

# Low Cost Ventilator System

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**Abstract** - A ventilator pumps air usually with extra oxygen into patients' airways when they are unable to breathe adequately on their own. Ventilators are not affordable due to its high cost. In this project a low cost ventilator is presented along with the IOT based parameter monitoring. Here blood oxygen sensor and heart rate sensor is used to monitor both the parameters. 2 potentiometer are used to adjust the value of pumping speed and volume of air. All these components send signal to Arduino. Arduino operates servo motor to push air bag. Likewise air from the airbag pushed into patients airways. A pressure sensor is attached to measure the pumped air pressure. All the parameters are displayed on 16x2 LCD and also on thing speak web page through ESP WiFi module. To power up the system, a DC adapter is used.

**Index Terms** – COVID, ventilator, IOT, automation, Biomedical

## I. INTRODUCTION

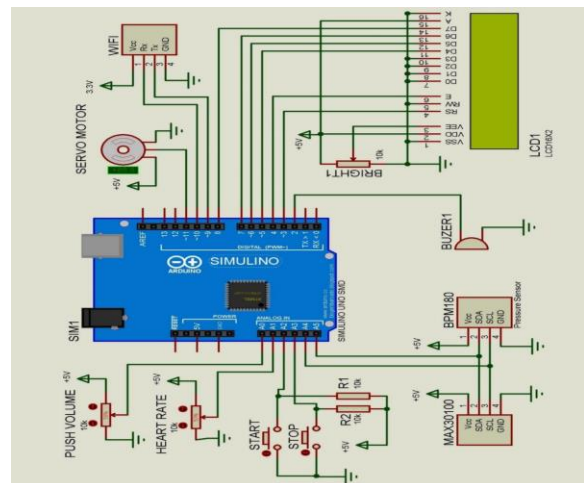
Corona-virus, (SARS-CoV-2), is in part so dangerous because it threatens to overwhelm our medical infrastructure at the regional level, causing spikes in mortality rates. Within the medical infrastructure, there are critical technologies that are generally available, but simply do not exist in a high enough density to handle the excessive volume of patients associated with pandemics. Thus, people die unnecessarily throughout the world because of a combination of COVID-19 infections and the lack of access to some of these technologies<sup>6</sup>. Ventilators are an example of technologies that are currently in critical short supply. A ventilator pumps air usually with extra oxygen into patients' airways when they are unable to breathe adequately on their own. If lung function has been severely impaired due to injury or an illness such as COVID-19, patients may need a ventilator. It is also used to support breathing during surgery. To pump the air into patient's airway, it is important to push the air with sufficient pressure and volume. Here that task will be automated depending

on patients breathing pattern. To press the airbag, motorized mechanism will be used with control features.

## II. LITERATURE REVIEW

This paper presents a prototype design and developing process of low-cost Bluetooth technology-based noninvasive volume control emergency medical ventilator for respiratory support. Arduino mega used as the main control board. The rack and pinion system are used to press the Am-bu bag by which pressurized oxygen mixed air can be supply to the patient's lung. Four control parameters like BPM, I: E ratio, Volume, and Pressure can be set by the keypad of the ventilator manually, and also it can be possible remotely by mobile application. Mechanical design is done in a Solid-work designing software platform. The hardware and PCB design are done in the Proteus software package. Finally, the prototype developed according to design, and the results are presented in this paper. As a conclusion, it was designed, implemented, and tested with very good results such as pulse oximeter sensor error was 1.02% and temperature sensor error was 0.28%.

## III. SYSTEM DESIGN



## IV. RESEARCH METHODOLOGY

A role of ventilator is to pumps air into patients' airways when they are unable to breathe adequately on their own. In short ventilators support lungs to breath. To pump the air into patient's airway, it is important to push the air with sufficient pressure and volume. For this purpose a trained person can use air bag and push it manually to pump air. Here that task will be automated depending on patients breathing pattern. To press the airbag, motorized mechanism will be used with controlling methods.

## VI. OBJECTIVE

To pump the air into patient's airway, it is important to push the air with sufficient pressure and volume. Here that task will be automated depending on patients breathing pattern. To press the airbag, motorized mechanism will be used with control features.

- To measure body parameters: heart rate, blood oxygen saturation, body temperature.
- Push the airbag with adjustable volume and adjustable speed to provide artificial air pressure for lungs.
- Display the readings on display and webpage for monitoring.
- Also provide alert signal in case of any critical situation or emergency

## VII. CONCLUSION

In conclusion, If lung function is severely impaired due to injury or an illness such as COVID-19, patients may need a ventilator. It is also used to support breathing during surgery. Though many times medical facilities goes helpless due to not availability of ventilator machines. Main reason behind this is the high cost of machines. Proposed design of ventilator will be the affordable low cost solution in above situations. In this phase of project we studied the ground situation and understood the important parameters related to ventilator and its technical requirements. On the bases of this we decided the specifications of system. Till now, all the on paper design of project is completed & hardware model working successfully.

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