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Smoke Alert System For Dye Industries Using IoT

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Abstract - *The goal of this paper is to integrate AVR technology into smoke sensor circuitry. We created a fire alarm using an Arduino Uno, which is linked to a smoke sensor and a buzzer. The smoke sensor detects any smoke produced by burning or fire. A buzzer connected to an Arduino provides us with an alert indication. When fire and smoke are activated, it burns nearby objects and emits smoke. Small smoke from candlelight or incense sticks used in the home can also set off a fire alarm. Also, whenever the heat intensity is high, the alert is activated. When the temperature returns to normal, the buzzer or alarm is turned off, and the smoke level decreases. The smoke alert system is an important system for both industrial and residential purposes. When it detects fire or smoke, it immediately alerts the user by sounding the buzzer. We are using an Arduino Uno from the Arduino family for this purpose. Additionally, the Arduino is interfaced with the LCD display to display the status of the system, whether Smoke and Overheat are detected or not.*

***Key Words*: Arduino, Mq2 sensor, Buzzer, Lcd display**

I. INTRODUCTION

This project is about smoke detection systems used in industry. Our project is to create a smoke warning system for the dye industry. Essentially, dye industries manufacture various types of products that have dye applied to them. Threads, boxes, and other items are examples of products. There is a possibility of fire accidents occurring. Because no one knows how and when these fires will occur, these incidents can be fatal. When a fire occurs, it is critical to have a quick response and stop time. Otherwise, the dye industries will suffer a significant loss of product. To avoid the damage caused by fires, we must be alerted and control the fire if it produces more smoke than usual. We are alerted by a buzzer that will sound when the ppm of smoke exceeds the normal range. To create a smoke detection system utilising Internet of Things (IoT) technology and a sensor capable of assessing the situation and updating the system in real-time. The system's goal is to initiate a response that reduces the severity of fire and smoke accidents while also providing users with a helpful alert with an alarm when smoke is detected.

II. LITERATURE REVIEW MATERIALS AND METHODOLOGY

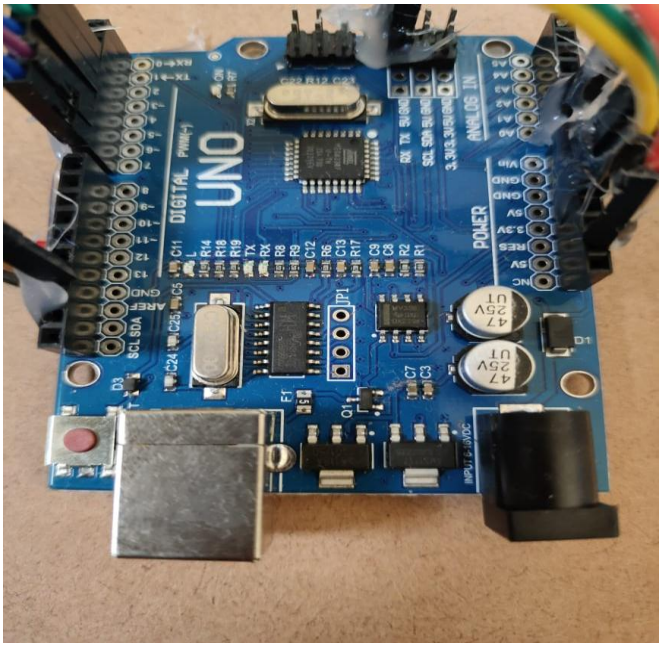
II. i. Literature Review

In order to prevent loss of life and property damage, safety is an important consideration in the design of residential and commercial buildings. Fire is an important consideration in safety. This project created a smoke alert based on a microcontroller that will continuously monitor the amount of smoke and activate an alarm to alert safety measures to contain the situation. When it comes to fire safety, it's best to have a smoke alert in our homes and industries. With so many smoke detectors available, we can rest assured that our industries are safe from the unimaginable. The smoke detector is one of the simplest and least expensive. Most industries use it because it protects effectively and efficiently. Instead of relying on heat/temperature sensors, which sound an alarm when a fire has already started, this system can be useful in both domestic and industrial settings to detect smoke. This can go a long way toward saving human lives. This system can also be used to detect and deter smokers in non-smoking areas. The cost of implementing this system is low because the components used are inexpensive and widely available on the market. As long as more pins are freed for multiple inputs and multiple outputs, a single microcontroller can be used to interface several sensors with alarms located in different locations. This system includes a power supply that can be plugged directly into a power outlet (5V DC) to provide the necessary operating voltage. Smoke detectors are more sensitive to fires in their early, smoldering stages (before it breaks into flame).

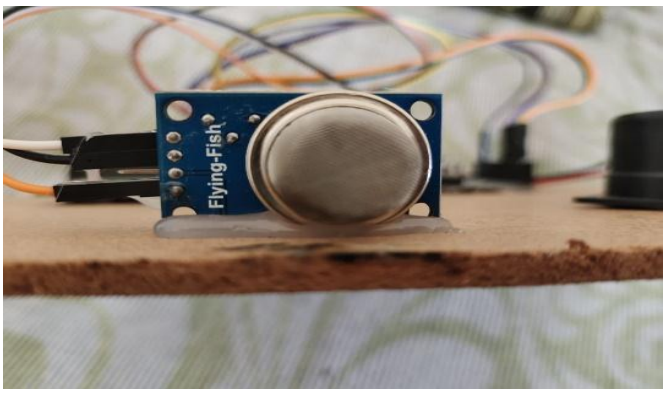
II.ii. Materials

1. Arduino UNO:

The Arduino UNO is built around the ATmega328P microcontroller. In comparison to other boards, such as the Arduino Mega, it is simple to use. The board is made up of digital and analogue I/O pins, shields, and other circuits. The Arduino UNO has six analogue input pins, fourteen digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It's written in IDE, which stands for Integrated Development Environment. It is compatible with both online and offline platforms.

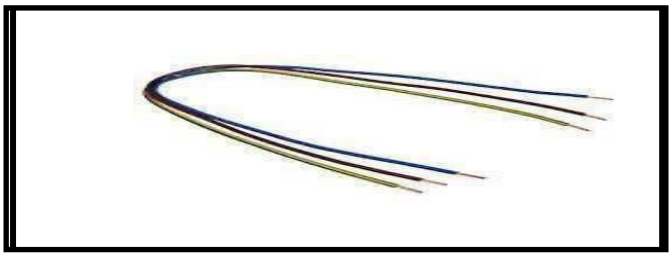


2. MQ2 sensor: The MQ-2 is a sensor for smoke and combustible gases. It has a detection range of 300 - 10000ppm for flammable gases. Its most common application is in domestic gas leak detection and detectors with a high sensitivity to smoke.



3. Connecting Wires:

Wires are the conductive connections between the elements in contact in any electronic circuitry. They have zero resistance and provide perfect connections in theory. They appear on the breadboard as nicely coloured jumper wires.

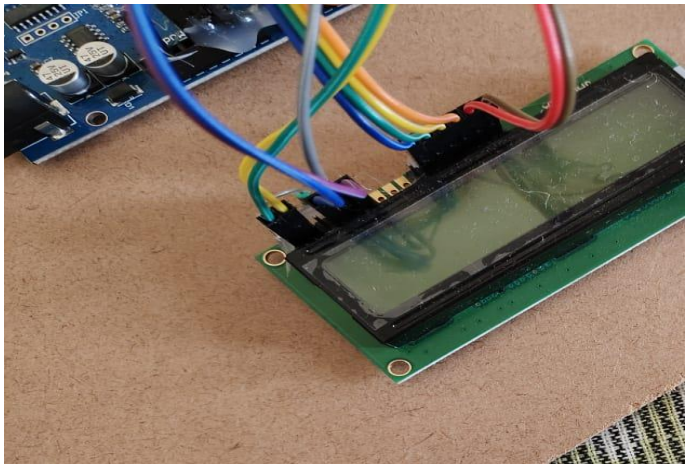


5. Buzzer:

Sensor-Buzzer is a buzzer that is passive. It is like a magnetic speaker, requires voltage with different frequencies in order to produce sound. When the frequency increases, the pitch becomes louder.

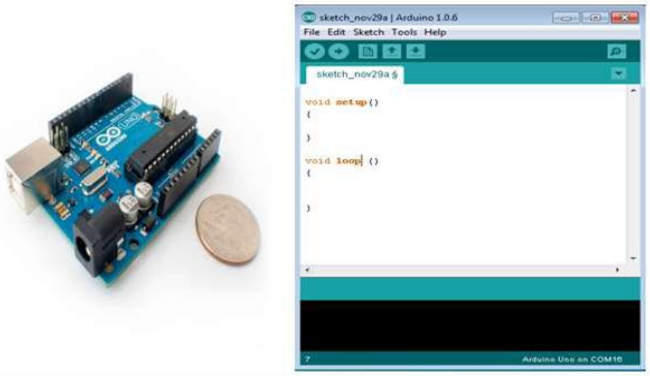
6. LCD Display

To provide a user interface, we can connect a liquid crystal display (LCD) to an Arduino. LCDs are commonly used to display data in devices such as calculators, microwave ovens, and a variety of other electronic devices.



7. Arduino IDE compiler:

Arduino is an open-source electronics platform built primarily on user-friendly hardware and software. To upload our programme into the microcontroller, the Arduino IDE employs an AVR-GCC compiler and AVR-dude. The Arduino IDE is open-source software for writing and uploading code to Arduino boards. The IDE application is compatible with a variety of operating systems, including Windows, Mac OS X, and Linux. It is compatible with the programming languages C and C++. IDE is an abbreviation for Integrated Development Environment.



II. iii. Methodology

When you turn on the device, the Arduino initializes the sensor module and the LCD display. It begins to read data from the MQ-02 sensor. The data is read from the sensor's analogue output pin. The read data is in the form of an analogue voltage that is digitalized using an ADC channel built into the device. Because the Arduino board's ADC channels are 10-bit long, the digitalized reading ranges from 0 to 1023. After calibration, the ADC reading is directly proportional to the smoke concentration in PPM by a factor of one. The reading is saved in a variable and shown on the LCD screen.

The reading is compared to a calibrated threshold that represents the danger level of smoke detection. If the smoke concentration in PPM exceeds the threshold value, the Arduino board sends a HIGH pulse to the respective controller pin, activating the alarm indicator in the form of an LED and activating the DC motor used as exhaust. Otherwise, the LED is kept off by passing a LOW at the respective controller pin, and the motor is kept in top condition by passing a LOW at the pins controlling the motor input signals, until the concentration of smoke in PPM does not exceed the dangerous limit.

Examine the project code to see how the portable Arduino board reads data from the MQ-02 sensor, stores it, displays it on the LCD screen, compares it to a threshold value, and activates the motor and LED indicator when a dangerous level of smoke concentration is detected.

III. MODELING AND ANALYSI

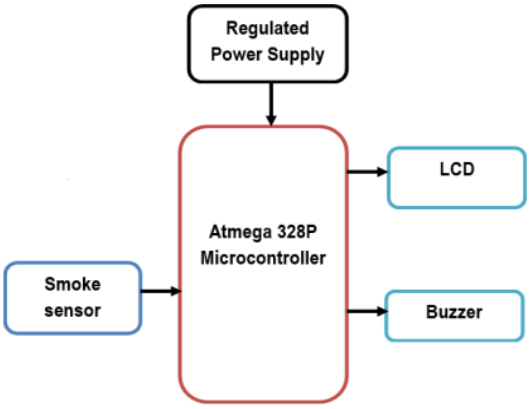


Figure 1: Model Block Diagram.

IV. RESULTS, DISCUSSION, AND CONCLUSION

The project "Smoke alert system for industries" has been designed and tested successfully. It was created by combining features from all of the hardware components used. Every module's presence has been carefully considered and placed, resulting in the best possible operation of the unit. Second, the project was successfully implemented by utilising highly advanced ICs and growing technology. Since the first generation of smoke detectors was released, there have been a number of advancements to both reduce detection time while also decreasing detector's activation when combustion products are not present. Smoke detectors and alarms are evolving from simple smoke detectors to combination detectors and multicriteria detectors.

The future will be multicriteria detection, in which the detector will be more of a sensor, detecting combustion products such as carbon monoxide, carbon dioxide, sulphur dioxide, and nitrogen oxides as well as heat and particulate matter. Sensors will also be able to detect or track whether a room is occupied or not, and will be integrated with occupant notification and evacuation. The development of more advanced algorithms and artificial intelligence, both within the sensor and the front-end control unit, will reduce the time between the start of an event and its notification.

It is not unlikely that detection technology will be able to detect an impending fire at that stage rather than when it is flaming. At the same time, this may reduce the likelihood of an unwanted activation occurring. Within the next decade, video image detection (VID) will become more common, allowing the image of smoke or flame to be isolated and detected from within a room or space using analytics. The VID system would also be able to detect if someone is in the space and, through integration with the notification appliances, provide an exit path.

Figure 1a. Normal smoke detected and displayed in LCD display.

Figure 1b. High smoke detected and displayed in LCD display.

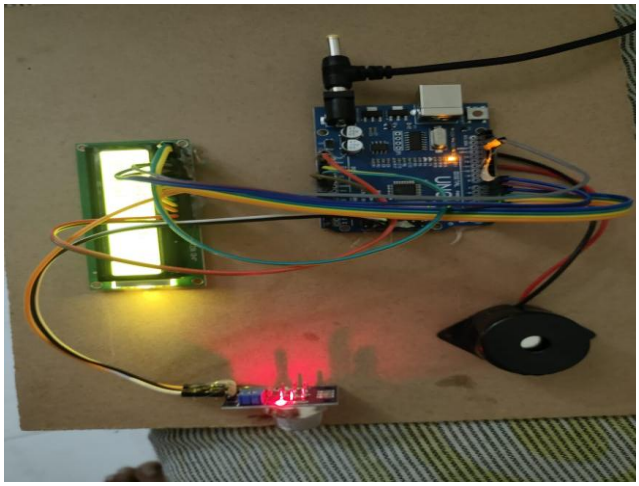


Figure 2. Lock Closed.

V. ACKNOWLEDGEMENT

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