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IoT based impulsive O₂ support appended in patient monitoring system with physician's concern

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Abstract

Patient Monitoring System (PMS) with oxygen supply is primarily implemented to have a quantitative evaluation of the crucial physiological parameters of patients during critical periods. In today's complex environment, the demand for clinicians are immense. Clinicians will not be available for 24/7, of course the treatment decisions must be determined by them but it is possible for us to replace their task of monitoring with use of PMS. The research is intended to create a healthcare internet of things system that can track the medical condition of mankind. There have been attempts to use the new technology in numerous fields to enhance the quality of human life as a result of technological advancements and the miniaturization of sensors like temperature, heartbeat, blood pressure, etc. This project is an attempt to combine an oxygen support with patient monitoring system. Appropriate oxygen level differs from patient to patient, that at different intervals according to their medical condition. So in this situation it is mandatory for consulting a doctor, regarding the oxygen level that is needed to be administered. To overcome this issue we are sum-mating the feature of doctors response of oxygen level that is needed to supply as a reply message. Once the reading level of sensors goes to a critical condition, as told an alert message is sent to doctors mobile. According to the medical data received by the doctor, the oxygen measure that is to be supplied is communicated to the system by the reply text from doctors. As a result, appropriate amount of oxygen is supplied to patient which is best suited for their medical data in order to maintain a stable medical condition.

Keywords: IoT, PMS, oxygen support, arduino mega

Introduction

These days, the expansion of innovations by well-being specialists is exploiting these electronic devices. IoT devices are profoundly utilized in the clinical area. Medical equipment is not readily available in rural areas, except for government medical centers which may causes trouble during emergency crisis. The remaining work will be done by doctors based on their vital parameters. This system can be used to measure the oxygen saturation level, heart rate, and temperature of the human body and display the results on a web-based platform. The primary goal of this IoT is to enhance a cosmology-based response with the ability to track the state of health. While individuals with corona virus illness feel ill, their oxygen levels are often insufficient. Pulse- oximetry is a technology for determining the amount of oxygen-carrying hemoglobin in the blood. With the help of a pulse- oximeter, a light emission passes through the fingertip. Body temperature is another vital physiological parameter of humans. People with illnesses find it very essential to monitor their body temperature. This system has made life easier for elderly patients, as for them, the long way to the hospital can be both difficult and tiring. The system will collect data on the patient's heartbeat, oxygen saturation level, temperature etc. For critically ill patients, high concentration oxygen should be administered immediately and this should be recorded afterwards in the patient's health record. Pneumonia (lung inflammation) alone accounts for 8L deaths per year. It is estimated that 20 - 40% of these deaths could be prevented with the availability of oxygen therapy. So to overcome the stated issue us the system we propose is the "IOT based impulsive o₂ support appended in patient monitoring system with physician's concern". In this project, we introduce a feature of instant o₂ support to patients along with the consent of doctors in accordance with the medical data in their critical circumstances.

Methodology

The system's central element is an Arduino board called an Arduino Mega. The location is transmitted via a GSM module. The Arduino Mega is serially interfaced with the GSM module, which is used to connect to the internet and transfer data from device to device. The pressure sensor is used to detect the pressure in the oxygen cylinder. The heart rate sensor, temperature sensor, oxygen sensor, and pressure gauge are used to measure the patient's heartbeat, temperature, and oxygen level. Raw data from patient are gathered through the sensors and sent to the Arduino board connected to the sensors. This raw data would then be converted into a readable string (format), which would be shown on the output device (Liquid crystal Display). The Arduino Mega will be constantly inspecting these three sensor readings.

Whenever the level of o₂ goes down an alerting SMS is sent to doctors. Further from the doctor side, the required o₂ level that is to be administered for the patients to return to the stable condition, will be communicated with a reply message.

Once the SMS reply is received by the GSM module, the arduino instructs the servo motor to operate the pressure valve in order to supply the oxygen to patients

Literature survey**A Survey on healthcare monitoring system using IOT (2017)**

The proposed work is to design and develop a Mobile-IoT based healthcare system which is featured with Pattern Matching Algorithm by gathering patient's data from various PHD sensors and timely alert the caretaker as well as doctor by sending messages ^[1].

Survey on patient health monitoring system using iot & arduino (2018)

As elderly population increases day by day partaking demands are also increasing. Thus, patient health monitoring systems are becoming more and more significant today. This paper is based on patient monitoring. A dependable, energy efficient patient monitoring system has been created by our team. It is able to transmit patient parameters instantly. It allows medical professionals to keep an eye on the patient's vital signs (heart rate, temperature, ECG, and position) in real time. The patient's health is continuously monitored in the system that is currently being developed utilizing several sensors that are connected to the Arduino board ^[2].

Patients health monitoring system using IOT (APRIL 2019)

The goal of the research is to create a human health monitoring internet of things for the healthcare sector. Notification will be sent to doctors right away in an emergency. It uses the body's physiological characteristics, including temperature, humidity, pulse, and movement. Analysis of patients' body data is done against the normal situation to track abnormal physiological parameters ^[3].

AN IOT Based health monitoring system using arduino UNO (March 2021)

Internet of Things (IoT) is an online system. IoT devices used in several application areas that makes the lifestyle of the users comfortable. The worry of contamination in

clinical environments has led to a dramatic reduction in on-the scene referrals for routine care. Additionally, there has been a perception that non-severe

Monitoring an individual's heart rate and body temperature is usually very important as irregularities in either can indicate other underlying illnesses such as cholesterol, high blood pressure, low blood pressure, flu, etc. And in times of pandemic, importance of healthcare monitoring system has elevated even more than ever before ^[4].

E Patient monitoring system using arduino (July 2021)

The IoT-based completely affected character health monitoring device is a regular progressive term given to any clinical machine that has internet capability and may diploma one or extra healthcare records of a affected character who is related to the device together with heartbeat, body temperature, humidity, blood pressure, ECG, steps, etc. For example, a affected character can stay at a one in every of a type location and preserve his or her routine existence and a medical doctor can show the affected character's health. Based on the received records from the affected character health expert can prescribe the fantastic treatment or take straight away motion in case of an emergency. If there may be an abrupt exchange with inside the affected character's health, an SMS alert may be sent to the family member and attending medical doctor ^[5].

An efficient health monitoring system with temperature and heart rate sensors using IOT (2021)

Nowadays, keeping track of a person's daily health has grown in importance in light of Covid19. It would aid in the diagnosis of some potential alterations within the human body. The internal temperature and heart rate of a person are two of the significant metrics that might be tracked by an IOT system. This is done to keep tabs on someone's health. The goal of this study isto create a framework for comprehending the healthcare system and treating patients. The purpose of this study is to create an orderly framework for a survey of medical experts and to provide patients with responses ^[6].

Patient monitoring system using IOT (2018)

Patients in serious cases typically need to have their temperature, oxygen saturation level, and heart rate regularly monitored. The patient's history cannot be presented in the prior scenario; just the most recent data is shown. The doctor can continuously check on the patient's condition on his smartphone, and the patient's medical history will be stored on a web server so that the doctor can access the data whenever they need it from anywhere. In the current paper, we are analyzing various methods and techniques used for health care monitoring systems ^[7].

Health monitoring system using arduino (2018)

In India, around one-two tenth of the population perishes as a result of a broken health monitoring system; in the majority of hospitals, doctors visit patients either during the morning or evening shifts, or during each shift. What happens if the patient's health changes during that time or if a doctor isn't available to see the patient? The remedy is that a sufferer could pass away. We tend to area unit offering a practical embedded system gadget that continuously analyses patients' health in order to avert this crucial issue. This system keeps track of a patient's vital signs, including

their pulse and blood pressure (if any ^[8]).

Components

Arduino-mega

The Arduino mega 2560 is a microcontroller board used to bridge software and hardware modules of the device. It is the board based on AT MEGA 2560 IC with number of input and output pins about 54 digital pins and 16 Analog input/output pins. It also contains 4 UART. Every other modules are ported into the ports of Arduino and programmed with easy C++ coding.

LCD

About 16 columns and 2 rows of digital electronic element to display the commands for the users is named as 16x2 LCD. It has two registers namely Command and Data. It is a display built up with liquid crystal that displays the programmed statement or command to the user.

Temperature sensor

A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. Contact temperature sensors are temperature sensors which are required to be in physical contact with the object being sensed and used conduction to monitor changes in temperature.

Heartbeat sensor

The basic heartbeat sensor consists of a light-emitting diode and a detector like a light detecting resistor or a photo diode. When tissue is illuminated with the light source. The Sensor is Based IR molded in silicon, So Once the Finger is inserted Heart Beat will not miss t. In order to calculate the heart rate based on the blood flow to the fingertip, a heart-rate sensor is assembled with the help of OP-AMP for monitoring the heartbeat pulses.

Sensitivity pulse oximeter (MAX30102)

Pulse oximetry is a test used to measure the oxygen level (Oxygen saturation) of the blood. It is an easy, painless measure of how well oxygen is being sent to parts of your body furthest from your heart, such as the arms and legs.

GSM Module

A customized Global System for Mobile communication

(GSM) module is designed for wireless radiation monitoring through Short Messaging Service (SMS). This module is able to receive serial data from radiation monitoring devices such as survey meter or area monitor and transmit the data as text SMS to a host server. The SIM900A is a common GSM/GPRS module found in various cell phones and PD As. The SIM900A is a dual-band GSM/GPRS engine that operates on the EGSM 900MHz and DCS 1800MHz frequencies. SIM900A supports the GPRS coding schemes CS-1, CS-2, CS-3, and CS-4 and has GPRS multi-slot class 10/class 8 (optional).

Servo motor

A servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. Servo motors are used in applications such as robotics, CNC machinery and automated manufacturing.

Oxygen cylinder

Cylinders and concentrates specifically, are especially designed to supply oxygen to patients at hospitals, home, on the go, or when they are being transferred between medical sites. Pulse Dose delivers oxygen in accordance with the user's breathing pattern. Depending on which kind of oxygen supply system you use, the number of hours of use also varies remarkably. Therefore, with a broad range of weights and sizes on offer, it's important to choose the size that's right for you.

Pressure valve

Oxygen pressure relief valves are pressure-reducing devices used in compressed air gas systems. By opening proportionally to pressure increases, pressure relief valves are used to ensure outlet pressure remains stable when the inlet pressure and outlet flow change.

Software requirements

The Arduino Integrated Development Environment - or Arduino Software (IDE) -contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. Blynk Application

Block diagram

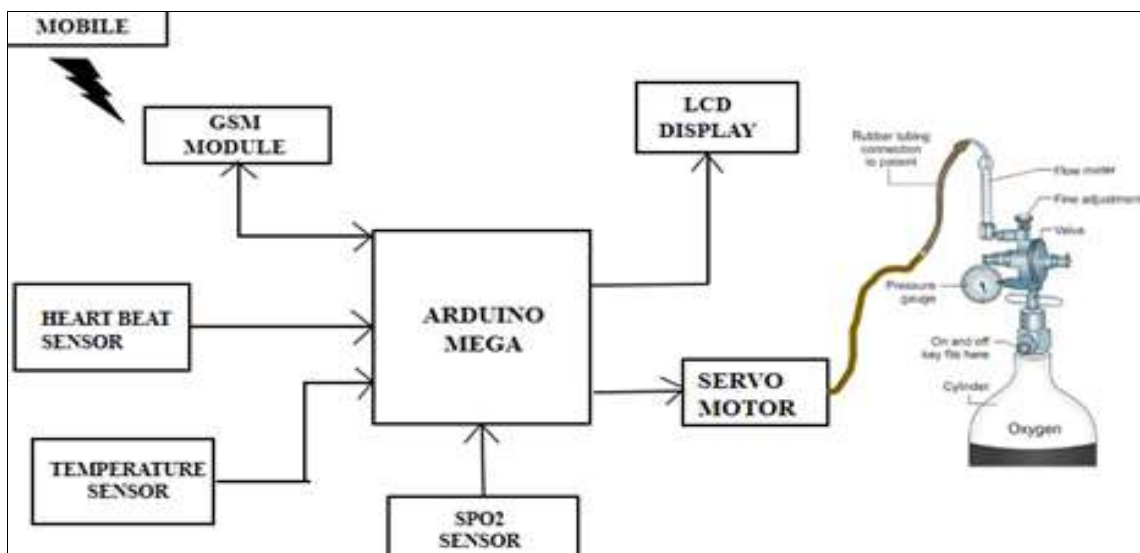


Fig 1: Block Diagram

Output



Conclusion

The proposed system of patient monitoring can operate more effectively in order to collect medical data from patients body which is under continuous observation. And also main feature of oxygen supply is achieved with doctor's guidance. On successful implementation of this project, the number of death due to unavailability of instant o2 support can be minimized in an effective way.

Because of this the expenses required for the training given to care givers for handling o2 cylinders can be lessened based on the percentile implemented this system.

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