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^{N^{*}} Volume : 53, Issue 4, No. 1, April : 2024 IOT BASED HEALTHCARE SYSTEM WITH PORTABLE VENTILATOR

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Abstract - A ventilator pumps oxygen into patients' airways when they are unable to breathe adequately on their own. Ventilators are not affordable due to their high cost. In this project, a low-cost ventilator is presented along with the IOT-based body parameter monitoring. Here blood oxygen sensor, heart rate sensor, temperature sensor and ECG sensors are used to monitor body parameters. 2 potentiometers 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 airbag. Likewise, air from the airbag is pushed into patients airways. A pressure sensor is attached to measure the pumped air pressure. ECG graph will be displayed on separate design software interface. All the parameters are displayed on 16x2 LCD and also on the thingspeak webpage through the ESP WiFi module. To power up the system, a DC adapter is used. *Keywords -COVID, ventilator, IOT, automation, Biomedical*

I. INTRODUCTION

There has been an exponential growth in healthcare technology in the last century. Devices like health care Monitoring systems and modern ventilators are being produced. A ventilator is an electromechanical device that can be used as an alternative breathing mechanism for a patient whose lungs have lost the capacity to inhale and exhale. There are two types of such ventilators, 1. Nasal based ventilator 2. Oral based ventilator. Nasal based ventilators are used for patients having minor breathing problems. Oral based ventilators are used at times when the condition of a patient is very severe. These already available ventilators require a lot of costs, space and an expert handler. Ventilators are used only in extreme conditions. COVID-19 pandemic taught everybody that ventilators are far more important than we thought. Most of the patients who lost their lives during the pandemic were due to the unavailability of a ventilator. Along with ventilators, patient healthcare monitoring systems also played a vital role. These systems can monitor vital data such as BPM, temperature and SpO2 levels of a patient. These can be separately used and are used in daily needs as well. In this project, we are combining these two systems but we have kept an option of using these together or separately as per need. In today's world, we need cost-friendly, portable and easy to make systems. IoT will help us to integrate these systems to a website that can be monitored by the doctors themselves and they will receive alerts if a patient's vitals fall below a certain level. With the use of IoT, the whole healthcare system based on these devices can become more efficient and reliable and fast.

II. PROBLEM STATEMENT

During the COVID-19 pandemic, many patients experience Acute Respiratory Distress Syndrome (ARDS), a condition that can be treated with mechanical ventilation. 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. Though many times medical facilities goes helpless due to not availability of ventilator machines. Main reason behind this is the high cost of machines.



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III. OBJECTIVES

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

- To measure body parameters: heart rate, blood oxygen saturation, body temperature.
- To detect ECG and show it on software interface.
- Display the readings on 16x2 display and webpage for monitoring.
- Push the airbag with adjustable volume and adjustable speed to provide artificial air pressure for lungs.

• Also provide alert signal in case of any critical situation or emergency

Model



Block Diagram



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IV. METHODOLOGY

Method for doing the project is in two parts that is hardware and software setup. Hardware required for this project are Microcontroller, Temperature Sensor, ESP01 Module, Oximeter Sensor, GSM Module, LCD Display, Ventilator box.

Software Setup

While setting up the software we need to do two things that includes programming the microcontroller and setup the IoT software.

ATmega328 Microcontroller Setup

Arduino IDE is the software which is used to setup the microcontroller the steps include

- Install Arduino 1.6.8 from Arduino website
- Start Arduino IDE
- Install libraries for esp01 module and DHT-11.
- Now we can load program to microcontroller using Arduino IDE.

Uploading Data to THINKSPEAK.com

Thinkspeak is an open source api "Internet of Things" (IoT) application and API to store and retrieve the data from thinkspeak via HTTP over the Internet which is provided to the system using Wi-Fi Hotspot. In Addition to storing and retrieving numeric and alphanumeric data thinkspeak software allows us to graphically represent the data.

V. RESULT AND DISCUSSION



Fig. shows the sample graph of the project which is obtained via real time monitoring of data.

This system will provide a constant health monitoring facility for the patients who are in the ICU or bedriddenat home remotely from any place. Moreover, the data are continuously updated to the cloud at a regular time interval. This helps the doctors, nurses or the relatives of the patient to monitor the health condition of the patient and also helps to take any action at the appropriate time. The system also sends an automated notification via text to the doctors or the relatives if the PULSE OXIMETER signals and the temperature reading go above or below the threshold value. It will help

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doctors in many ways and will enhance the efficiency of monitoring and treatment for patients. In the future, it will be modified by adding the pulse oximeter to measure oxygen saturation in blood for a patient to make the system even more efficient.

VI. ADVANTAGES AND APPLICATION

Advantages:

- Both the pumping speed and air volume can be adjusted
- Also measured air pressure
- Automatically measures body parameters
- Provide sound alert in critical situations
- Values can be seen on LCD screen as well as Thing speak webpage.
- Readings can be seen from anywhere in the world due to use of IOT

Application:

- In ICUs Operation theaters
- In ambulance
- Critical care centers.
- Isolation wards

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