient acquire until the required oxygen which make them stable.

IX. CONCLUSION

A working prototype was developed that could be operated on a lung test. Prototype has user-controlled respiratory rate and tidal volume. Has support control and overpressure alarm. Further development of this proof of concept is planned. Future iterations will include changes based on prototype testing results.

X. ACKNOWLEDGEMENT

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Lastly, I am thankful to all those who have encouraged me to complete this project before the deadline.

Authors' contributions

Vamshi, Vineeth and Anurag got an idea about this project, Vineeth and Anurag developed the theory and information related to the project. Vamshi encouraged Anurag and Vineeth to investigate about the sensors and Vamshi and Anurag studied about the working of the Arduino. Anurag and Vamshi learnt about the libraries and software used in the project. we three are took the lead in authorizing. All authors discussed the results and contributed to the final manuscript.

Mrs. G. Samatha assistant professor also provided valuable guidance with her expertise.

XI. REFERENCES

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