BELGIUM CAMPUS
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Technical Report

Title: Project Arduino

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Abstract

The design and Implementation of a Fire Alarm digital system which will sound at the detection of any smoke in the air. This project uses a gas sensor to detect smoke, this will trigger the alarm and set an emergency message on an LCD screen to alert all the people near the alarm and prompt them to phone the police. The deign was done using Tinkercad software to implement it on a breadboard using an Arduino Uno 3.

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Body

What is a smoke Detector?

A sensor called a smoke detector picks up smoke as the main sign of a fire. It produces an audible and visual alert locally in a room or house, or it sends a signal to a fire alarm system in a big building. Smoke detectors are typically installed on the roof, where there are fire hazards or risks of fire, and are enclosed in small, spherical plastic cases. (safeopedia, 2018)

How does a smoke detector work?

Tin dioxide, which makes up semiconductor particles, absorbs oxygen when heated to a high temperature in the air. Donor electrons in tin dioxide are drawn to oxygen that has been deposited on the surface of the sensing material in clean air. This blocks the flow of electric current.

Adsorbed oxygen's surface density reduces in the presence of reducing gases as a result of their reaction. The tin dioxide is subsequently given up its electrons, allowing current to flow freely through the sensor. (Last Minute Engineers, n.d.)

In short, using a variety of technologies, smoke alarms can sense minute airborne particles to identify fires. They signal the alarm to ring when they find those particles above a certain level so that you and your family can flee to safety and dial 10111. (Scotish Sensory Centre, 2019)

Different types of Smoke detectors

Ionization Smoke Alarms

Ionization-type smoke alarms ionize the air and induce current to flow between two electrically charged plates with the use of a small amount of radioactive material. Smoke disturbs the ion flow in the chamber, which lowers the current flow and sets off the alarm.

Photoelectric Smoke Alarms

They are typically more responsive to fires that start off smoldering for a long time (referred to as "smoldering fires"). (National Fire Protection Association, n.d.)

Optical or photo-optical smoke alarms, often known as photoelectric smoke alarms, identify visible combustion products.

According to research, these smoke alarms are often more effective against a wider spectrum of home fires. They react more quickly to blazing fires, heavy smoke produced by foam-filled furniture, and overheated PVC wiring. (Queensland Fire and Emergency Services, 2017)

Why use a smoke detector?

Smoke detectors are used notify people within a home or building of a fire intime to give them time to safely escape. Without a smoke detector you may be to late to identify a safe exit or smoke may cause you to not be able to see one.

In homes with functioning smoke alarms, the probability of dying in reported home structure fires is 55% lower than in homes without alarms or ones that did not function. According to the NFPA's "Smoke Alarms in US Home Fires" report. (Ahrens, 2021)

Circuit Parts & Schematic View

Arduino Uno 3

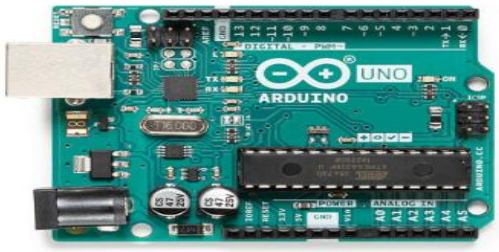

Figure 1 Arduino Uno 3

The Uno is a microcontroller board with a 16 MHz ceramic resonator, 6 analog inputs, 14 digital input/output pins (of which 6 can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button. It comes with everything needed to support the microcontroller; to get started, just plug in a USB cable, an AC-to-DC adapter, or a battery. (ROBOFACTORY, n.d.)

Large Breadboard

It is a thin plastic board used to house wired-together electronic parts, such as transistors, resistors, chips, etc. Breadboards are used to create electronic circuit prototypes that can be utilized again in the future. (PC, n.d.)

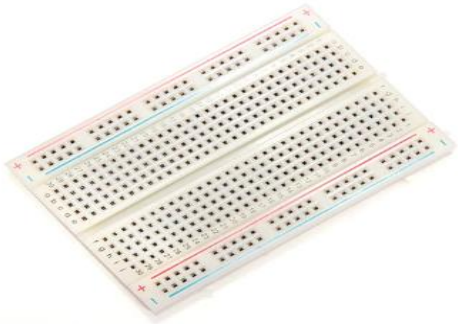

Figure 2 Large Breadboard

MQ-9 Gas Sensor

Figure 3 MQ-9 Gas Sensor

The MQ-9 gas sensor is very sensitive to CO, ME, and LPG. The sensor is inexpensive and suited for a variety of applications, and it may be used to detect various gases that contain CO and flammable gases.

Piezo Buzzer

A piezo buzzer is a sort of electronic device that, in the simplest terms, creates a tone, alarm, or sound. It has a straightforward design, is lightweight, and is often inexpensive. However, depending on the parameters of the piezo ceramic buzzer, it is also dependable and can be built in a variety of sizes that operate over a range of frequencies to provide various sound outputs. (APC, n.d.)

Figure 4 Piezo Buzzer

Push Button

Push buttons are merely the machine or appliance's basic power control switches. These switches are often made of metal or thermoplastic and are designed to be user-friendly. Electric circuits are designed with the premise that electricity should be able to flow continuously through numerous cables and parts. (Chhabra, 2018)

Figure 5 Push Button

Potentiometer

By comparing it to the known voltage, the potentiometer is a device used to measure the unknown voltage. It can be used to compare the emf of several cells and to ascertain the emf and internal resistance of the specified cell. The potentiometer employs the comparative method. (Aakash, n.d.)

Figure 6 Potentiometer

LCD 16x2

An LCD is a type of electronic display module that creates a visual image using liquid crystal. A fairly basic module frequently used in DIY projects and circuits is the 162 LCD display. (Amazon, n.d.)

Figure 7 LCD 16x2

Resistors

A resistor is an electrical component that controls or restricts how much electrical current can pass across a circuit in an electronic device. A specified voltage can be supplied via resistors to an active device like a transistor. (Contributer, n.d.)

Figure 8 Resistors

Figure 9 Cables

Cables

Copper or aluminum are the most common materials for electrical wire, and these conductive materials are insulated to create the lines that distribute power throughout your home. (Thiele, 2022)

Schematic View

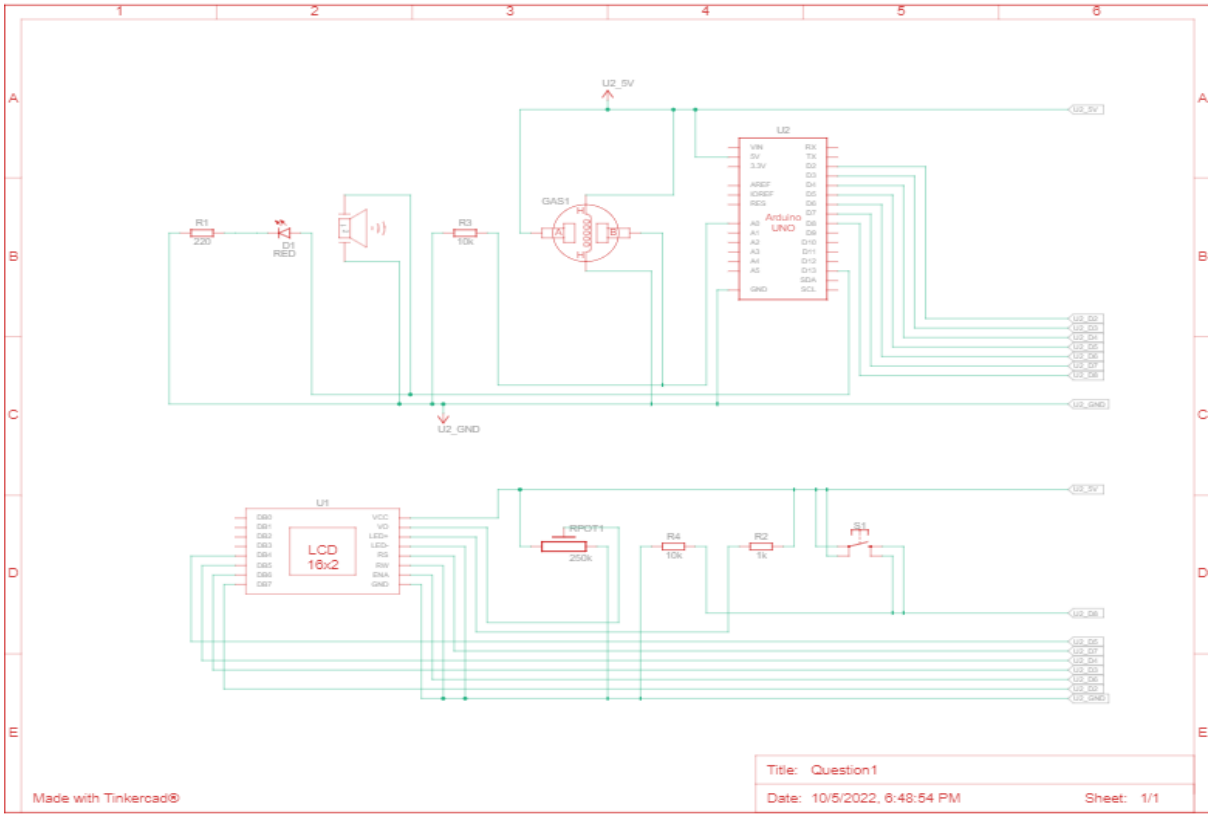

Figure 10 Schematic View

Conclusion

When lighting energy levels fall below acceptable levels, smoke detectors are devices made and engineered to sound an alarm through voice signals. They are necessary in public spaces, especially those where fire incidents are more prone to occur, such kitchens, where they are designed to warn people if there is a threat of fire.

Link to project

https://www.tinkercad.com/things/lVsm5BNFSkv?sharecode=RcZRHtCMB2EFVMX5KnztGPhLFpsCN9utVu7dyOx4HpI

References

Aakash. (n.d.). *Potentiometer*. Retrieved from What is a Potentiometer?: https://byjus.com/jee/potentiometer/

Ahrens, M. (2021, February). *NEWS & RESEARCH*. Retrieved from Smoke Alarms in US Home Fires: https://www.nfpa.org/News-and-Research/Data-research-and-tools/Detection-and-Signaling/Smoke-Alarms-in-US-Home-Fires#:~:text=The%20risk%20of%20dying%20in,alarms%20or%20none%20that%20worked.

Amazon. (n.d.). Retrieved from DEPOKE 16 x 2 LCD Display: https://www.amazon.in/Generic-JCE-16X2-Lcd-Display/dp/B00OVY28M4

APC. (n.d.). Retrieved from PIEZO BUZZERS: https://www.americanpiezo.com/standard-products/buzzers.html#:~:text=What%20Is%20A%20Piezo%20Buzzer,typically%20a%20low-cost%20product.

Chhabra, A. (2018, July 13). *Access to Energy*. Retrieved from Push buttons and their widely used applications across industries: https://blog.se.com/access-to-energy/2018/07/13/push-buttons-and-their-widely-used-applications-across-industries/

Contributer, T. (n.d.). *Definition*. Retrieved from Resistor: https://www.techtarget.com/whatis/definition/resistor

Last Minute Engineers. (n.d.). *Arduino*. Retrieved from How MQ2 Gas/Smoke Sensor Works? & Interface it with Arduino: https://lastminuteengineers.com/mq2-gas-senser-arduino-tutorial/

National Fire Protection Association. (n.d.). *Public Education*. Retrieved from Ionization vs photoelectric: https://www.nfpa.org/Public-Education/Staying-safe/Safety-equipment/Smoke-alarms/Ionization-vs-photoelectric

PC. (n.d.). Retrieved from breadboard: https://www.pcmag.com/encyclopedia/term/breadboard

Queensland Fire and Emergency Services. (2017, Ver 6). Photoelectric Smoke Alarms.

ROBOFACTORY. (n.d.). Retrieved from Arduino UNO R3 - Original: https://www.robofactory.co.za/arduino-boards/352-arduino-uno-r3-original.html?gclid=Cj0KCQjw1vSZBhDuARIsAKZlijSvfKPPrA7mAd_VhIbgkVQ7A--YCmVI8k330eLkjGyW2YXwT2eK7VsaAhi3EALw_wcB

safeopedia. (2018, November 10). *Smoke Detector*. Retrieved from safeopedia: https://www.safeopedia.com/definition/1080/smoke-detector

Scotish Sensory Centre. (2019). *British Sign Language Glossaries of Curriculum Terms*. Retrieved from BSL Physics Glossary - smoke/gas sensor - definition: http://www.ssc.education.ed.ac.uk/BSL/physics/smokegassensord.html#:~:text=In%20a%20fire%20many%20gas,the%20alarm%20is%20set%20off.

Thiele, T. (2022, June 6). *Wiring & Circuits*. Retrieved from 6 Different Types of Electrical Wire and How to Choose One: https://www.thespruce.com/common-types-of-electrical-wiring-1152855