



Automatic Covid-19 Patient Monitoring and Health Caring System

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Abstract: Internet of things (IoT) is one of the quickest growing technologies all over globe in the medical, agricultural and industrial fields. In this project it is used for transmitting the information of the patients like their oxygen level, heart rate and body temperature to the doctor or hospitals. According to the last situation of the pandemic and the increasing number of the infected people, the researchers started working on how to monitor the patient's information remotely in order to reduce the chance of infection.

This project is all about an Automatic and affordable application which will help to reduce the transmission of COVID-19 infection. This device can help doctors and medical staff to monitor patient remotely at the same time it can help patients by monitoring their health on time and getting treatment on time. This project consists a device to measure heart rate, blood oxygen level, and body temperature; it also gives on time medicines to patient by using smart medicine box. An Arduino board with sensors is used to measure all records and send them to the cloud server.

Index Terms - Automatic valve control, Oximeter, Medicine box, GSM module

I. Introduction

Covid 19 is an infectious disease. About 80% of people recover from the disease without special treatment. However 20% of people are in critical situation and they required special treatment. This virus can be spread when another person come in contact with infected person. Fever, cough, tiredness, loss of taste or smell these are some most common symptoms of covid-19[1].

We all know that Covid 19 is the respiratory disease and it is one of the most dangerous diseases in the world. We can control the spread of this virus if we maintain our healthcare and transport. We can also maintain the spread of this virus by maintaining social distance. So to avoid the physical contact between doctors and patients we have created one IOT based device by using various sensors which can act as an attendee to the patient.

Our project is one of the leading factors in such situations containing automatic medicine guider, oxygen level controller and most important is GSM system.

II. Problem Statement

- 1.The numbers of covid-19 patients are increasing day by day, so the work burden on the doctors as well as the hospital staff is increasing also the chances of infection are increasing due to the doctor's came in contact with the patient.
2. By using PPE kit for long time medical staff can face many problems.
3. Due to risk of infection the family members can't get the idea of health of patient.

III. Literature Review

- **Pulse Oximeter**

Critical Care 1999, Article no. R11 Amal Jubran, Pulse oximeter is one of the most commonly used monitoring device in the critical care setting. This review shows there is huge advancement in the technologies of pulse oximetry. The preciseness of pulse oximeter and their demerits are critically studied. Finally, the existing data of the medical uses and costeffectiveness of pulse oximeter are discussed [6].

- **Automatic oxygen regulator control system by using Arduino Uno.**

T.K. Sethuramalingam and M. Karthighairasan, International Journal of power system and integrated circuits. The automatic oxygen regulator control system is designed using Arduino Uno. Arduino UNO is programmable open source microcontroller board. A motor is fitted to an oxygen regulator [9]. Four control positions are there in the module to control the level of oxygen, there are two main positions which are used for opening or closing the valve. Here we are using DC geared Motors which have integrated gear that can be precisely controlled [10].

- **Analysis of Pulse Oximetry and breathing rate of patient**

Respiratory Medicine (1996) 90, 593-599

Mowar W.R., Deep study is done by using pulse oximetry to measure saturation level of oxygen in patients at yard. After completing the medical evaluations the saturation values are disclosed only to the doctors. We checked the changes in the hospital management initiated after declaration of pulse oximetry values. By providing the regularly pulse oximetry measurements to doctors resulted in great changes in medical treatment of patients [13].

- **General Application**

Research on GSM Module Yuchun Ma Sept. 2011 International Conference on Internet Computing and Information Services, Nowadays GSM network became worldwide mobile communication network [3]. Now days we can integrate GSM modules with IoT and by doing this one can do all the things that a normal phone can do like sending and receiving messages (SMS), sending SMS to group users [12]. Furthermore, a flexible solution is proposed on real time reading SMS. Application cases are given for GSM module.

IV. Objectives

This project is designed,

- To monitor O2 and body temperature of covid-19 patient on regular intervals.
- To communicate the O2 and temperature values to the doctors and family members through IoT.
- To alert the hospital at the time of emergency through IoT based emergency switch.
- To supply oxygen automatically in case of sudden drop in O2 level
- Automated medicine box to facilitate patient to take the right medicine at right time.

V. Methodology

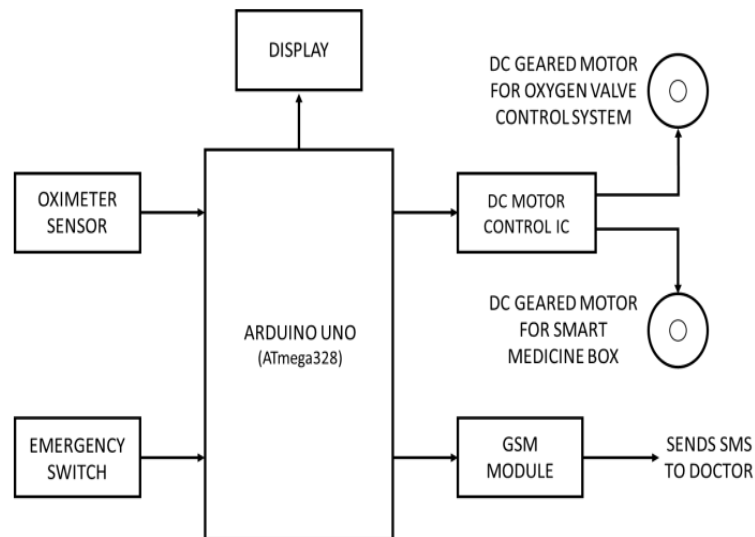


Fig. 1 Block Diagram

In this block a simple oximeter sensor is connected to the Arduino UNO to measure the oxygen level and heart rate of patient. We are using a GSM Module which is used to send messages to the doctor or medical staff. In this the Arduino UNO is main processing and controlling unit for all system. There are two geared motors the first geared motor is used to rotate the oxygen control valve and other motor is used for smart medicine box and dc motor control IC is controlling these two motors. Display is used to show the Oxygen level, Heart rate, motor positions and emergency. There is a simple push button which is working as emergency switch [15].

Description of Hardware Model

- **Oximeter Sensor:-**



Fig. 2 Oximeter Sensor

In our project we used MAX30100 sensor which is used for measuring blood oxygen level and heart rate. It consists two LEDs which are used to pass the red light and by using that absorption level of light we can get blood oxygen level. This is connected to the Arduino UNO to measure the oxygen level and heart rate of patient [4].

- **Emergency Button :**

The simple push button is used as emergency button.

- **GSM Module :**

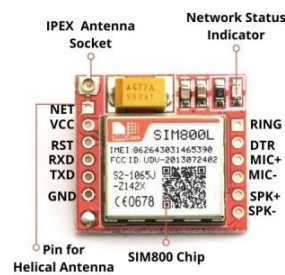


Fig. 3 GSM Module

SIM800L is a miniature cellular module which is used for sending and receiving SMS and making and receiving voice calls. It is a Mini GSM/GPRS module. In this project it is used to send a message to the doctor or medical staff.

- **Arduino UNO:-**



Fig. 4 Arduino UNO

Arduino UNO is programmable open source microcontroller board. Here we are using microcontroller board which works on Microchip ATmega328P. It consists digital and analog input/output pins which we can connect easily with other circuits. In this project it will act as main processing and controlling unit for all system.

- **DC Motor Control IC:-**

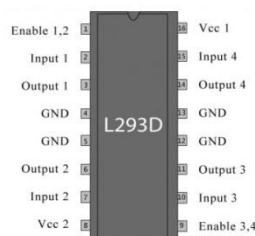


Fig. 5 Dc Motor Control IC

In our project we are using L293D motor control IC. It is a Motor Driver IC which allows DC motor to operate on both directions.

It is a 16 pin IC which can control two DC motors at the same time on either direction. In this project it is used for controlling the DC geared motor.

- **DC Geared Motor :**



Fig. 6 DC Geared Motor

DC geared motors has a gear assembly with it. It has high torque and low speed which is required in this project. In this project we are using two motors the first geared motor is used to rotate the oxygen control valve and other motor is used for smart medicine box.

- **Display:-**



Fig. 7 Display

Display is used to show the Oxygen level, Heart rate, motor positions and emergency.

VI. Flow of Hardware Model (Working)

- **Oxygen Control System:**



Fig. 8 Oxygen Control System

In this system, first we measure the oxygen level and heart rate of patient's body with the help of Oximeter Sensor. Then this data is send to the Arduino UNO microcontroller. Then this data is processed in this microcontroller.

In microcontroller program regarding 'oxygen control valve with respect to pulse oximeter sensor' is uploaded in this microcontroller [2]. The geared motor which is coupled with control valve is moved according to the oxygen level of the patient. When the Oxygen level of patient is goes low, then the motor rotates the control valve to the anticlockwise direction to increase the flow of Oxygen flow to the patient (In LPM). When the Oxygen level of patient is increased then the flow of Oxygen goes lower as per limit, by rotating the geared motor clockwise direction. The Oximeter sensor takes the continue readings, and after every 10 seconds the microcontroller is decided the movement of motor (Clockwise or Anticlockwise) as per the patients Oxygen level. The Oxygen level and the motor positons is given in the result section [11].

- **Smart Medicine Box:**



Fig. 9 Smart Medicine Box

In this system, one circular compartment container plastic box is used to contain the different medicines in it. One geared motor is attached to the lid of the container box and one hole is provided on the lid. The motor is controlled by the Arduino UNO microcontroller [8]. The timer is set on the controller to control the motor. At set time, the motor rotates the lid of the container and open the specific medicine compartment. We can change the timer of this system as per doctor's advice. We can add up to different medicines at a different time as per advice [14].

- **GSM Module Messaging System:**

In this system we use SIM800A GSM module to send emergency messages to the doctors or present medical staff. In this system we provide one 'Emergency Switch' to Automatic Covid-19 Patient Monitoring And Automated Caring System Department of Electrical Engineering Page 19 the patient [7]. Sim card is inserted in sim slot of the GSM module. This module is also connected with the Arduino UNO. When a patient wants to talk to doctor, the emergency switch will be pressed by the patient. Then one message is sent on the registered mobile number which is given to the concern doctors or medical staff. In case of extreme 'Low Oxygen Level' of patient, the microcontroller sense and send an emergency message to the doctor with the help of this module [5].

VII. Hardware Results

- **For Oxygen Control System**

Table 1 Oxygen Control System Positions

SpO ₂ Level (%)	Motor Position (POS)	Oxygen Flow Rate(LPM)
100 – 90	1	1
90 – 80	2	2
80 – 70	3	5
Below 70	4	10

- **For Medical Box**

Table 2 Medical Box Positions

Time	Motor Position
7:00 Am	1
12:00 Pm	2
6:00 Pm	3

VIII. Conclusion

By implementing this project, it can be concluded that this project will help the patient, the family members and the medical staff to monitor the health condition remotely and at regular intervals. In emergency automated system it saves the patient by supplying oxygen and alerting the medical staff.

This project reduces work load of healthcare system and protects doctors and other people from coming in contact with the covid-19 virus. This project is very cheap and effective investment in the fight against this menace called covid-19, pandemic.

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