IOT BASED PORTABLE VENTILATOR

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College ***:*** *Bangalore Institute of Technology*
Branch ***:*** *Department of Electronics and Telecommunication Engineering*
Guide(s) ***:*** *Prof. Manjula A. R.*
Student(S) ***:*** *Mr. Lakshmeesha M.*
Mr. Mihir Venkat Sudarshan
Mr. Pranav A.
Ms. Sneha B. S

Abstract:

The demand of ventilators has been increasing drastically from the past few years due to the spike in the COVID-19 cases globally. Not only during the COVID situation, even today ventilators are very much needed for patients. Around the World, the absence of availability of ventilators have taken a lot of lives in just the past couple of years. The use of ventilators has been proven to be helpful from preventing the danger of lung harm through low- quantity airflow and helps us to get the adequate amount of influx of pure air. The ventilators available are expensive and scarce in supply. They are heavy and would normally weigh around 7 to 8 kilograms, which makes it inconvenient to carry from place to place due to its enormous size. Our project aims at developing a smart ventilator system using a microcontroller board and sensors based on Internet of Things (IOT). The smart ventilator will be portable and very light in weight, which makes it handy to use and requires no additional expertise to handle it. The usage of the high torque motor enables us to change the pressure as per the requirement. The sensors used collects the temperature and the Pulse oxi-metry levels and the same is updated on the LCD display

Introduction to the Project:

Failure of respiratory system and respiratory diseases caused by different kind of injuries is a source of great stress in both the worlds of advanced and technologically improvised countries as well as backward and semi advanced countries. Bone of contention in the form of Asthma, chronic obstructive pulmonary disease are a continuous source of pain and stress

for the representatives of these countries. It is the generic perception that these catastrophes are widespread because of the imitation of smoke, usage of hazardous gases on massive level and successive use of natural resources for the sake of mending energy needs. The diseases mentioned above requires mechanical ventilation in case of failure of lungs. This prototype will help a patient to inhale and exhale so the exchange of carbon dioxide and oxygen could be possible and the patient have the artificial respiration to survive. Ventilators those are already in use in most of privileged hospitals are high in cost. Poor countries are seem unable to render such services and reason is very much clear, the high costs of acquiring and utilizing them.

Thus, their maintenance is also a costly affair of business. Another dilemma related to such kind of developing countries is saturation of basic resources to urban areas only. In distant and deprived areas such kind of facilities are still missing, and as a result there is lag of such ventilators in these outlying areas. Based upon these circumstances it is empirical to have such a low cost and efficient ventilators.

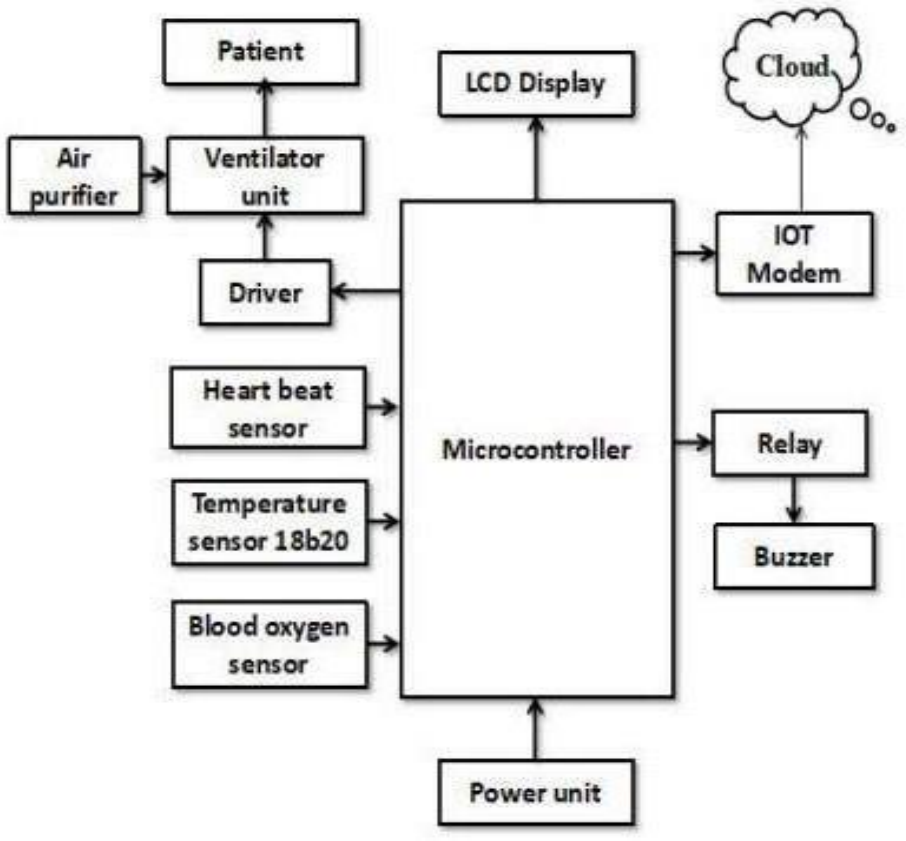
Objective of the Project:

The objective of creating a low-cost portable ventilator using IoT (Internet of Things) technology is to design a reliable, accessible, and cost-effective solution for assisting individuals with respiratory difficulties, especially in resource-constrained or emergency settings. By leveraging IoT, we aim to enable real-time monitoring, precise control, and remote operation of the ventilator, allowing healthcare professionals to adjust ventilation parameters and track patients' status efficiently. The integration of IoT facilitates seamless connectivity and data transmission, ensuring timely interventions and improved patient outcomes while maintaining affordability and accessibility, critical for widespread deployment and utilization in challenging healthcare scenarios.

Hardware And Software Requirements:

- Hardware Requirements:
  - ✓ ARDUINO MEGA
  - ✓ TEMPERATURE SENSOR
  - ✓ HIGH TORQUE MOTOR
  - ✓ AMBU BAG SETUP
  - ✓ HEARTBEAT SENSOR (SP02)
  - ✓ MOTOR DRIVER
  - ✓ LCD
- Software Requirements:
  - ✓ ARDUINO SOFTWARE (IDE) .
  - ✓ EMBEDDED C

BLOCK DIAGRAM :



SYSTEM ARCHITECTURE AND METHADOLOGY:

Figure depicts the block diagram of the Portable Ventilator which would have a 12 V power supply feeding the Arduino. The Connections from the Arduino would be LCD, Keypad, Motor Driver, AMBU Bag, Contactless Temperature, Pulse oximeter. The LCD would be displaying the values of the various modes available and the Pulse oximeter values, Keypad determines the option for the mode for the setup to function in, Motor Driver would have a High Torque motor which would adjust the different modes and the breath per minute values. There would be a contactless temperature sensor

added to the system for the patient's vital sign to be depicted along with the Pulse oximeter. The Internet of things (IoT) is the relationship of real devices which is connected with sensors, equipment and programming. The IoT can be recognized and controlled from a distance across existing association establishment.

Expected Cost of the project:

The expected cost of this project is about 4000 - 5000 rupees.

Expected Result of the project:

The Objective to create a Device has to be achieved and the ability to perform one of the six modes of a ventilator successfully and efficiently in the Assist Volume control and seeing the functionality and working of the Low-cost device. With the wake of Covid 19 and the affected patients, 75% of the patients required mechanical ventilation. The most important device which was required and still is, were Ventilators which was very limited to the usage of the hospital staffs, with the aid of our such portable

ventilators people who don't have access to the hospitals and infrastructure could use it to their requirements. Total Protein and cell viability increases >90% within 4 to 6 hours of air humidification. Air humidification ventilation is really important for people affected with respiratory diseases and problems. Airway cooling and drying could also be an action of external

exercise induced bronchospasm. The device should function in several different modes of ventilator namely pressure assist, pressure ventilation, Synchronized intermittent mandatory ventilation. The addition of a portable patient monitor which should display everything all together at once. More vital signs to be included along the project such as heart rate, monitoring of co2 levels, and a sphygmomanometer.

References:

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