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# SENSOR-POWERED MASK: THE FUTURE OF OXYGEN THERAPY

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**ABSTRACT: The anesthetic machine receives medical gases (oxygen, nitrous oxide, air) under pressure and accurately controls the flow of each gas individually. A gas mixture of the desired composition at a defined flow rate is created before a known concentration of an inhalational agent vapor is added. The anesthesia machine can deliver oxygen (O2) and inhalation anesthetics**

**to the patient. The inhalation sedation unit used in dentistry to deliver nitrous oxide-oxygen (N2O-O2) is a modification of the anesthesia machine used in the operating room. Oxygen is breathed during the induction of anesthesia, and an increased concentration of oxygen (O(2) ) is given during the surgery to reduce the risk of hypoxemia. In the present work, this project focuses on enhancing the functionality of oxygen masks by integrating an infrared (IR) sensor on the top of the mask to measure**

**the distance between the nose and the mask. When the distance exceeds a certain threshold, the patient has removed the mask. Additionally, a carbon dioxide (CO2) sensor is incorporated inside the mask to monitor the patient's CO2 levels. If CO2 is not detected, oxygen release is halted as a safety measure. The system provides real-time feedback through digital displays, indicating the detected values. An alarm is triggered if the patient is not wearing the mask, ensuring timely intervention.**

**KEYWORD: CO2 and IR for carbon dioxide and infrared sensors**

## I.INTRODUCTION

Accidental oxygen disconnection during rapid sequence intubation (RSI) in the emergency department is a potentially catastrophic yet avoidable event. We report three cases of inadvertent oxygen disconnection during RSI, which resulted in significant oxygen desaturation.

An oxygen mask is a mask that provides a method to transfer breathing oxygen gas from a storage tank to the lungs. Oxygen masks may cover only the nose and mouth (oral nasal mask) or the entire face (full-face mask). They may be made of plastic, silicone, or rubber. In certain circumstances, oxygen may be delivered via a nasal cannula instead of a mask.

Medical plastic oxygen masks are used primarily by medical care providers for oxygen therapy because they are disposable and so reduce cleaning costs and infection risks. Mask design can determine the accuracy of oxygen delivered with many various medical situations requiring treatment with oxygen. Oxygen is naturally occurring in room air at 21% and higher percentages are often essential in medical treatment. Oxygen in these higher percentages is classified as a drug with too much oxygen being potentially harmful to a patient's health, resulting in oxygen dependence over time, and in extreme circumstances patient blindness. For these reasons, oxygen therapy is closely monitored. Masks are light in weight and attached using an elasticated headband or ear loops. They are transparent allowing the face to be visible for patient assessment by healthcare providers, and reducing a sensation of claustrophobia experienced by some patients when wearing an oxygen mask. The vast majority of patients having an operation will at some stage wear an oxygen mask; they may alternatively wear a nasal cannula but oxygen delivered in this way is less accurate and restricted in concentration.

The rate of oxygen isn't affordable and hence steps must be taken to avoid and restrict the wastage of oxygen. Sometimes the oxygen mask can be displaced from the patient and thus wastage of oxygen occurs. The main reasons for the mask to drop are loosening of the mask or sometimes the patient himself removes the mask. Under such conditions, there's no halt to the flow of oxygen running from the mask, thus oxygen is squandered.

This project focuses on enhancing the functionality of oxygen masks by integrating an infrared (IR) sensor on the top of the mask to measure the distance between the nose and the mask. When the distance exceeds a certain threshold, it indicates that the patient has removed the mask. Additionally, a carbon dioxide ($CO_2$) sensor is incorporated inside the mask to monitor the patient's $CO_2$ levels. If $CO_2$ is not detected, oxygen release is halted as a safety measure. The system provides real-time feedback through digital displays, indicating the detected values. An alarm is triggered if the patient is not wearing the mask, ensuring timely intervention.

## II.EXISTING SYSTEMS:

Development of an automatic anesthesia control system using LabView:

Anesthesia is a condition of loss of sensation with or without loss of consciousness that is artificially produced by the administration of one or more anesthetic agents that block the passage of pain impulses along nerve pathways to the brain at the time of surgery. While the dosage of Anesthesia administration is not in proper control during the surgery may result in lethal effects for the patient. To overcome this problem, the proposed work aimed to design an automated anesthesia control system that ensures the number of anesthetic agents to be delivered during the surgery depending on their age, MAC value, and type of surgery to the patients. These control parameters are given as input to determine the amount of anesthetic agents in percentage by using the LabViewresulted as the low and excess dose of anesthesia incidence error can be optimally reduced.
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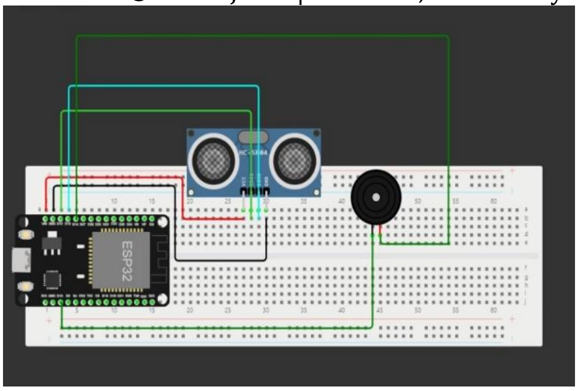
Non-Invasive IoT-Based Anaesthesia Control System:

In this paper, we present the design, implementation, and authentication of a novel Internet of Things (IoT) Anaesthesia drug control system for the online continuous and mutinous controlling of Anaesthesia drugs by detecting two vital body parameters, i.e., body temperature and pulse rate. The mentioned complete system comprises a Node MCU-based control system that drives and reads out the signal from the sensors. When the sensors sense readings of heart rate, body temperature, and sweat from the patient's body, which are out of the normal range, the system is designed to drive the servomotor and hence control the anesthesia drugs injection in the body according to the patient's current state. The IoT network is upheld by a Cloud framework, which permits the specialist to monitor all the patient's information through Ubidots Cloud. The real-time readings of the body parameters of the patient and the position of the servo motor, hence the status of the anesthesia drug delivery is sent to the hospital cloud from where an anesthetist can observe the readings. If abnormal body temperature and heart rate are observed, the concerned personnel are alerted. Anesthesia delivery is stopped until the state of the patient becomes normal. The approval closes with the check that this framework effectively works for the concurrent observing and controlling of sedation and the system is turned off manually with a switch. This work is focused on automating the process of anesthesia delivery and making the process more economical and efficient.

## III.PROPOSED MODEL:

To avoid accidental mask disconnection and also since. The cost of oxygen isn’t affordable and hence steps must be taken to avoid accidental life threats and restrict the wastage of oxygen. Sometimes the oxygen mask can be displaced from the patient making oxygen flow cut to the patient and thus wastage of oxygen occurs. The main reasons for the mask to drop are loosening of the mask or sometimes the patient himself removes the mask. Under such conditions, there’s no halt to the flow of oxygen running from the mask, thus oxygen is squandered.

This project focuses on enhancing the functionality of oxygen masks by integrating an infrared (IR) sensor on the top of the mask to measure the distance between the nose and the mask. When the distance exceeds a certain threshold, the patient has removed the mask. Additionally, a carbon dioxide ($CO_2$) sensor is incorporated inside the mask to monitor the patient's $CO_2$ levels. If $CO_2$ is not detected, oxygen release is halted as a safety measure. The system provides real-time feedback through digital displays, indicating the detected values. An alarm is triggered if the patient is not wearing the mask, ensuring timely intervention.



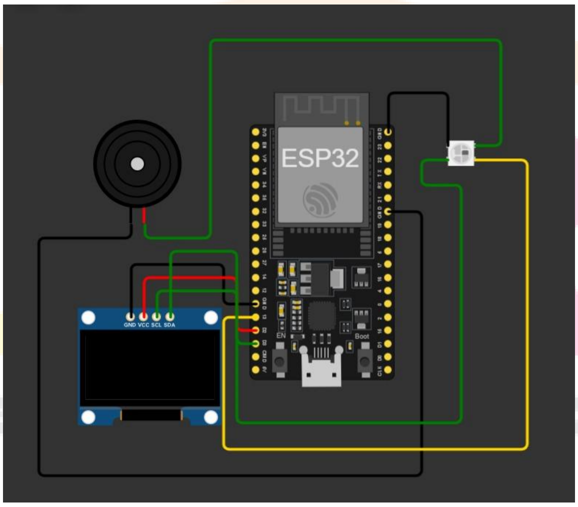

COMPONENTS:

1. esp8266
2. oxygen mask
3. IR sensor
4. CO2 sensor
5. jumper wire
6. alarm
7. display

COMPONENTS AND WORKING:

ESP8266:
The ESP8266 is a versatile microcontroller with built-in Wi-Fi capabilities, allowing it to connect to wireless networks and communicate with other devices over the internet.
It can be programmed to perform various tasks such as collecting data from sensors, controlling actuators, or sending and receiving data from a remote server.
In your system, the ESP8266 could serve as the central controller, gathering data from sensors such as the IR sensor and CO2 sensor, and controlling other components like the alarm and display based on predefined conditions.

Oxygen Mask:
An oxygen mask is a device used to deliver oxygen to a person in need of supplemental oxygen.
It typically consists of a mask that covers the nose and mouth, a tube that connects the mask to an oxygen source, and a reservoir bag to store oxygen.
In an emergency where the oxygen level is low, the mask would be worn by individuals to ensure they receive an adequate supply of oxygen to breathe.




IR Sensor:
An infrared sensor works by detecting infrared radiation emitted by objects in its field of view.
When an object comes within range of the sensor, it reflects or emits infrared radiation which is then detected by the sensor.
In your system, the IR sensor could be used for motion detection or object proximity sensing. For example, it could trigger an alarm if it detects movement in a restricted area.

CO2 Sensor:
A CO2 sensor measures the concentration of carbon dioxide gas in the surrounding air.
It typically uses a chemical sensor or infrared technology to detect CO2 levels.

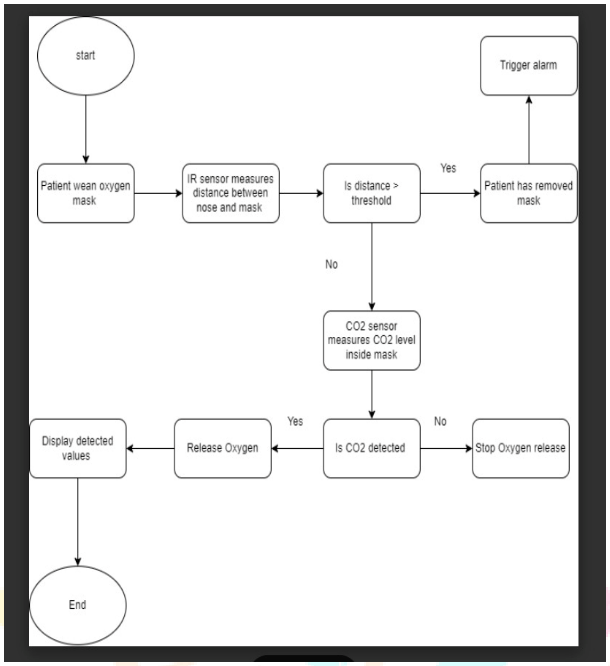
In your system, the CO2 sensor could be used to monitor indoor air quality and trigger an alarm if CO2 levels exceed a certain threshold, indicating poor ventilation or potentially hazardous conditions.

Jumper Wire:
Jumper wires are used to create electrical connections between components on a breadboard or in a circuit.
They allow for easy prototyping and experimentation without the need for soldering.
In your system, jumper wires would be used to connect the various components, forming the electrical connections necessary for the system to function.

Alarm:
An alarm is a device that emits a loud sound or visual signal to alert people to a specific danger or event.
It can be triggered by various sensors or input signals depending on the application.
In your system, the alarm could be triggered by the $CO_2$ sensor detecting high levels of carbon dioxide, indicating a potential safety hazard such as a gas leak or poor ventilation.

Display:
A display module provides visual output, allowing users to view information or data in a readable format.
It can be an LED display, LCD screen, OLED display, or any other type of display technology.
In your system, the display could be used to show sensor readings, system status, or any other relevant information to the user. For example, it could display the current $CO_2$ levels detected by the $CO_2$ sensor or provide feedback on system operation,
here we are using an LED display

A LED (Light Emitting Diode) display:
commonly referred to as an LED matrix or LED panel, is a type of visual display technology that utilizes an array of light-emitting diodes to create text, numbers, symbols, or graphics. LEDs are semiconductor devices that emit light when current flows through them. They come in various colors, such as red, green, blue, and white, and can be arranged in different configurations to form a display.




## IV.CONCLUSION

In conclusion, this study endeavors to address critical challenges in healthcare accessibility by introducing an IOT-based health monitoring system. Oxygen in these higher percentages is classified as a drug with too much oxygen being potentially harmful to a patient's health, resulting in oxygen dependence over time, and in extreme circumstances patient blindness. For these reasons, oxygen therapy is closely monitored. Masks are light in weight and attached using an elasticated headband or ear loops. They are transparent allowing the face to be visible for patient assessment by healthcare providers, and reducing a sensation of claustrophobia experienced by some patients when wearing an oxygen mask. The vast majority of patients having an operation will at some stage wear an oxygen mask; they may alternatively wear a nasal cannula but oxygen delivered in this way is less accurate and restricted in concentration. Thus, enhancing the functionality of oxygen masks by integrating an infrared (IR) sensor on the top of the mask to measure the distance between the nose and the mask. Additionally, a carbon dioxide ($CO_2$) sensor is incorporated inside the mask to monitor the patient's $CO_2$ levels. If $CO_2$ is not detected, oxygen release is halted as a safety measure. The system provides real-time feedback through digital displays, indicating the detected values. An alarm is triggered if the patient is not wearing the mask, ensuring timely intervention. Hence we can prevent accidental oxygen mask disconnection but implementing this project and also prevent the overflow of oxygen.

## V.REFERENCES

**1. W. S. Sandberg, E. H. Sandberg, A. R. Seim, S. Anupama, J. M. Ehrenfeld, S. F. Spring, et al., "Real-time checking of electronic anesthesia records for documentation errors and automatically text messaging clinicians improves the quality of documentation", Anesth. Analg., vol. 106, pp. 192-201, 2008.**
**2. S. F. Spring, W. S. Sandberg, S. Anupama, J. L. Walsh, W. D. Driscoll, and D. E. Raines, "Automated documentation error detection and notification improves anesthesia billing performance", Anesthesiology, vol. 106, pp. 157-163, 2007.**
**3. Zhang Baiyang, Zheng Yuxin, Qiu Yue, Yang Liu, Zhang Runqing, Liao Yuhao, et al., "Overview of Intelligent Face Mask and Application of New Technology", Tianjin Textile Science & Technology**
**4. B. G. Nair, G. N. Peterson, S. Newman, E. Y. Huang, and H. A. Schwid, "Wastage reduction of inhalation agents through real-time notification of excess fresh gas flow", presented at the 2011 American Society of Anesthesiologists Conference, Chicago, IL.**
**5. Paul G. Barash, Clinical anesthesia. Lippincott Williams & Wilkins, 2009**
**6. Ghita Mihaela, Martine Neckebroek, Cristina Muresan and Dana**
**7. Copot, "Closed-loop control of anesthesia: Survey on actual trends challenges and perspectives", IEEE Access, vol. 8, pp. 206264-206279, 2020.**
**8. Jerry A. Dorsch, "Understanding anesthesia equipment", Lippincott Williams & Wilkins, 2012**