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DYNAMIC OXYGEN AND NEBULIZATION DELIVERY SYSTEM USING LIFA

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Abstract - A nebulizer is a tiny equipment that produces a mist from liquid medicine. The patient can breathe that mist through the medicine chamber. This allows the patient to readily breathe the drug into their lungs. The main disadvantage of the nebulizer is that the pharmaceutical flow is continuous, resulting in overdosing due to the high pressure generated by the nebulizer. As a result, there will be a waste of medicine or drug. The major goal of this initiative is to reduce drug waste from nebulizers. We designed a "Dynamic Oxygen and Nebulization Delivery System using LabVIEW" interface for Arduino in the same way that their techniques may be used to regulate oxygen wastage.

Keywords: **Nebulizer, Arduino, LabVIEW, respiratory disease.**

1. INTRODUCTION

The constant output jet nebulizer aerosolizes the majority of the medication solution and delivers a substantial dose with minimal patient coordination. Treatment with a nebulizer can be time consuming and ineffective, as a continually used nebulizer loses 50% of its effectiveness. Only 10% of the whole dose loaded in a nebulizer is actually deposited in the lungs on average. The goal of this research is to create a technologically sophisticated nebulizer that will reduce drug waste and improve delivery performance. The aerosol production of a nebulizer can be boosted by directing auxiliary air entrained at the time of inspiration through improved delivery systems. Adaptive aerosol delivery tracks a patient's breathing pattern for the first three breaths, then directs aerosol delivery to the first half of each inhalation. This guarantees that the aerosol is delivered to the patient only during inspiration, avoiding the loss that occurs with a continuous output nebulizer. This project concept also includes an oxygen supply as a parameter, so that a patient can receive oxygen only during their inspiration, similar to how a nebulizer works. There will be no oxygen flow when you are dying. As a result, there will be no waste of oxygen and the oxygen deficit will be resolved. The goal of using the LabVIEW interface for Arduino (LIFA) is to make it simple to integrate measuring hardware and to reduce the lines of code into a visual programme that is easy to comprehend and to decrease the execution time in half. And displayed complex logic on the diagram, as well as developing data analysis methods and designing bespoke engineering user interfaces. The patient's breath and exhale control the dynamic oxygen and nebulization delivery mechanism. The medicine or oxygen is administered as the patient inhales. There is no medication or oxygen flow during exhaling. As a result, medicine is only supplied during the patient's inspiration, resulting in no drug or oxygen waste.

2. EXISTING SYSTEM

2.1Patient discomfort due to drug overflow:

- Jet nebulizers provide a steady output and can aerosol the majority of the medication solution. As a result, it will give a significant dosage and cause discomfort to the patient.

2.2 Continuously operated nebulizer:

- The constantly run nebulizer will lose 50% of its capacity due to the continual flow of drugs. Nebulizers constantly give medication to the patient during breathing and exhalation. As a result, drugs are squandered in existing nebulizers.

2.3 Wastage of oxygen in oxygen concentrator:

- The oxygen concentrator will have a constant supply of oxygen, similar to a nebulizer. As a result, there will be a 50 percent loss of oxygen.

3. PROPOSED METHODOLOGY

• The pressure is sensed by the Smar lec pressure sensor when the patient inhales, and the data is sent to the Arduino UNO R3. The relay is controlled using Arduino.

• The relay functions as a switching component, controlling the solenoid valve's opening and shutting.

• On the other hand, the solenoid valve receives input (oxygen or nebulization). The solenoid valve opens when the patient inhales, allowing the medicine or oxygen to be supplied to the patient.

•There will be no medicine or oxygen delivery to the patient when they are dying.

We can save medication or oxygen without squandering it using this way. On LabVIEW, the patient's breath and exhalation are represented graphically. There's also a representation of the delivery status over there

• The objective of using the LabVIEW interface for Arduino (LIFA) is to make it simple to integrate measuring devices and to reduce the lines of code into a visual programme that is easy to comprehend and to decrease the execution time in half.

3.1 Block diagram

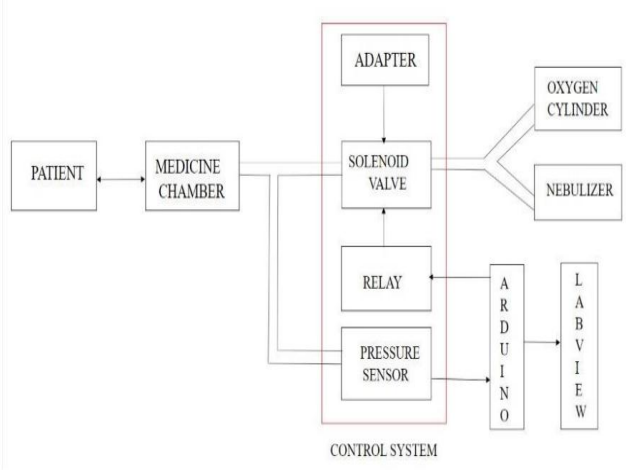

FIG 1: Block Diagram

4. HARDWARE AND SOFTWARE REQUIREMENT

Hardware:

- Arduino Uno R3
- Solenoid Valve
- Smartec pressure Sensor
- Relay
- Nebulizer
- Oxygen concentrator
- Adapter 12V

Software:

- LIFA

4.1 Arduino UNO:

The Arduino UNO R3 was utilized in this project (ATMEGA 328P).

The ATmega328P microcontroller is used in the Arduino UNO. There are 14 digital input/output pins, 6 analogue inputs, a 16 MHz ceramic resonator, a USB connector, a power jack, an ICSP header, and a reset button on this board. It comes with everything you need to get started with the microcontroller; simply connect it to a computer via USB or power it with an AC to DC adapter or battery. You can play around with your UNO without fear of breaking it; in the worst-case scenario, you can replace the chip for a few dollars and start over.

The Arduino UNO R3 is connected to LAB View through a USB wire, and the data from the Arduino is sent to LAB View. LIFA is the name for this form of Arduino interfacing. As a result, the lines of code have been reduced to a visual programme that is simple to grasp, and the execution time has been cut in half.

The Ao pin is an Arduino input pin. The pressure sensor provides the input, which is based on the patient's breaths (Inhalation and Exhalation).

The output, Io, is then linked as an input to the relay.

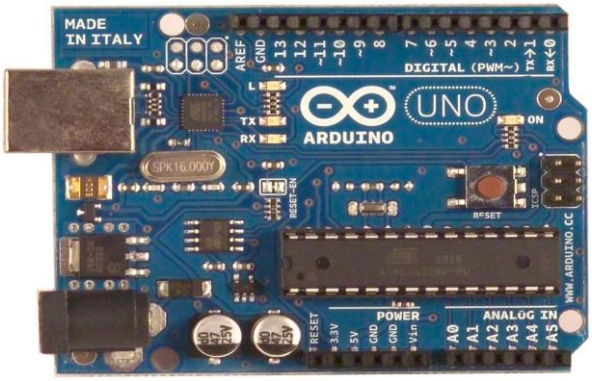

FIG 2: Arduino UNO

4.2 Solenoid Valve

Close, open, dose, distribute, or mix the flow of gas or liquid in a pipe with a solenoid valve. The circuit function of a solenoid valve expresses its specialised purpose.

The electromagnetic coil is used to open or close the valve orifice in a solenoid valve. The plunger is lifted or lowered to open or close the aperture when the solenoid's coil is energised. This, in turn, regulates flow by regulating gas or liquid movement.

A 12V DC Solenoid valve and a 12V Adapter are used in this project to power the solenoid valve. It is a two-way valve (open/close) that regulates the supply of drugs or oxygen.

The solenoid valve opens when the patient inhales, allowing the medicine or oxygen to be supplied to the patient. While inhaling, the solenoid valve closes, preventing any medicine or oxygen from flowing. In this project, the solenoid valve is crucial. We can achieve our project goal of preventing medicine or oxygen waste by using this 2-way open/close solenoid valve.

FIG 3: Solenoid valve

4.3 Smar lec pressure Sensor

An amplified analogue output is provided by this Smartec differential pressure sensor. The sensor has a 102mm H2OFS range and a ratiometric output to the power supply voltage.

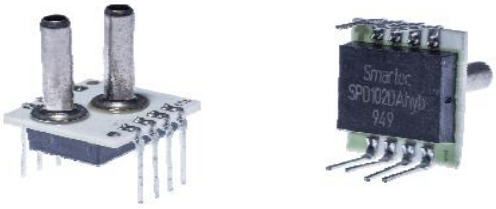

FIG 4: Smar lec sensor

- Wetted materials are: Pyrex glass, RTV, Ceramic, Nickel and Silicon
- The output is ratiometric to Vcc.
- Uses of N.C. pins will cause malfunction.
- Connect between Gnd and Vcc a capacitor.

4.4 Relay

A relay is a switch that is controlled by electricity. The switch can contain any number of contacts in any combination of contact types, such as make and break contacts.

Relays are employed when an independent low-power signal is required to control a circuit or when multiple circuits must be controlled by a single signal. Relays were first utilized as signal repeaters in long-distance telegraph circuits, refreshing the signal coming in from one circuit by transmitting it on another.

Relays were widely employed to conduct logical operations in telephone exchanges and early computers.

FIG 5: Relay

4.5 Nebulizer

A nebulizer is a small machine that turns liquid medication into a mist, enabling for faster and simpler absorption into the lungs.

FIG 6: Nebulizer

4.6 OXYGEN CONCENTRATOR

An oxygen concentrator is a device that selectively removes nitrogen from a gas supply (usually ambient air) to produce an oxygen-enriched product gas stream.

FIG 7: Oxygen concentrator

4.7 SOFTWARE USED

LabVIEW interface for Arduino (LIFA)

5.RESULT

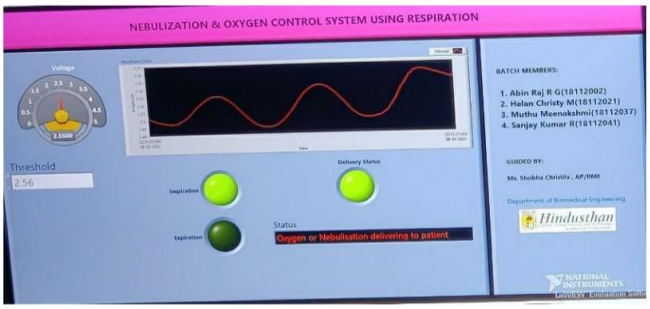

FIG 8: Delivery status of Drug or Oxygen while Inhaling

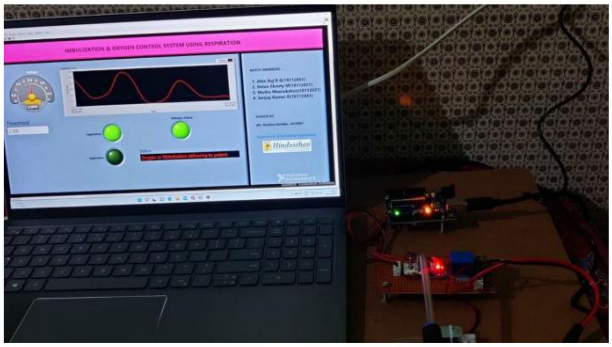

FIG 9: Project setup

6.CONCLUSION

We developed a "Dynamic Oxygen and Nebulization Delivery System" using LIFA as a result of this (LAB VIEW INTERFACE FOR ARDUINO). As a result, it has been completely created and packaged. The device was tested and found to be functional. The design aim was met by all of the gadget requirements.

7.FUTURE SCOPE

This modern approach of nebulization and oxygen therapy controls the wastage of drug. According to the patients need multiple inputs can be given. This can be designed with lower cost and it is portable. Patient with a respiratory illness, this therapy gives quick and effective way to find relief from their symptoms. Oxygen supply can also be delivered to the patient through this method.

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