BREATHING AID DEVICE TO SUPPORT NOVEL CORONA (COVID-19) PATIENTS

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Abstract: Novel corona virus (COVID-19), an ongoing pandemic, is threatening the whole population all over the world including the nations having high or low resource health infrastructure. The number of infection as well as death cases are increasing day by day, and outperforming all the records of previously found infectious diseases. This pandemic is imposing specific pressures on the medical system almost the whole globe. The respiration problem is the main complication that a COVID-19 infected patient faced generally, and many COVID-19 infected patients died due to inappropriate oxygen cylinders availability. It is a matter of hope that the recent development of small-scale technologies like ventilator, Continuous Positive Airway Pressure (CPAP) are mostly used to resolve the problem associated with medical equipment's for breathing. This paper aims to overview the existing technologies which are frequently used to support the infected patients for respiration. We described the most recent developed breathing aid devices such as oxygen therapy devices, ventilator, and CPAP throughout the review. A comparative analysis among the developed devices with necessary challenges and possible future directions are also outlined for the proper selection of affordable technologies. It is expected that this paper would be of great help to the experts who would like to contribute in this area.
Keywords: covid-19, pandemic, CPAP, respiration, ventilator

I. INTRODUCTION

It is announced by the World Health Organization (WHO) that the novel corona virus (COVID-19) has become a pandemic in recent times." The severity of this pandemic is increased from day to day and created new records almost every day and the infected, death and recovered cases for this disease are respectively, around the world"[1] .Due to this pandemic, almost all the sectors including the healthcare system are facing a serious crisis of infrastructure both in developed and developing countries.

There are several types of diseases such as heart disease breast cancer, liver disorders, diabetes available in medical science that causes a lot of problems in human health but the current pandemic is COVID-19[2]." The major symptoms for COVID-19 are fever, tiredness, breathing difficulties, and dry cough .Among these symptoms, the respiration problem is more severe and acute"[10] There are crucial devices usually available within the healthcare technology but they simply do not occur in a high sufficient density to deal with the increased number of patients related to epidemics. Various assistant devices are developed to support humanity in different applications like fall detection for elderly staircase detection path hole.

Recent development of respiratory support systems assists infected patients for initial treatment. The Oxygen therapy devices are an appropriate solution for the COVID-19 patients, generally available in hospitals as well as ambulance. Ventilators both invasive and non-invasive are mostly used devices for breathing assistance in the hospital environment. The recent deployment of CPAP devices has emerged a direction for the patients having breathing Problem.

The paper views the recent technologies that are evolved for covid-19 patients, generally available in hospitals as well as ambulance. Ventilators both invasive and non-invasive are mostly used devices for breathing assistance in the hospital environment. The recent deployment of CPAP devices has emerged a direction for the patients having breathing Problem.

The rest of the paper is organized as follows. "Breathing Aid Devices for COVID-19 Patients" describes the existing technologies for breathing support for the patients infected with COVID-19. A relative analysis among the available technologies with the necessary challenges and possible future directions are described in Section "Discussions". Section "Conclusion" concludes the paper lastly.

II. Existing System:

"Almost every bed in a hospital has a manual resuscitator nearby, available in the event of a rapid response or code where healthcare workers maintain oxygenation by squeezing the bag"[5]. Automating this appears to be the simplest strategy that satisfies the need for low-cost mechanical ventilation, and we can easily identify the availability of oxygen cylinders nearby through application with the ability to be rapidly manufactured in large quantities. However, doing this safely is not trivial

Electrical ventilation is indicated when the patient's spontaneous breathing is inadequate to maintain life." It is also indicated as prophylaxis for imminent collapse of other physiologic functions, or ineffective gas exchange in the lungs"[3].]. Because Electrical ventilation serves only to provide assistance for breathing and does not cure a disease, the patient's underlying condition should be identified and treated in order to resolve over time. In addition, other factors must be taken into consideration because Electrical ventilation is not with out its complications.

III. Design Of The Proposed System:

We proposed the design of breathing aid device to support corona virus with patient monitoring using **ARM7 LPC2148**. It is designed to provide the better and effective solutions when compared to the previous projects. This project will helps for patient survival compared to the existing systems.
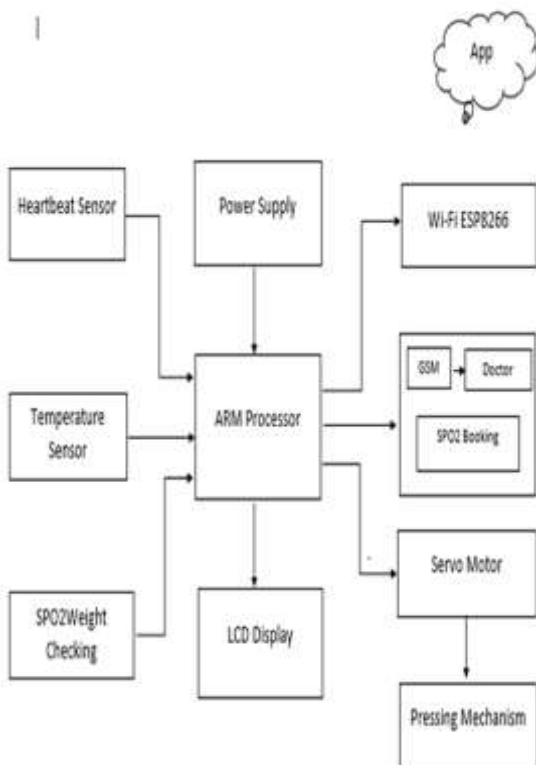

Fig 1: Block Diagram Of The Proposed System

The system is composed of different modules that are controlled by ARM processor. There are different types of communication of each module. The objective of this analysis consists about using free hardware and software in order to develop a valid and effective device to assist the patients.

Almost every bed in a hospital has a manual resuscitator nearby, available in the event of a rapid response or code where healthcare workers maintain oxygenation by squeezing the bag. Automating this appears to be the simplest strategy that satisfies the need for low-cost mechanical ventilation, with the ability to be rapidly manufactured in large quantities. The main aim of this project is to automate the work done by the resuscitator during emergency. In this project we automated the squeezing of the oxygenation bag where workers are not required for squeezing the bag in the event of rapid response, the oxygen bag supplies the required oxygen to the patient automatically when the oxygen levels of the patient goes down, we can setup this equipment either in hospital or even in the houses too.

If the patient is using this setup in home, if the condition of the patient goes worse then automatically we can alert nearby doctor or hospital through GSM module. The information about the patient like temperature, heartbeat, and pulse of the patient will measured by using the required sensors and automatically information sent to the nearby doctor so that doctor can understand the patients situation and respond immediately.

One more challenge faced by the patients during this pandemic especially in our country is availability of the oxygen cylinders and inappropriate information about the availability of oxygen cylinders. Thousands of people lost their lives due to inappropriate information about availability of oxygen cylinders. In our project we can also easily trace where the oxygen cylinders are available so we can save the patient's life easily.
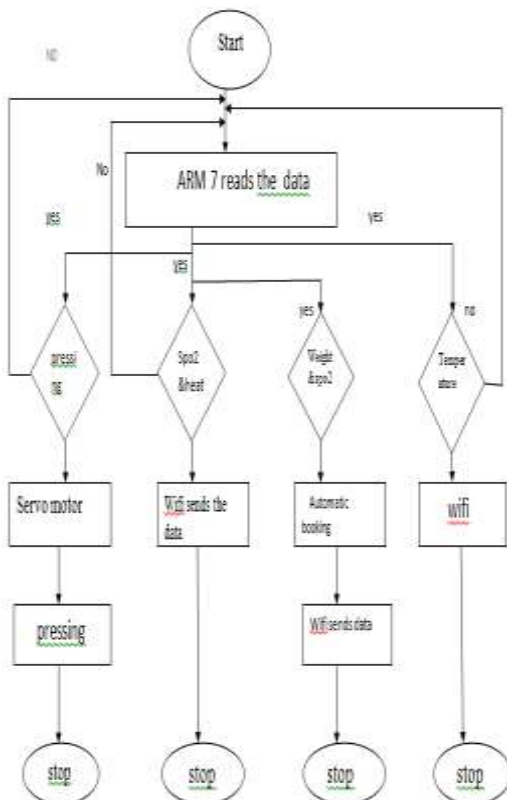

Fig 2: Flowchart of the proposed system

In this project we completely focused on all the challenging parameters faced by covid-19 patients during past 2 years. This project will help the patients in all aspects so that we can decrease the death rate.

The flow chart of the proposed system shows how the sensors respond and how they sends the required data (health condition) of the patient.

IV. Results:

The above figure clearly shows the project kit with ARM7 LPC2148 ventilation System and sensors which are used for the patient monitoring. In the above figure we can also use button which is used to press to send the emergency details to the hospital through GSM module.

Fig 3: Result of the prototype

➢ We can see the details of the patient on the LCD display.
➢ We can see the body temperature of the patient which is displayed on the LCD display.
➢ We can see the heartbeat of the patient which is displayed on the LCD display.
➢ We can see if the pulse rate of the patient is dropping or in the correct level.
➢ If there is any difference in the values of the body which is given by the sensors i.e.(if the sensor given values are greater than the threshold values) then automatically an alert will be sent to the doctor of the nearby hospital through GSM module.
➢ There are the results we got in this paper.

V. Conclusion:

• The COVID-19 is still an ongoing pandemic that is creating a lot of crisis in all sectors for humans all over the world.
• This outbreak aims at increasing the threat–benefit investigation of assessing the modality of breathing assistant for the infected patients.
• paper overviews the recent available technologies that are frequently used for COVID-19 patients in hospitals, homes as well as ambulance.
• The device can read the data from the sensors and if the body temperature or heartbeat or puslerate rate is greater than the threshold values then automatically alert will be sent to the nearby hospital.
• Hence usage of this kit under the experts surveillance can save the patient's life from danger as it is portable, cost effective.
• The devices are described in terms of working principle with construction, the equipment and technology used, cost, and relative analysis of merits and demerits throughout the paper.

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