



DIY Ventilator using Arduino with Blood Oxygen Sensing

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ABSTRACT

This paper portrays outline of different Examination done. The human lungs are utilized for breaths. They use push system in every breath motivation and Exhalation process happens. The DIY ventilator here we Configuration are to help individuals during pandemic. It is exceptionally modest and reasonable. At the point when Patients experience the ill effects of lung or breathing issue this can be utilized in a patient basic condition. Stepper motor Component is utilized to push the ambo sack.

While breathing Heartbeat level identified are low this component can be performed. The LED screen is utilized to show the breathing Heartbeat levels. Likewise, in a patient basic condition or Breathing issue ringer is fitted in the framework to sound already when any irregularities are identified. Aside from this the ventilator should have the option to screen the patient's blood oxygen level and breathed out lung strain to keep away from over/under air tension at the same time. The ventilator we here plan and foster utilizing Arduino envelops this large number of necessities to create a dependable yet cheap DIY ventilator to help in the midst of pandemic.

I. INTRODUCTION

Human lungs utilize the opposite pressure produced by the compression movement of the stomach to suck in air for relaxing. An incongruous movement is utilized by a ventilator to swell the lungs by siphoning type movement. A ventilator component should have the option to convey inside the scope of 10-30 breaths each moment, with the adaptability to manage rising augmentations in sets of two. Along with this, the ventilator should have the ability to manage the air volume drove into the lungs with every breath. Last however presently least is that the setting to control the time length for inward breath to exhalation. Aside from this the ventilator should have the option to screen the patient's blood oxygen level and breathed out lung strain to keep away from over/under gas tension at the same time. The ventilator we here plan and foster utilizing Arduino envelops of these prerequisites to create a solid yet reasonable DIY ventilator to aid seasons of Pandemic. We here utilize a silicon ventilator pack coupled .

Driven by DC engines with 2 side push system to push the Ventilator sack. We utilize an electric switch for exchanging And a variable pot to direct the breath length and the BPM an incentive for the patient. Our framework utilizes a Blood oxygen sensor along with a delicate tension sensor to Watch the compulsory vitals



of the patient and show them on a little screen. Likewise, a crisis ringer alert is fitted inside The framework to sound a ready when an abnormality is Identified. The whole framework is driven by an Arduino Regulator to acknowledge wanted results and to help Patients inside the COVID pandemic and other crisis.

In the midst of the world emergency brought about by the pandemic, medical clinics and medical services offices are revealing deficiencies of significant gear.As creators; it's our obligation to battle the deficiency by Building improvised open-source substitute gadgets. Our nation likely could be in an extremely lockdown yet our creativity is not! One significant gadget that request has inclined up is ventilators for patients who need help with Their breathing thanks to the respiratory impacts of COVID-

19. Fundamentally, a ventilator could be a machine that gives breathable air into and out of the lungs, to convey breaths to a truly incapable patient to inhale, or breathing deficiently. DIY ventilator probably won't be proficient as that of clinical grade ventilator yet it can go about as a fair substitute on the off chance that it's command over the ensuing key boundaries. Tidal volume: it is the volume of air delivered to the lungs with each breath by the ventilator - typically 500ml at rest.BPM (Breaths per minute): this is often the set rate for delivering breaths. Range is 10 – 30.Inspiratory: Expiratory ratio (IE Ratio): refers to the ratio of inspiratory time: and expiratory time. Flow rate: is that the most flow at which a set tidal volume of breath is deliver by the ventilator Peep (Positive end-expiratory pressure): it's the pressure within the lungs above gas pressure that exists at the top of expiration.

II. LITERATURE REVIEW

This text shows the improvement of low-cost, open-source automatic ventilators. This text also shows the numerical method for monitoring patients' pulmonary conditions. With the assistance of a pressure sensor, we will classify whether the patients are healthy or unhealthy lungs .An Arduino board collects the data from the pressure sensor and sends them to a raspberry pi. The raspberry pi commands the acuter and breathing bag compress accordingly. in line with the manufacturer, the pressure sensor can measure differential pressure of up to 70 cm H₂O.the gear was attached to the servo meter rod. The rod was made of a Plexi glass bar. The radius of this gear is 2.5cm.Aliaksei Patsies, Nagendra G. Tanikella, Samantha Dertinger, Adam Pringle, Shane Oberloier, Joshua M. Pearce, (Partially RepRapable automated open-source bag valve mask-based ventilator)

This text shows the event of a straightforward and easy-to- build portable automated mask value bag. This handle with Arduino controller with the real-time package installed on largely rewrap 3d printable parameter component-based structure. For Arduino extensively conceivable outcomes of the controller. A real-time software system gives fundamental capacities to software tasks, like planning, dispatching, inter task communication ,and synchronization Couch man, B. A. et al. (Nurses role in prevention and management of mechanical ventilation related complications) (2006)

III. EXISTING METHOD

Hospital and healthcare facilities have diverse indoor environments due to the varying needs ofpatients and healthcare workers. The indoor environments range from a simple general practitioners'room to an operating



room. Furthermore, the recent pandemic of influenza creates the maximum likelihood for airborne transmission by congregating communicable and vulnerable individuals in healthcare facilities.

ADVANTAGES OF EXISTING METHOD

The low-cost, easy-to-build non-invasive ventilator performs similarly to a high-quality commercial device, with its open-source hardware description, which will allow for free replication and use in LMICs, facilitating application of this life-saving therapy to patients who otherwise could not be treated. The patient does not have to work as hard to breathe—their respiratory muscles rest. Portable, low cost, easy to operate

IV. PROPOSED METHOD

This method for counting RBC and WBC that helps in diagnosing various diseases such as anaemia, polycythaemia etc, this method introduces an automatic blood counting by using image analysis techniques and specifically aims, that are improving the results using plane extraction and counting techniques. The proposed system of Automated Blood Cell Count System is shown in Fig 2.

SOFTWARE REQUIRED

Arduino IDE

It is an open-source hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Its hardware products are licensed under a CC BY-SA license, while the software is licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), [1] permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially from the official website or through authorized distributors. [2]

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (for prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs. The microcontrollers can be programmed using the C and C++ programming languages, using a standard API which is also known as the Arduino Programming Language, inspired by the Processing language and used with a modified version of the Processing IDE. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) and a command line tool developed in Go.

The Arduino project began in 2005 as a tool for students at the Interaction Design Institute Ivrea, Italy, [3] aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.

The name *Arduino* comes from a bar in Ivrea, Italy, where some of the project's founders used to meet. The bar was named after Arduino of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014. [4]

BLOCK DIAGRAM OF PROPOSED METHOD

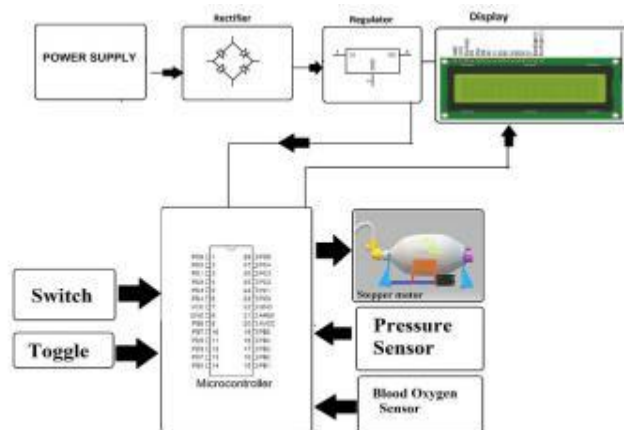


Fig: block diagram of proposed system

The extension rectifier is used to change ac over completely to throbbing dc. Then, at that point, capacitors go about as channel so we use capacitor for shifting.

Transformer is used to supply fixed yield voltage 5V DC. Arduino required voltage is 5V DC supply utilized for showthe message and it likewise required 5V DC supply.

Arduino are required three essential need pr supply, reset circuit and oscillator unit. The ventilator we here plan and foster utilizing Arduino envelops of those prerequisites to create solid yet reasonable DIY ventilator to help in the midst of pandemic. We are here utilizing a silicon ventilator sack coupled driven by DC engines with 2 side push system to push the ventilator sack.

We use control for exchanging and a variable pot to control the breath length thus the BPM an incentive for the patent.

Breath sample Acquisition

Exhaled breath analysis is a method in medicine for gaining information on the clinical state of an individual by monitoring the components present in the exhaled breath. It is a non-invasive method and breath samples can be extracted as often as desired.^[1]

Identification and quantification of potential disease biomarkers can be seen as the driving force for the analysis of exhaled breath. Moreover, future applications for medical diagnosis and therapy control with dynamic assessments of normal physiological function or pharmacodynamics are intended. Breath analysis is performed using various approaches for sampling and analysis. Breath gas analysis consists of the analysis of volatile organic compounds, for example in blood alcohol testing, and various analytical methods can be applied.

Breath aerosol analysis consists in the sampling and analysis of particles emitted in the respiratory tract and present in exhaled breath.^[2] This is a relatively new field that holds great promise for direct diagnostics of

pathogens, such as Influenza, and for in-vivo monitoring of the respiratory lining fluid (Respiratory epithelium) components, such as proteins and phospholipids.^[3] Various methods are used for sampling exhaled breath aerosols, such as filters, impactors, impingement filter, or electrostatic precipitators.^{[4][5]} This latter field is related to that of Bio aerosol sampling and analysis.

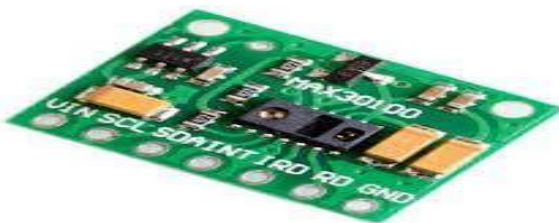
Arduino Uno

The Arduino Uno is an ATmega328P grounded micro controller. It features 14 digital I/O legs, among which 6 can be used as PWM outputs, the rest of the legs include 6 analog inputs, a 16MHz ceramic oscillator leg, power jack point, USB connection harporage, an ICSP header leg, and a reset button. It can be powered either by with a USB string or with an AC-to-DC attachment or a battery. Though this board can accept voltages between 7 to 20 V, its operating voltage is 5V..



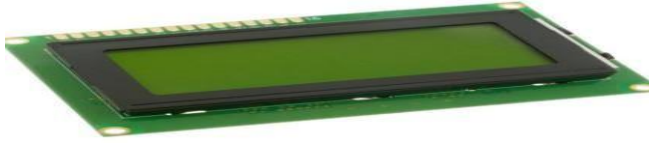
Pulse Oximeter and Heart-Rate Sensor (MAX30100) Sensor Description

The MAX30100 is complete pulse Oximeter and heart-rate sensor system solution designed for the demanding requirements of wearable devices. The MAX30100 provides very small total solution size without sacrificing optical or electrical performance. Minimal external hardware components are needed for integration into a wearable device. The MAX30100 is fully configurable through software registers, and the digital output data is stored in a 16-deep FIFO within the device. The FIFO allows the MAX30100 to be connected to a micro controller or microprocessor on a shared bus, where the data is not being read continuously from the device's registers.



16x4 LCD Module

LCD Module LCD stands for liquid Display. The LCD screen is an alphanumeric display and it's various applications in several fields. This display might be a very essential module and is most normally employed in devices and circuits. A 16 x 4 LCD means it will be wont to display a maximum of 16 characters per line, and there are two such lines. Each character through this LCD is displayed in a very 5x7 pixel matrix format. The digital display is capable to display 224 various characters and symbols in two modes 4-bit and 8-bit. It consists of 16 pins. this may be operated between 4.7 V to 5.3 V.



AMBUBAG

A bag valve mask (BVM), sometimes known by the proprietary name Ambu bag or generically as a manual resuscitator or "self-inflating bag", is a hand-held device commonly used to provide positive pressure ventilation to patients who are not breathing or not breathing adequately. The device is a required part of resuscitation kits for trained professionals in out-of-hospital settings (such as ambulance crews) and is also frequently used in hospitals as part of standard equipment found on a crash cart, in emergency rooms or other critical care settings. Underscoring the frequency and prominence of BVM use in the United States, the American Heart Association (AHA) Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiac Care recommend that "all healthcare providers should be familiar with the use of the bag-mask device

Fig 2: schematic diagram of Proposed system

Future scope

We can involve this venture in season of crisis as a first help device. For instance: If an individual gets a respiratory issue. He really wants to taken to clinic quickly while going in rescue vehicle or in the mishap area he wanted of ventilator to breath so around then our venture is little, helpful and to work which can save a daily existence. Since the cost of our project is reasonable it is simple purchase by a destitute group to rich individuals. In later we can foster the venture by adding GSM module to remain associated with specialists during going in emergency vehicle, we can add BP sensor rather than pressure sensor for more exactness, we can add camera to live correspondence with specialists for better fid help treatment while voyaging

RESULT



Fig 3: final output image of kit

CONCLUSION

This work is a reasonable strategy potential for crisis and pandemic. It is an open source ventilator configuration created utilizing disseminated fabricating. This paper is an itemized clarification of delivering minimal expense, open source mechanical ventilators for patients. This is at the beginning phases of plan required further turns. Sure this work will acquire more noteworthy consideration. There is a great deal of future work to be moved up to make it clinical grade equipment. It is a major hotspot for both the ongoing pandemic circumstance and crisis purposes and in any event, for regular use in low asset settings

VII. REFERENCES

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