Mechanical ventilation for COVID-19 patients

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ABSTRACT

The main aim of the project is to design a mechanical ventilator and connect it remotely using Internet of things. With the advancement in technology and IOT devices a ventilator can be operated remotely. During the COVID-19 pandemic it is difficult for the doctors to operate a patient on the ventilator from a nearby distance. In order to safeguard our medical staff a ventilator is designed to operate it remotely. In this system a ventilator and IOT device/laptop/smart phone are connected to each other over the internet and can take necessary decisions. It can also have communication between each other. It is built using NodeMCU an IOT device

Keywords— Blynk, LM298, NODEMCU, COVID-19, IoT based ventilator, Respiratory Rate, Temperature Sensing, Heartbeat Sensing

1. INTRODUCTION

Ventilators are one of the most important devices to keep COVID-19 patients in the most critical condition alive. As the global demand for ventilators is increasing and there is shortage of ventilators in our country as well, also managing patients during this time is a big task, so we have designed portable rechargeable battery operated Ambu bag compressing machine, which sends real time cloud messages to the doctors and other medical authorities about the patient. We have made the prototype and we are improving it's performance by adding extra new features. It can be used for emergency purposes, in hospitals, Corona virus quarantine coaches, isolation wards and rural areas as well. The shortage of ventilators can be met effectively by developing this project.

Respiratory rate is normally in the range of 10-16. The amount of volume with each mechanical breath (mL per breath) is referred as tidal volume. The concentration of oxygen is the range of 20-100%. The amount of pressure that helps keep alveoli open for O2/CO2 exchange (typically 5-20mmHg) at the end of expiration is referred to as positive end expiratory pressure (PEEP). Normally a person should have at least a PEEP of 5 to start. More amount of PEEP is required in people who have obesity.

2. PROPOSED SYSTEM

It is a completely controlled by mobile application called blynk. The motor speed can be controlled at anytime so we can control the oxygen flow in to human body. Thus increasing the mechanical speed of motor the mechanical arm connected to air bag keep pushing which produces continuous air flow. The air flow is fed to the mask which is given to the patient.

The respiratory level can be determined by using sensor and oxygen level goes down the through the mask adequate amount of oxygen is provided to patient. We can also determine other parameters such as body temperature, heart beat rate, Sb02 level in the body and air flow. Thus we are providing a Mini ventilator facility to paralyzed person, aged people in home itself. The controlling of motor the air flow can be controlled.
3. EXPERIMENTAL SETUP AND RESULT

An IOT based ventilator has been presented in the work. By referring to the system, the ventilator can monitor the respiratory rate, heart rate, SpO2, and the pumping of the ventilator using a motor. The output parameters are displayed in a blynk application using graph widgets. This system can be carried anywhere where it is best for home treatment purposes. This system consists of only a few wires and a mobile application. It is very fast, accurate and highly efficient. During the test it is shown that our system can produce the same parameters which are produced when physical tests are performed.

A mechanical ventilator is a machine that helps a patient to breathe when they cannot breathe during seriously ill conditions such as during cardiac surgery. The patients are given ventilator support unless and until they improve their condition and are capable enough to breathe by themselves. Ventilators give enough oxygen to the body and at the same time remove excess amounts of carbon dioxide from the body.
4. CONCLUSION

Since the start of the COVID-19 pandemic, researchers have been striving to help society face many problems caused by this pandemic. The motivation comes from the worldwide shortage of mechanical ventilators in the treatment of COVID-19 patients—mechanical ventilators keep severely ill patients alive. This system is useful while shifting patients from ICU or home to ambulance or if needed at any accident site. It helps persons who perform first aid by systematic easy approach, even less experienced persons can easily operate it. The biggest advantage of our system is that the complete working of the system is controlled by the IOT systems hence it ensures the patient is under control and adequate action will be taken by the ventilator itself. In this pandemic it helps to reduce the working force behind it, the ventilators itself periodically determines the condition of the patient instead of a worker approaching a patient periodically.

5. REFERENCES
