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Breathing Support and Health Monitering System

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ABSTRACT
Outer Breathing Support is required if an individual can't breathe sufficiently all alone. The present circumstance might happen on account of general sedation or because of a disease that impacts their breathing like Covid-19.
Individual utilize the converse pressing factor created by withdrawal movement of stomach to suck in air for relaxing.
The breathing help go about as a ventilator by siphoning their lungs thus helping the lungs to breathe in and breathe out air. Its instrument convey the scope of 20-30 breaths each moment with the capacity to change the recurrence of siphoning. This likewise can change the air volume drove into lungs in every breath.
Alongside the breathing supportive network it includes a checking framework by which SPO2 levels and heartbeat could be observed. Plan and advancement of this is framework is finished utilizing Arduino and envelops every one of these prerequisite and reasonable breathing and wellbeing checking emotionally supportive network.
Keywords: Covid-19, Arduino, SPo2.

I. INTRODUCTION

The most recent couple of months have seen an expanded interest for ventilators in the treatment of patients with this pandemic COVID-19, a reality that prompted a ventilator lack around the world. The outcome of this lack is cataclysmic, particularly in denied regions. Indeed, even exceptional clinics have created conventions for dividing similar ventilator among two patients a questionable practice (for example since it opens up the chance of not just dividing bacterial and viral burden between patients, yet additionally inciting untoward mischief . As an endeavor to deal with the overall issue of ventilator lack, specialists have begun a drive of delivering minimal expense, open-source ventilators.

Numerous clinics, colleges and individual creators are settling the score scrappier, utilizing everything from windshield wiper parts to home improvement shop supplies to make ventilating gadgets. Mechanical ventilation is a respiratory consideration treatment to treat genuine respiratory disappointment or respiratory lack coming about because of a wide assortment of clinical causes. Whenever performed suitably, this treatment can briefly and falsely uphold or supplant genuinely harmed respiratory capacities, keeping up with typical or almost ordinary ventilation and oxygenation. This gives the clinician time to treat essential infections and to work on the patient's overall clinical condition. Whenever performed suitably, mechanical ventilation is an amazing and successful life-saving instrument. Whenever performed improperly, notwithstanding, mechanical ventilation might be similarly amazing and compelling in hurting the ventilated patient.

Since mechanical ventilators conceivably uncover the patient's lungs to harm, all drives of developing minimal expense mechanical ventilators should give the guideline of the lung's pressing factor as well as the positive end-expiratory pressing factor (PEEP)— two focuses for concern. The primary point includes managing the machine to forestall extreme pressing factor, which is a symptom of the overflow of energy from the ventilator apparatus. We fostered an original strategy that screens the patient's aspiratory condition to moderate the shot at happening those undesired spikes in the lung's pressing factor. The sensor of pressing factor, which is joined in the inspiratory appendage, takes care of a cautiously planned calculation. This calculation consolidates the Clegg-integrator framework with a low-relax. This calculation applied in a mechanical ventilator addresses an oddity. Trial information support the handiness of this calculation.

The second point for worry on the ventilator's plan is that of guaranteeing PEEP. A constraint of the mechanical ventilator displayed here is that it doesn't represent PEEP. However PEEP valves are financially accessible and can be promptly adjusted in the inspiratory appendage. Thus, the no-PEEP-observing condition doesn't forestall the utilization of this minimal expense ventilator in clinical preliminaries.

II. NEED OF THE PROJECT

Human lungs use the reverse pressure generated by contraction motion of the diaphragm to draw in air for respiration. A contradictory motion is used by way of a ventilator to inflate the lung area by pumping motion that is kind. Amid the crisis that is international because of the corona virus pandemic, hospitals and healthcare services are stating shortages of essential tools. As makers its our responsibility to fight the shortage by making makeshift resource that is available products. Our nation is inside a lockdown but ingenuity isn't.

One product that is crucial which need features ramped up is ventilators for patients who need assistance with their breathing because of the respiratory ramifications of COVID-19. Fundamentally a ventilator is a machine that provides air that is breathable and out from the lung area, to produce breaths to a client that is actually not able to breathe, or respiration insufficiently.

III. OBJECTIVE

The point of our task is a ventilator system should have the option to convey in the scope of 10-30 breaths each minute, with the capacity to change rising additions in sets of 2. Alongside this the ventilator should can change the air volume drove into lungs in every breath. The last yet not the least is the setting to adjust the time length for inward breath to outward breath ratio.

Aside from this the ventilator should have the option to screen the patients blood oxygen level and breathed out lung strain to keep away from over/under air tension all the while. The ventilator we here developed utilizing arduino envelops this load of prerequisites to foster a solid yet reasonable DIY ventilator to help in the midst of pandemic.

Our framework utilizes blood oxygen sensor alongside touchy compel sensor to screen the essential vitals of the patient and show on a small scale screen. The whole framework is driven by arduino regulator to accomplish wanted outcomes and to help patients in COVID pandemic and other crisis circumstances.

IV. IMPLEMENTATION DETAILS

The design of the system is such that the main device which is used to pump the oxygen is connected with the servo motor. An arm is used to inflate and pump the ambu bag which results in the pumping of air. Switch is used to vary the frequency at which the air is being pumped. It is designed in such a way that it has 3 modes :

- Child mode
- Adult mode
- Manual mode

Child mode and adult mode are set already in the system while for manual mode a knob is provided using which the frequency could be adjusted. The supply could be provided by two ways. If we are providing it with direct source we have to use an adapter of 1-2 amp. Power bank could also be used.

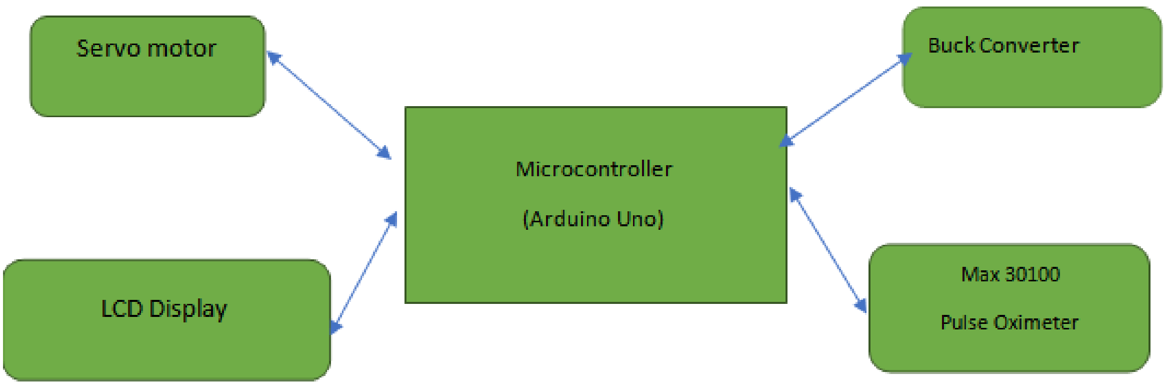

Figure: Block Diagram of the Project

The microcontroller used in the project to control and monitor the system are Arduino UNO. It is used to give power and instructions to the buck converter and the servo motor connected to the output of buck converter. On the other hand, Arduino Uno is used to give instructions to Max 30100 pulse oximeter

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And also give instructions to the LCD display to show the all monitoring levels.

4.1 HARDWARE IMPLEMENTATION

Circuit Design of the Setup :

This is an Arduino-Based Breathing Support System. It is a prototype to show the working of project. This project is entirely based on an Arduino controller and this paper give a good understanding this system. Now, we have step-by-step method that can make this prototype system.

Max30100 Sensor to Controller pin information

The sensor has seven pins and only four pin is usable of this sensor: Vin, SCL,SDA,GND. Connect:

- Vin pin to 3.3V on controller
- SCL pin to A5 pin on controller
- SDA pin to A4 pin on controller
- GND pin to GND on controller

LCD to Controller pin information

The LCD has 16 pins but we can use only seven pins: Vcc, Rs, E, D4, D5, D6, D7. Connect:

- D4 pin to 10 pin on controller
- D5 pin to 11 pin on controller
- D6 pin to 12 pin on controller
- D7 pin to 13 pin on controller
- Enable Pin to 9 pin on controller
- RS Pin to 8 pin on controller
- Vcc pin to Vcc on ICSP pins on controller

Buck converter to Controller pin information

In buck converter has four pins: +IN,-IN,+OUT,-OUT. Connect:

- - IN pin to GND pin on controller
- +IN pin to VIN pin on controller

And buck converter output connect servo motor,

In servo motor has three pin signal, VCC, GND. Connect:

- VCC pin to +Out pin on buck converter
- GND pin to -OUT pin on buck converter

And the signal pin of servo motor is connected to 6 pin of controller.

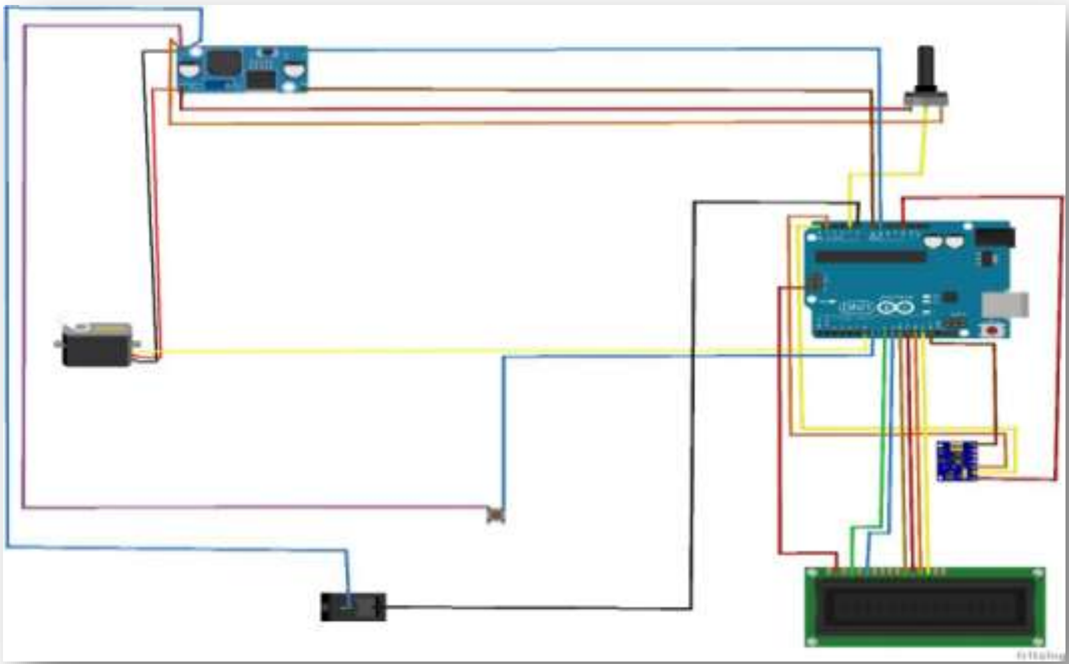

Figure: Circuit Diagram of the Setup

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V. RESULTS AND DISCUSSIONS

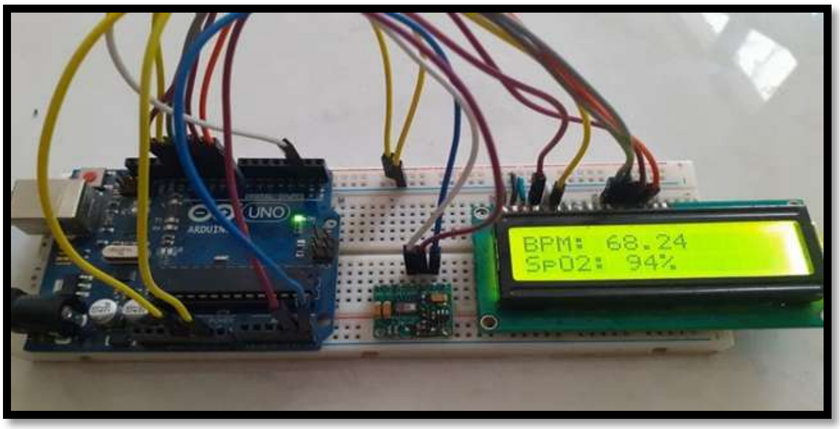

Figure 1 : testing of max30100 and implementation on bread board is sucessfully worked.

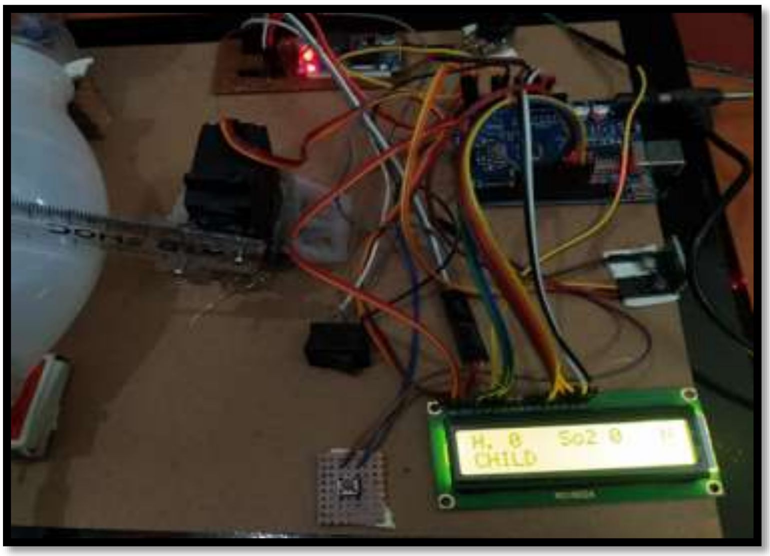

Figure 2: Child Mode, In this mode the frequency of pumping is adjusted in accordance with the physical requirements of a child.

Figure 3: Young Mode, The frequency of pumping in this mode is changed from child mode and is set in accordance with the breathing pattern of adults.

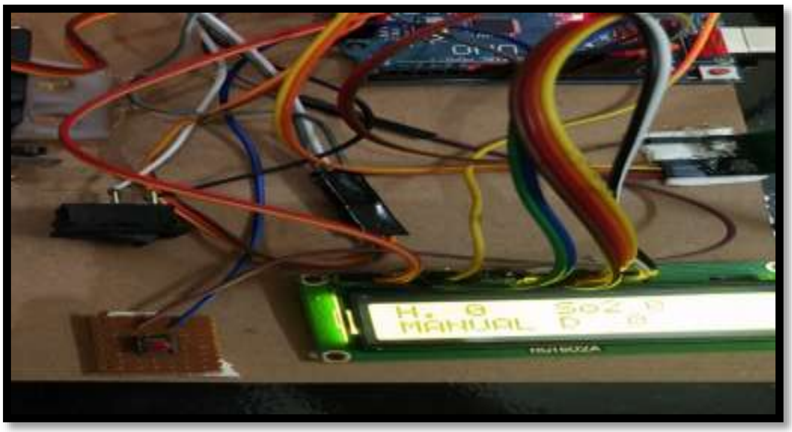

Figure 4: Manual Mode, As in many cases it has been observed that different patient require different speed at which air is being pumped. This situation could easily be tackled by using this mode. After the adult mode when switch is long pressed the device gets activated into the manual mode and this is shown on the display itself. Manual mode allows the user to adjust the frequency of pumping according to the patient.

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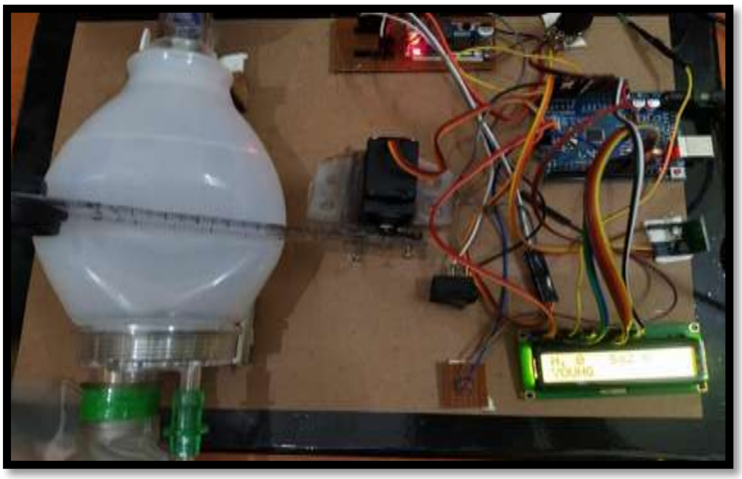

Figure 5: This is actually the prototype Breathing Support and Health monitoring System. Breathing system plays an part this is certainly crucial it ought to be small and easy to manage. This method is designed in such a genuine method in which it might easily be held to place to put.

VI. CONCLUSION

The globally medical neighborhood currently experienced a vital shortage of medical equipment to address the pandemic that is COVID-19. In specific this is actually the instance for ventilators, that are needed during COVID-19 related treatment at onset, throughout the attention that is intensive and during the extremely extended recovery times. Organizations tend to be scaling up manufacturing, but this can not be enough to meet up the need in line with the forecasts which can be present. There exists a spectrum that is large of, which range from highly advanced through to easier products, beneficial in the milder levels of infection. Amid pandemic crisis in India we had been motivated to cater the local shortage of this gear this is certainly medical develop a significantly semi-automatic ventilator that could be found in disaster health devices in hospital along with cellular medical devices such ambulances to offer disaster air flow utilizing an Ambu bag based setup to patients impacted with COVID-19. Goal with this task is always to supply cost this is certainly low home easily provide the wellness tracking system.

VII. FUTURE SCOPE

The main purpose of the system is to provide healthcare at low cost and it should be easy to use. The technology which will be more user friendly and economical will be preferred. Minimizing the cost of treatment through efficient technological development is the soul purpose. Further this system could be developed by introducing a monitored and highly oxygen supply. It is lightweight and it can be bi more upgradable in future Its design is more compact.

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REFERENCES

1. World Health Organization: Critical preparedness, readiness and response actions for COVID-19: interim guidance, 7 March 2020.(No. WHO/COVID-19/Community_Actions/2020.1). World Health Organization.2020. Reference Source [Google Scholar]
2. The Lancet: COVID-19: too little, too late? Lancet. 2020;395(10226):755. 10.1016/S0140-6736(20)30522-5 [PMC free article] [PubMed] [CrossRef] [Google Scholar]
3. Fisher D, Heymann D: Q&A: The novel coronavirus outbreak causing COVID-19. BMC Med. 2020;18(1):57. 10.1186/s12916-020-01533-w [PMC free article] [PubMed] [CrossRef] [Google Scholar]
4. Ramsey L: Hospitals could be overwhelmed with patients and run out of beds and ventilators as the coronavirus pushes the US healthcare system to its limits. Business Insider. 2020. Reference Source [Google Scholar]

[2]. Zhang X, Meltzer MI, Wortley PM: FluSurge--a tool to estimate demand for hospital services during the next pandemic influenza. Med Decis Making. 2006;26(6):617–623. 10.1177/0272989X06295359 [PubMed] [CrossRef] [Google Scholar]

[3]. Miller J: Germany, Italy rush to buy life-saving ventilators as manufacturers warn of shortages.Reuters.2020. Reference Source [Google Scholar]

[4]. Neighmond P: As The Pandemic Spreads, Will There Be Enough Ventilators?NPR.2020. Reference Source [Google Scholar]

[5]. Rubinson L, Vaughn F, Nelson S, et al. : Mechanical ventilators in US acute care hospitals. Disaster Med Public Health Prep. 2010;4(3):199–206. 10.1001/dmp.2010.18 [PubMed] [CrossRef] [Google Scholar]

[6]. Huang HC, Araz OM, Morton DP, et al. : Stockpiling ventilators for influenza pandemics. Emerg Infect Dis. 2017;23(6):914–921. 10.3201/eid2306.161417 [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[7]. MacLaren G, Fisher D, Brodie D: Preparing for the Most Critically Ill Patients With COVID-19: The Potential Role of Extracorporeal Membrane Oxygenation. JAMA. 2020. 10.1001/jama.2020.2342 [PubMed] [CrossRef] [Google Scholar]

[8]. Smetanin P, Stiff D, Kumar A, et al. : Potential intensive care unit ventilator demand/capacity mismatch due to novel swine-origin H1N1 in Canada. Can J Infect Dis Med Microbiol. 2009;20(4):e115–e123. 10.1155/2009/808209 [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[9]. Ercole A, Taylor BL, Rhodes A, et al. : Modelling the impact of an influenza A/H1N1 pandemic on critical care demand from early pathogenicity data: the case for sentinel reporting. Anaesthesia. 2009;64(9):937–941. 10.1111/j.1365-2044.2009.06070.x [PubMed] [CrossRef] [Google Scholar]

[10]. Stiff D, Kumar A, Kissoon N, et al. : Potential pediatric intensive care unit demand/capacity mismatch due to novel pH1N1 in Canada. Pediatr Crit Care Med. 2011;12(2):e51–e57. 10.1097/PCC.0b013e3181e2a4fe [PubMed] [CrossRef] [Google Scholar]

[11]. Kanter RK: Would triage predictors perform better than first-come, first-served in pandemic ventilator allocation? Chest. 2015;147(1):102–108. 10.1378/chest.14-0564 [PubMed] [CrossRef] [Google Scholar]

[12]. Kim KM, Cinti S, Gay S, et al. : Triage of mechanical ventilation for pediatric patients during a pandemic. Disaster Med Public Health Prep. 2012;6(2):131–137. 10.1001/dmp.2012.19 [PubMed] [CrossRef] [Google Scholar]

[13]. Neyman G, Irvin CB: A single ventilator for multiple simulated patients to meet disaster surge. AcadEmerg Med. 2006;13(11):1246–1249. 10.1197/j.aem.2006.05.009 [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[14]. Paladino L, Silverberg M, Charchaflieh JG, et al. : Increasing ventilator surge capacity in disasters: ventilation of four adult-human-sized sheep on a single ventilator with a modified circuit. Resuscitation. 2008;77(1):121–126. 10.1016/j.resuscitation.2007.10.016 [PubMed] [CrossRef] [Google Scholar]

[15]. Farkas J: PulmCrit – Splitting ventilators to provide titrated support to a large group of patients. 2020. Reference Source [Google Scholar]