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Diy Ventilator Using Arduino With Blood Oxygen Sensing for Covid Pandemic

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ABSTRACT

Coronavirus Disease 2019 (COVID-19) threatens to overwhelm our medical infrastructure at the regional level causing spikes in mortality rates because of shortages of critical equipment, like ventilators. Human lungs use lungs for respiration. They use push mechanism in each Breath. Inhalation and exhalation process takes place. The ventilator here we design is to help people during Covid situation. It is very cheap and affordable. When people suffer from lungs or breathing problem this can be used for emergency situation. Motor mechanism is used to push the air bag. When oxygen level counts are low this mechanism can be performed. Small screen is used to display the oxygen levels. The entire system is driven by an Arduino microcontroller And a buzzer is fitted to detect any low levels of oxygen count. In this study, after providing a background on ventilators, the academic literature is reviewed to find the existing and designs for ventilators systems. With the considerably larger motivation of an ongoing pandemic, it is assumed these projects will garner greater attention and resources to make significant progress to reach a functional and easily-replicated system. There is a large amount of future work needed to move DIY Ventilators up to the level considered scientific-grade equipment, and even further work needed to reach medical-grade hardware. Future work is needed to achieve the potential of this approach by developing policies, updating regulations, and securing funding mechanisms for the development and testing of DIY Ventilators for both the current COVID19 pandemic as well as for future pandemics.

Keywords : DIY ventilator, Amhu bag, breathing problem, BPM, respiration, Arduino Mega 328P.

I. INTRODUCTION

Coronavirus, a dangerous disease caused by a virus which got spread two years back, made our lives up and down. Many people died because of this virus due to lack of medicinal facilities. It infects our respiratory system also. It is very difficult to breathe. In case if a patient suffers from respiratory failure mechanical ventilators are needed.

Ventilator is a medical device used for the breathing process. Ventilators are needed to treat influenza and coronavirus and people in intensive care units (ICU). Before Covid times only people in intensive care units used ventilators but after a heavy spread of corona demand for ventilators increased.

Ventilator helps in pumping air into the lungs. People with coronavirus need a ventilator because they feel difficulty in breathing or they do not have sufficient oxygen levels. Whereas due to the heavy spread of corona there is a shortage of ventilators. There is a lack of ventilators for many medical units. This is not necessary. Some countries developed ventilators which are dangerous for human lives which are small in volume.

Yet this reliable and affordable DIY ventilator during Covid pandemic times. After designing this model these models are distributed and on the web so that others can also use it and design their own ventilator, even at the small scale.

II. PROPOSED SYSTEM

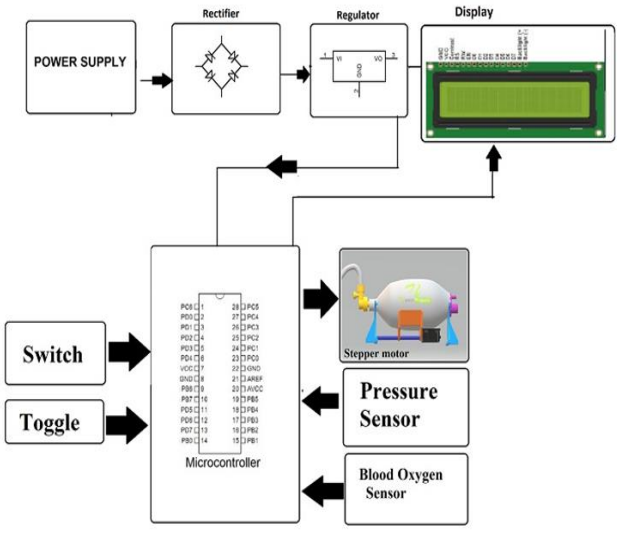

Fig 1. Block Diagram of System

2.1) BLOCK DIAGRAM DISCRIPTION:

The Arduino based on consists of six section namely power supply, sensing unit, Arduino, LCD display, stepper motor. The sensors sense parameter and give output to the Arduino will compare with standard value and output given to the display.

Arduino decodes the receive signal .LCD is provided for observing the parameters output signals.

2.2) HARDWARE REQUIRED

1. Arduino IC
2. Power Supply
3. Sensing Unit
4. Stepper motor
5. Display
6. Connecting Wires
7. Switch & Toggle

III. HARDWARE DISCRIPTION

3.1) Atmega controller - The ATmega328 is a single-chip microcontroller created by Atmel in the megaAVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC proc. The ATmega328 is a single-chip microcontroller created by Atmel in the megaAVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core.

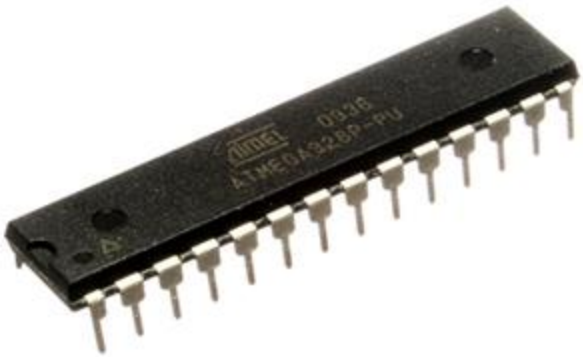

Fig 2. ATMEGA328P-PU

Features:

a) Advanced RISC architecture
b) Fully static operation
c) On-chip 2-cycle multiplier
d) program memory
e) 1Kbytes EEPROM
f) 2Kbytes internal SRAM

3.2) LCD DISPLAY

Here we used LCD 16x2 display for displaying status of motor whether it is ON or OFF.

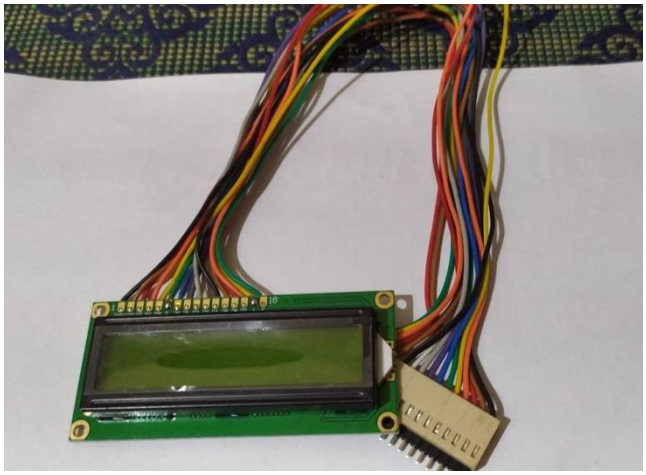

Fig 3 LCD Display

A display driver is a type of semiconductor with an integrated circuit that acts as an interface between microprocessors and LCDs. The display driver IC market is divided into two broad segments, namely the LED DDIC and touches controller IC. A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers It also shows monitoring parameter. An LCD is an electronic display module which uses liquid crystal to produce a visible image.

Features of 16×2 LCD module

1. Operating Voltage is 4.7V to 5.3V
2. Current consumption is 1mA without backlight
3. Each character is built by a 5×8 pixel box
4. Can work on both 8-bit and 4-bit mode
5. Available in Green and Blue Backlight

3.3 SENSING UNIT

A) **Blood Oxygen Sensor**

All pulse oximeter probes (finger or ear) have light emitting diodes (LEDs) which shine two types of red light through the tissue. The sensor on the other side of the tissue picks up the light that is transferred through the tissues. of arterial blood in the peripheral circulation . When doctors test blood oxygen, they often use sensors on fingers called pulse oximeters. These devices shine light through the skin and nail to detect the colour of the blood as a measure of how much oxygen is there.

Applications:

a. Wearable Devices
b. Fitness Assistant Devices
c. Medical Monitoring Devices

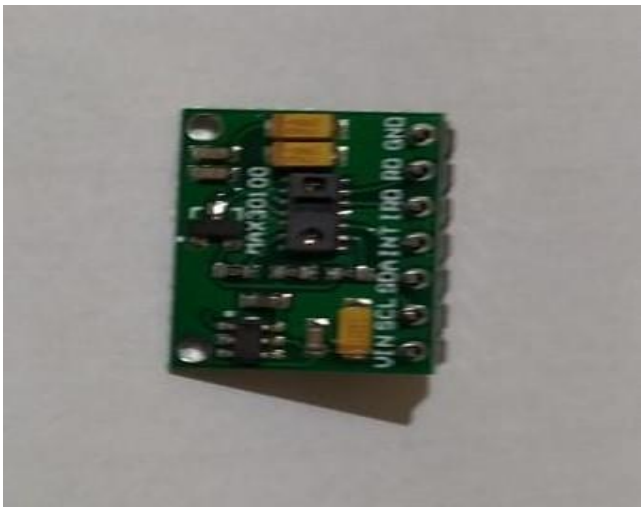

Fig 4 Blood Oxygen Sensor

B) **Temperature Sensor DHT11**

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the

surrounding air, and spits out a digital signal on the data pin. It's fairly simple to use, but requires careful timing to grab data.

Fig shows the DHT11 sensor:

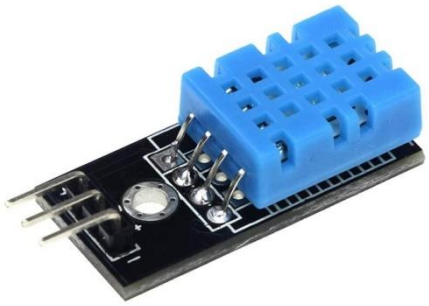

Fig 5 DHT11 Sensor

Principle of DHT11 Sensor

DHT11 sensor consists of a capacitive humidity sensing element and a thermistor for sensing temperature. The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in humidity levels. The IC measure, process this changed resistance values and change them into digital form.

DHT11 Specifications:

1. Operating Voltage: 3.5V to 5.5V
2. Operating current: 0.3mA (measuring) 60uA (standby)
3. Output: Serial data
4. Temperature Range: 0°C to 50°C
5. Humidity Range: 20% to 90%
6. Accuracy: ±1°C and ±1%

4 SOFTWARE REQUIREMENT

Arduino IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, mac OS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

The source code for the IDE is released under the GNU General Public License, version 2.The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution.

Flowchart

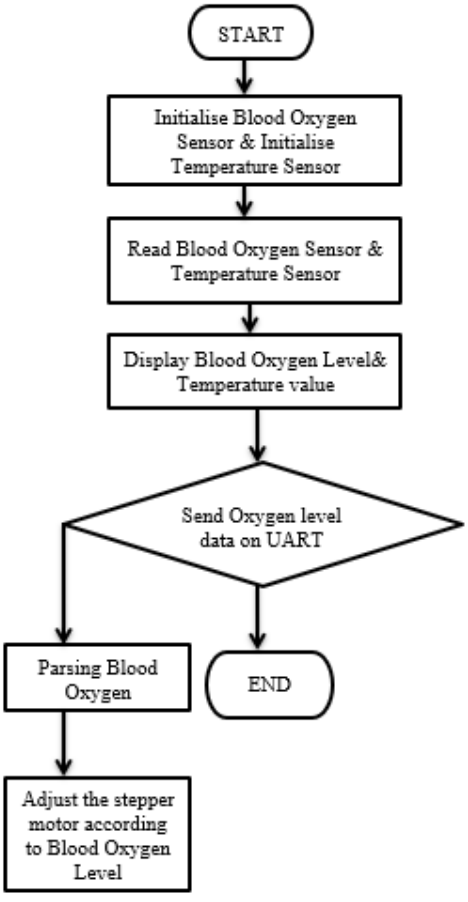

Fig 6 flow chart

IV. Result

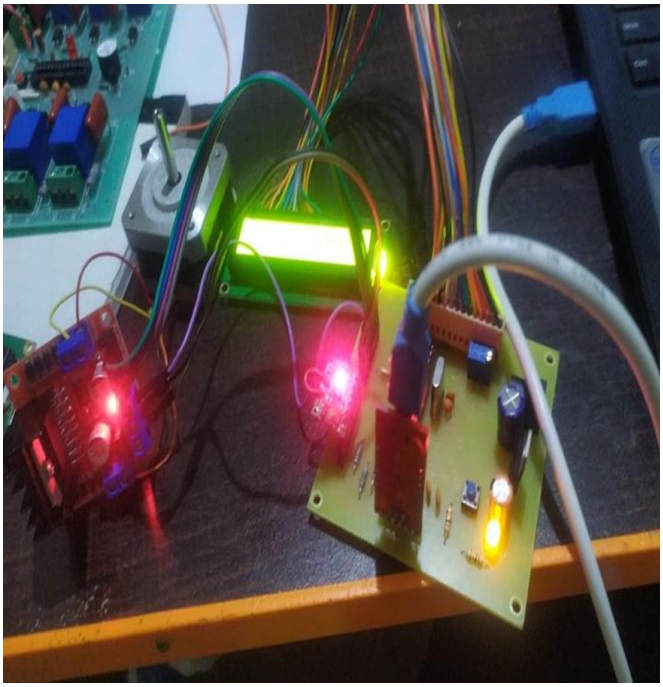

Fig 7 Output

V. CONCLUSION

This work is a clear technique potential for emergency and Covid pandemic. It is an open source ventilator design fabricated using distributed manufacturing. This paper is a detailed explanation of producing low cost, open source mechanical ventilators for patients. This is at the early stages of design and needed further developments. Sure this work will gain greater attention. There is a lot of future work to be upgraded to make it medical grade hardware. It is a big source for both the current pandemic situation and emergency purposes and even for everyday use in low resource settings.

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