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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

OPTION: ELECTRICAL TECHNOLOGY

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FINAL YEAR PROJECT

DESIGN AND IMPLEMENTATION OF AN ALCOHOL DETECTION SYSTEM FOR DRIVER

Final Year Project Submitted in partial fulfillment of the requirement for the award of an Advanced Diploma in Electrical Technology

Submitted

By:

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Kigali, October 2024

DECLARATION -A

This research study is my original work and has not been presented for a Degree or any other academic award in any University or Institution of Learning". No part of this research should be reproduced without the authors' consent or that of Ulk Polytechnic Institute.

Student name: MWEBAZE Benon Roll number: 202150215

Signature………………………………Date………. /………. /…………….

DECLARATION B

I, confirm that the work reported in this research project, was carried out by the candidate under my

Supervision and it has been submitted with my approval as the UPI supervisor.

Name Supervisor: Ir. KARIKURUBU Emmanuel

Sign: …………………………………………. Date: ………/ ……/2024

DEDICATION

I dedicate this work to:

Almighty GOD,

My family members, my brothers and sisters,

My classmates and friends,

My supervisor for the support he gave us,

All the teaching staff that have helped us during the studies,

AKNOWLEDGEMENT

I would like to express my gratitude to the almighty God for blessing us with strength and courage to complete this project. From the beginning until the end of this project, I have so many people who stand by us; gives guidance for every obstacle that stand in my way. Therefore, I would like to express my deepest appreciation to those involved in this project.

I would like to express my gratitude and to my project supervisor Ir. KARIKURUBU Emmanuel who had showered us with ideas and guidance through the whole time the last second. I will never forget all your sacrifices and only God could ever repay that you have done for me.

Finally, yet importantly, I cannot forget to thank ULK polytechnic institute administration

ABSTRACT

Alcohol Detection Driver System' is built and put into use to track drivers' blood alcohol content in real time, with the goal of improving road safety and preventing drunk driving in Rwanda's public transportation system. This system, which was created especially for the particular requirements of Rwanda's public transportation vehicles, combines sensors technology with clever control mechanisms to identify the presence of alcohol in a driver's breath. When the system detects alcohol concentrations above a set threshold, it sets off a sequence of safety measures, which may include warning the driver and maybe turning off the ignition to keep the car from running. The heart of the device is a highly sensitive alcohol sensor that is positioned carefully to guarantee reliable and consistent readings, especially when using public transportation. The system analyzes the sensor data in conjunction with a microcontroller unit to make judgments instantly depending on the amount of alcohol detected. The implementation makes sure that drivers are notified of their status in a clear and timely manner by including user-friendly interfaces for alarm notifications and system feedback. The danger of alcohol-related accidents within Rwanda's public transportation system can be greatly decreased by using this alcohol detection system, which will help make the country's roads safer and potentially save lives. Because of its design, which places a high priority on dependability, usability, and quick reaction, the system is a workable option for actual usage in the nation's transportation sector. In addition, the incorporation of this system into public transportation vehicles is a proactive measure to encourage safe driving practices and improve public safety throughout Rwanda.

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LIST OF ABBREVEATION

ADC	: Analog Digital Converter
CPU	: Central Processing Unit
DAC	: Digital Analog Converter
DC	: Direct Current
HOD	: Head of Department
PWM	: Pulse Width Modulation
TTL	: Transistor Transistor Logic
USB	: Universal Serial B

CHAPTER 1: GENERAL INTRODUCTION

1.0 Introduction

Driving while intoxicated continues to be one of the biggest global causes of traffic accidents, putting pedestrians and drivers at serious risk. The development of alcohol detection systems for automobiles has become a major area of study and innovation in response to the growing concern over road safety, especially within public transport networks. 'Alcohol Detection Driver System' is intended to tackle this problem by combining sophisticated sensor technologies with clever control systems to track and identify alcohol in a drivers breathe in real time. In nations such as Rwanda, where public transportation is an essential part of everyday transportation, it is critical that drivers maintain sobriety in order to lower traffic accidents and protect passengers. Conventional techniques for keeping an eye on drunk driving by drivers are frequently manual and reactive, depending on law enforcement actions taken after an infraction has happened. On the other hand, this technology provides an early warning system that can identify and stop driving while intoxicated even before the car is started.

The device measures the amount of alcohol in a driver's breath using a very sensitive alcohol sensor that is placed strategically inside the car. When the system detects alcohol levels above a predetermined threshold, it automatically initiates safety procedures, which may include warning the driver and maybe turning off the ignition to keep the car from running. This lowers the possibility of accidents by guaranteeing that only sober drivers operate automobiles. Given that passenger safety is Rwanda's top priority in the public transportation sector, the installation of such a system is very crucial. Operators of public transportation can greatly improve road safety, adhere to strict safety standards, and encourage a culture of responsible driving by incorporating this technology into their vehicles. In addition, the implementation of this system is a progressive step toward minimizing the risks associated with driving under the influence, improving public safety generally, and lowering the number of alcohol-related collisions on the road.

1.1 Background of the study

In today's world, road safety is of highest importance, and one of the main causes of traffic accidents and fatalities is drunk driving. Due to the well-established risks associated with drunk driving, strict laws and limitations have been put in place to try and lessen the number of these kinds of accidents. Even with these initiatives, alcohol-related accidents remain a serious risk, especially in areas like Rwanda where there is a lot of traffic and a large reliance on public transportation. This emphasizes how important it is to find creative ways to stop drunk driving in order to improve road safety.

Vehicle alcohol detection systems provide a proactive way to reduce this risk. These devices are made to keep an eye out for and identify signs of alcohol in a driver's breath before they start driving. The device can dramatically lower the risk of accidents by prohibiting drunk drivers from starting their cars. In order to measure the amount of alcohol in a person's breath, highly sensitive alcohol sensor is usually used with microcontroller to evaluate the data and, if needed, initiate safety procedures.

It is becoming more widely acknowledged that installing alcohol detection devices in cars especially those used for public transportation is essential to enhancing road safety. This is particularly important in places like Rwanda, where a large number of people commute mostly by public transit. In addition to protecting passengers, making sure public transportation drivers are sober before starting their routes also helps to increase road safety for everyone. These solutions not only increase safety but also support more general public health and safety objectives by encouraging safe driving practices and lessening the negative effects of drunk driving on the community. Therefore, the development and application of an alcohol detection driving system marks a substantial advancement in the continuous endeavor to establish safer roadways and communities.

1.2 Statement of the Problem

Drunk driving is a major problem that causes a lot of accidents and fatalities on the road. Current strategies, such as police checks, frequently fail to prevent drunk drivers from operating a vehicle, particularly when using public transportation where everyone's safety is at risk. I ‘m creating an alcohol detection system for drivers that measures a drivers breathe before the car begins in order to address this issue. The system will not let the car start if the alcohol content is too high. This method is to save lives, lessen accidents, and enhance road safety, especially in places where public transportation is widely used.

1.3. Research Objectives

1.3.1. Main objective

The main objective of this research project is to develop a **Design and implementation of an alcohol detection driver system.**

1.3.2. Specific objectives

I. To develop a system that accurately detects the presence of alcohol in a drivers breathe before the vehicle starts.
II. To integrate the alcohol detection system with the vehicle's ignition to prevent operation if the alcohol level exceeds a safe threshold.
III. To enhance road safety by reducing the risk of alcohol-impaired driving, particularly in public transport.

1.4 Research Questions

1. What are the best sensor technologies for accurate alcohol detection?
2. What factors are crucial for selecting effective alcohol sensors?
3. What are the integration challenges between the alcohol detection system and vehicle electronics?
4. How can the system be tested and validated for different driving conditions?

1.5 Scope and limitation of the Study

The Scope of This study focuses on designing and implementing an alcohol detection system for vehicles that accurately detects alcohol levels in a driver's breath and integrates with the vehicle's ignition system. The system aims to prevent vehicle operation if alcohol levels exceed a specified threshold, thereby enhancing road safety. The study includes the selection of appropriate sensor technologies, system integration with vehicle electronics, real-time data processing, and validation in different driving conditions.

The Limitations of The study is limited to the integration of the alcohol detection system within specific vehicle types and may not account for all variations in vehicle electronics.

The accuracy of the alcohol detection may be affected by environmental factors and sensor calibration. Additionally, the study does not cover the long-term reliability and maintenance requirements of the system. Testing may be constrained by practical limitations in replicating all possible real-world driving conditions.

1.6 Organization of the study

This work is mainly composed by three chapters whereby:

Chapter 1: which is the general introduction to the project will briefly explain all about

Chapter 2: is the literature review this chapter is deal with the information about all components I used in my project.

Chapter 3: which is deals with the methods and steps will be used to design and implementation of an alcohol detection driver system

Chapter 4: which is deals with the Design and implementation of an alcohol detection driver system

Chapter 5: is the conclusion and recommendation to my project

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter provides a detailed review of the research and hardware requirements that supported the development of my project, "**Design and Implementation of an Alcohol Detection System for Drivers**" Throughout my work, I explored various related projects to gain insight into alcohol detection technologies and vehicle safety systems. These references helped us acquire essential skills and knowledge on how to implement effective detection mechanisms. This chapter also outlines the hardware requirements used by others who developed similar systems. By examining previous research and applications, I identified key strategies and technologies to improve driver safety through alcohol detection, providing an in-depth understanding of the tools and techniques I utilized in my project.

2.2 Hardware Requirements

2.2.1 Introduction

This part consists of the discussion about the basics of electronic elements and electrical devices that are joined together in order to achieve the desired result during the design and implementation of alcohol detector project. Although there are several electronic and electrical elements and devices, this chapter will focus on those which are included with Public Transport Bus alcohol detection as the purpose of project. Whereas Electrical elements are electrical rock, push button, relay, alcohol sensor, Arduino. The concept contains both summaries and explanations of complete or current state of knowledge on text, theories related this topic and study made earlier which are similar the descriptions of work done before that found in books upon this subject. The entire system adopted the Arduino Uno Microcontroller Board (based on ATMEGA 328). The core functions modules are Arduino Uno, Alcohol Sensor (MQ-3)

2.2.2 Microcontroller

2.2.2.1 Introduction

Arduino is an open source microcontroller, which can be easily programmed, erased and reprogrammed at any instant of time. Introduced in 2005 the Arduino platform was designed to provide an inexpensive and easy way for hobbyists, Employees and professionals to create devices that interact with their environment using sensors and actuators.

Based on simple microcontroller boards, it is an open source - computing platform that is used for constructing and programming electronic devices. It is also capable of receiving and sending information over the internet with the help of various Arduino shields, which are discussed in this paper. Arduino uses a hardware known as the Arduino development board and software for developing the code known as the Arduino IDE (Integrated Development Environment).

Built in microcontrollers can be programmed easily using the C or C++ language in the Arduino

Figure 1: Arduino uno

2.2.2.2 Arduino pins

The Arduino Uno is a microcontroller board based on the ATmega328. It is a programmable micro controller for prototyping electromechanical devices. You can connect Digital and Analog electronic signals:

It has 14 digital Input / output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic Resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip.

Instead, it features theAtmega16U2 (Atmega8U2up to version R2) programmed as a USB to-serial converter. The name Arduino comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduino of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.

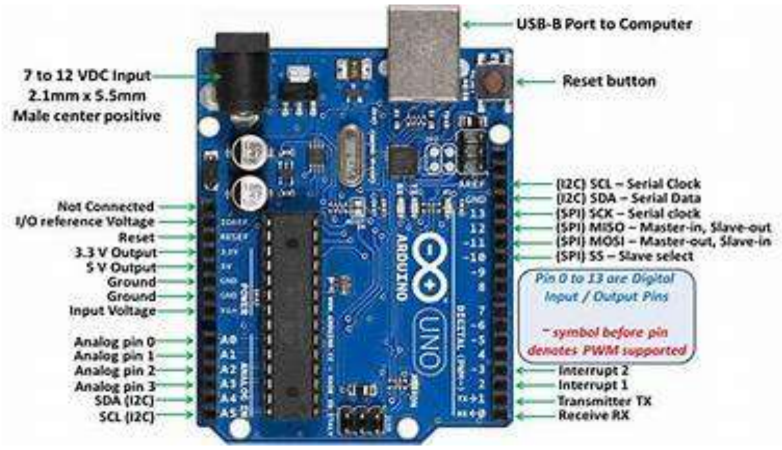

Figure 2: Arduino uno pins

2.2.2.3 Main Pin functions

- LED: There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

- VIN: The input voltage to the Arduino/Genuine board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.

- 3V3: A 3.3-volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND: Ground pins.
- IOREF: This pin on the Arduino/Genuine board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin

voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

- Reset: Typically used to add a reset button to shields which block the one on the board.

2.2.2.4 Special pin Functions

Each of the 14 digital pins and 6 Analog pins on the Uno can be used as an input or output, using pinMode (), digital Write (), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default, they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference () function.

In addition, some pins have specialized functions:

- Serial: pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- External Interrupts: pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- PWM (Pulse Width Modulation) 3, 5, 6, 9, 10, and 11 Can provide 8-bit PWM output with the analog Write () function.
- SPI (Serial Peripheral Interface): 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- TWI (Two Wire Interface): A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.
- AREF (Analog Reference: Reference voltage for the analog inputs. (leonardo, 2018)

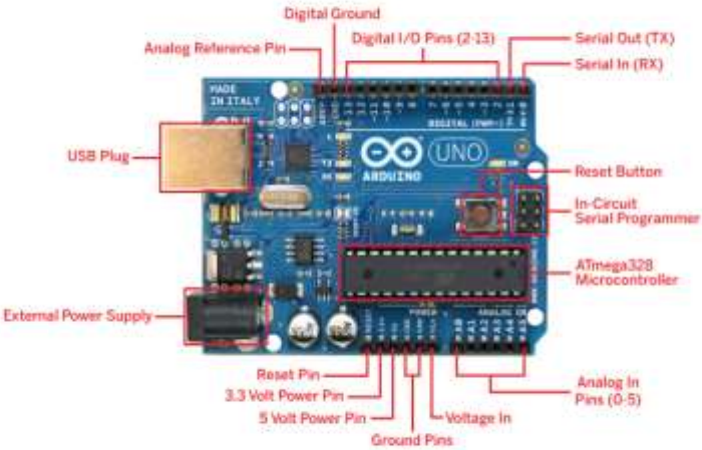

Figure 3: Special pin Functions

2.2.3 Alcohol Sensor

2.2.3.1 Introduction to Alcohol Sensor

The analog gas sensor - MQ3 is suitable for detecting alcohol, this sensor can be used in a Breathalyzer. It has a high sensitivity to alcohol and small sensitivity to Benzene. The sensitivity can be adjusted by the potentiometer. Sensitive material of MQ-3 gas sensor is SnO2, which with lower conductivity in clean air. When the target alcohol gas exists, the sensor's conductivity is higher along with the gas concentration rising, use of simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration.

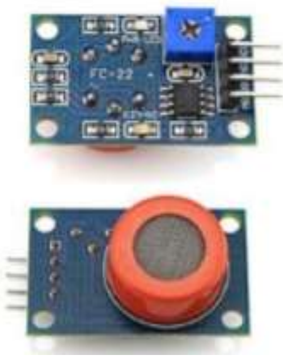

Figure 4: Alcohol Sensor

MQ-3 gas sensor has high sensitivity to Alcohol, and has good resistance to disturb of gasoline, smoke and vapor. The sensor could be used to detect alcohol with different concentration; it is with low cost and suitable for different application.

2.2.3.2 Sensitivity Adjustment

Resistance value of MQ-3 is difference to various kinds and various concentration gases. So, when using these components, sensitivity adjustment is very necessary. It is recommended to calibrate the detector for 0.4mg/L (approximately 200ppm) of Alcohol concentration in air and use value of Load resistance that (RL) about 200 KΩ (100KΩ to 470 KΩ). When accurately measuring, the proper alarm point for the gas detector has to be determined after considering the temperature and humidity influence.

2.2.3.3 Character configuration:

- Good sensitivity to alcohol gas
- Simple drive circuit
- Long life and low cost
- High sensitivity to alcohol and small towards benzene
- Fast response and High sensitivity and stability and long life.

2.2.3.4 Specifications:

- Power supply needs: 5V
- Interface type: Analog
- Pin Definition: 1-Output 2-GND 3-VCC
- High sensitivity to alcohol and small sensitivity to Benzene
- Fast response and High sensitivity
- Stable and long life
- Simple drive circuit with size: 40x20mm (Vijayalakshmi Badre, 2015)

2.2.5. DC Motor

DC motor is connected to the Arduino through the relay, and the start button and reset button are used to control the motor. DC motor starts by pressing the start button and can be stopped by pressing the reset button. DC motor acts as the vehicle's engine, the motor plays a crucial role in ensuring safety. Upon detecting alcohol, the system can cut off power to the DC motor, preventing the vehicle from moving, or reduce power to limit speed as a cautionary measure. The DC motor, integrated with other vehicle systems, can also safely decelerate and stop the vehicle in response to alcohol detection, ensuring controlled and gradual stops. Additionally, the motor can provide feedback through haptic alerts, warning the driver before taking more drastic actions.

Figure 5: DC Motor

2.2.6. Push-button

A push-button (also spelled pushbutton) or simply button is a simple switch mechanism to control some aspect of a machine or a process. Buttons are a DF typically made out of hard material, usually plastic or metal

Figure 6: Pushbutton schematic

2.2.6.1. Terms of the push button

Terms for the "pushing" of a button include;

Pressing,

Depressing,

Mashing,

Slapping,

Hitting, and punching.

2.2.7 Liquid Crystal Display (LCD)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over segments and other multi segmented. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special &even custom characters(unlike in seven segments),animations and so on. A 16x2 LCD means it can display 16 characters per line and there are two such lines. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD

Figure 7: Liquid Crystall Display

An LCD (Liquid Crystal Display) serves as the primary interface for communicating critical information to the driver. The LCD can display real-time feedback on the driver's alcohol level, indicating whether it is safe to drive or if the vehicle is immobilized due to alcohol detection. It can also show alert messages, such as warnings to stop the vehicle, instructions to retry the breathalyzer test, or system status updates for example an Alcohol Detected or Engine Disable. The clear visual output provided by the LCD enhances user interaction, making the system more intuitive and informative for the drive.

2.2.8 Buzzer

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren. a buzzer serves as an auditory alert mechanism. When the system detects alcohol levels above the acceptable threshold, the buzzer emits a sound to warn the driver and passengers of the danger. This audible alert can signal the driver to stop the vehicle or inform them that the vehicle's engine has been immobilized due to alcohol detection. The buzzer enhances safety by providing immediate, attention-grabbing feedback, especially in situations where the driver might not notice visual cues, like an LCD display.

Figure 8: Buzzer

2.2.9 PCB (printed Circuit Board)

A printed circuit board (PCB; also printed wiring board or PWB) is a medium used to connect electronic components to one another in a controlled manner. It takes the form of a laminated sandwich structure of conductive and insulating layers: each of the conductive layers is designed with an artwork pattern of traces, planes and other features (similar to wires on a flat surface) etched from one or more sheet layers of copper laminated onto and/or between sheet layers of a non-conductive substrate. Electrical components may be fixed to conductive pads on the outer layers in the shape designed to accept the component's terminals, generally by means of soldering, to both electrically connect and mechanically fasten them to it. Another manufacturing process adds plated-through holes that allow interconnections between layers.

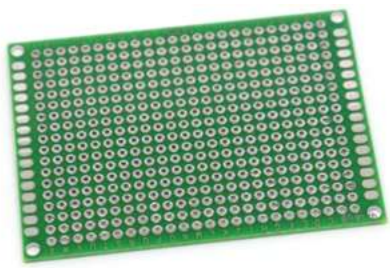

Figure 9: PCB (Printed Circuit Board)

2.2.10 LEDs

Light-emitting diode (LED) is a widely used standard source of light in electrical equipment. It has a wide range of applications ranging from your mobile phone to large advertising billboards. They mostly find applications in devices that show the time and display different types of data.

LEDs (Light Emitting Diodes) provide a simple, visual indication of the driver's alcohol status. Different LED colors can represent various conditions: for example, a green LED can signal that no alcohol is detected and it is safe to drive, a yellow LED might indicate a warning level, and a red LED can alert that alcohol levels are too high, leading to vehicle immobilization. LEDs offer quick, easily recognizable feedback to the driver, complementing other alerts like buzzers or LCD displays, and enhance the system’s overall usability and safety.

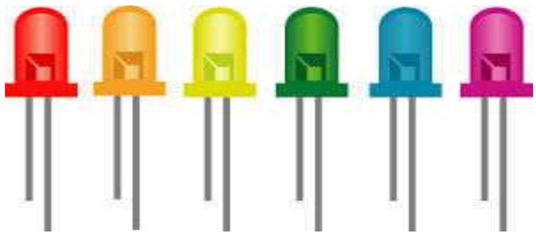

Figure 10: LED (light emitting diode)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The achievement of the objectives of any research project, researchers should often use a research through in a particular methodology. In addition, methodologies are different depending on the objectives for achievement and the need of the society and the whole world in general. Whereby a researcher is focusing on, but it is better to link the project with the society's need by trying to do my best.

3.2 Data collection

Many applications of methodology are the collection of data as well as their interpretation. And this section includes all methods utilized in conducting this research project for achieving my main objectives.

Hence, the following methods was utilized

- Review of different documents related to my project.
- Read Engineering handbooks related to electrical and electronic field.
- Use of library books and internet browsers.
- Consulting my supervisor to give us advice.
- Seeking the components required to my project.
- To show all parts of my project and their working principle.

3.3 Documentation

In my project I flicked through the physical documentation found in the school library, also my research has been carried on searching alcohol sensors and other electronics websites. I have consulted my supervisor, my instructors and also similar projects were consulted project. The time and ability to do the research was conducted to use the survey research, so the information, interviews, different people ideas and data had all collected and informed. The books from internet and library was consulted, also ICT lab was very important in programming of this project

3.4 Simulation

Programming language was used to automate different devices like Arduino and alcohol sensor. In this method, I have done a lot of work of identifying how will be the connection of components and devices required to design my system and for testing them whether they are at a sustainable level of performance.

I have used **Proteus** software to carry out this work.

3.5. Programming

This was achieved by using a software namely Arduino for designing the codes required to control alcohol detection.

Then, the next action was to upload the obtained program into Arduino UNO which was achieved by: connecting the Arduino to the USB port through the specific USB cable. Then after that, board type and the serial ports was set to Arduino Program. Therefore, the codes got uploaded in Arduino.

3.6 Tools and Instrument Used

The tools used in this project are the same from those currently used by other researchers especially those who participated first especially in workshop in the field of electronics, which is in my subject area. Here there are some important tools used in my project:

- Circuit board.
- Digital millimeter.
- Screwdrivers, pliers, Soldering iron, Wires
- Circuit covers.

3.7. Data editing

Editing of collected data will do to make the data ready and simpler for presentation Daniel and Gates.

The filled questionnaires will edit one by one to correct an error that will do by the study respondents. Data will edit in order to check for accuracy, completeness, consistency and uniformity.

3.8. Coding

Coding refers to the «assigning of symbol or a number to a response for identification purpose». This has been used to summarize data by classifying different responses, which will make into categories for easy interpretation and analysis.

3.9. Limitations

The system needs a continuous power supply to be practical or else I might not be able to control the appliances. Hence, best way to design the system efficiently would be to implement both the automated control and manual control through switches at a time.

3.10. Ethical Consideration

An ethical consideration refers to the ethical principle that will use when tackling a particular issue. Ethics are codes or rules which govern those practices of a profession. It dictates how information and client's relationships will manage. Ethical considerations occur when you are required to use these rules to better serve your clients state that the conduct of ethically-inform research should be the goal of all social researchers. Any research has the potential to impact on the lives of others and therefore consideration must be given to recognize and protect the rights of human beings

CHAPTER 4: SYSTEM DESIGN, ANALYSIS AND IMPLEMENTATION

4.1 Introduction

In this chapter, I explored the intricate aspects of designing and implementing the system. It provides a detailed account of the system's development, incorporating innovative approaches to achieve the intended results.

4.2 Calculation

4.2.1 Alcohol Sensor

Voltage: Typically operates at 5V

Current: Approximately 20 mA (0.02 A)

P sensor=V×I=5V×0.02A=0.1 W (100 mW)

4.2.2 Relay Module

Voltage: Typically operates at 5V

Current: Approximately 15 mA (0.015 A) when activated

4.2.3. LCD display

Voltage: 5V

Current: Depends on the LCD; assume 500 mA (0.5 A) for a small LCD

P LCD =V×I=5V×0.5A=2.5 W

P LCD =V×I=5V×0.015A=0.075 W (75 mW)

4.2.4 Arduino Power Consumption

The power consumption of the Arduino depends on the model, but let’s assume you're using a typical Arduino Uno. The relevant specs are:

Operating Voltage: 5V

Current Draw: Approximately 50 mA (0.05 A) when idle.

Power for the Arduino:

P Arduino=V×I=5V×0.05A=0.25W (250mW)

4.2 Block Diagram

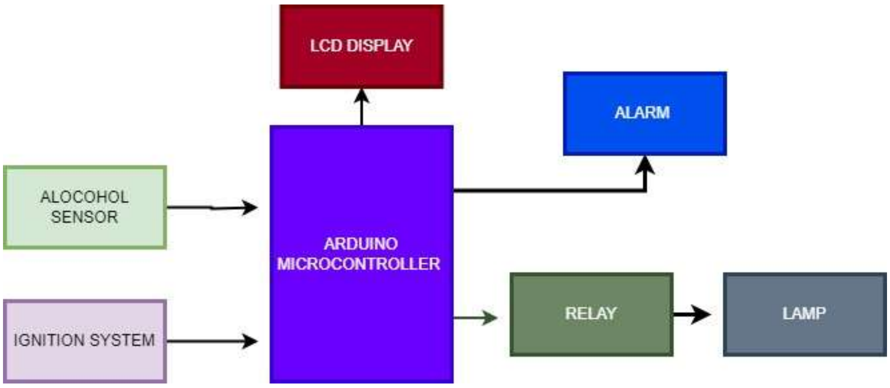

Figure 11: Block Diagram

4.3 Flowchart

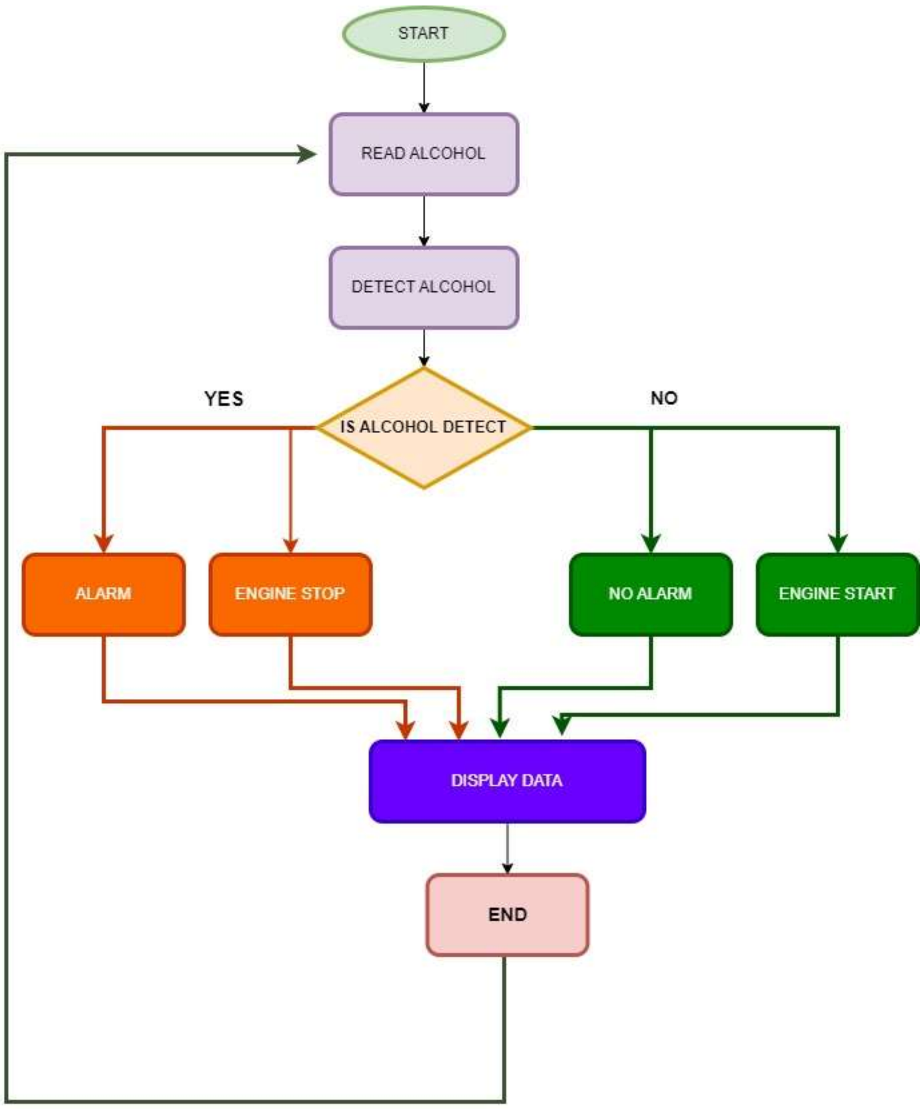

Figure 12: flowchart

The purpose of using this device is to stop cars from starting if the driver has drunk too much alcohol while driving. The operation of a car alcohol detecting system is explained in this flowchart. The first step in the procedure is to measure the alcohol content. The system doesn't allow car to start the engine, sounds an alarm, and shows the data if alcohol is found. In the event that alcohol is not found, the system makes sure no alarm goes off.

4.4 Circuit Diagram

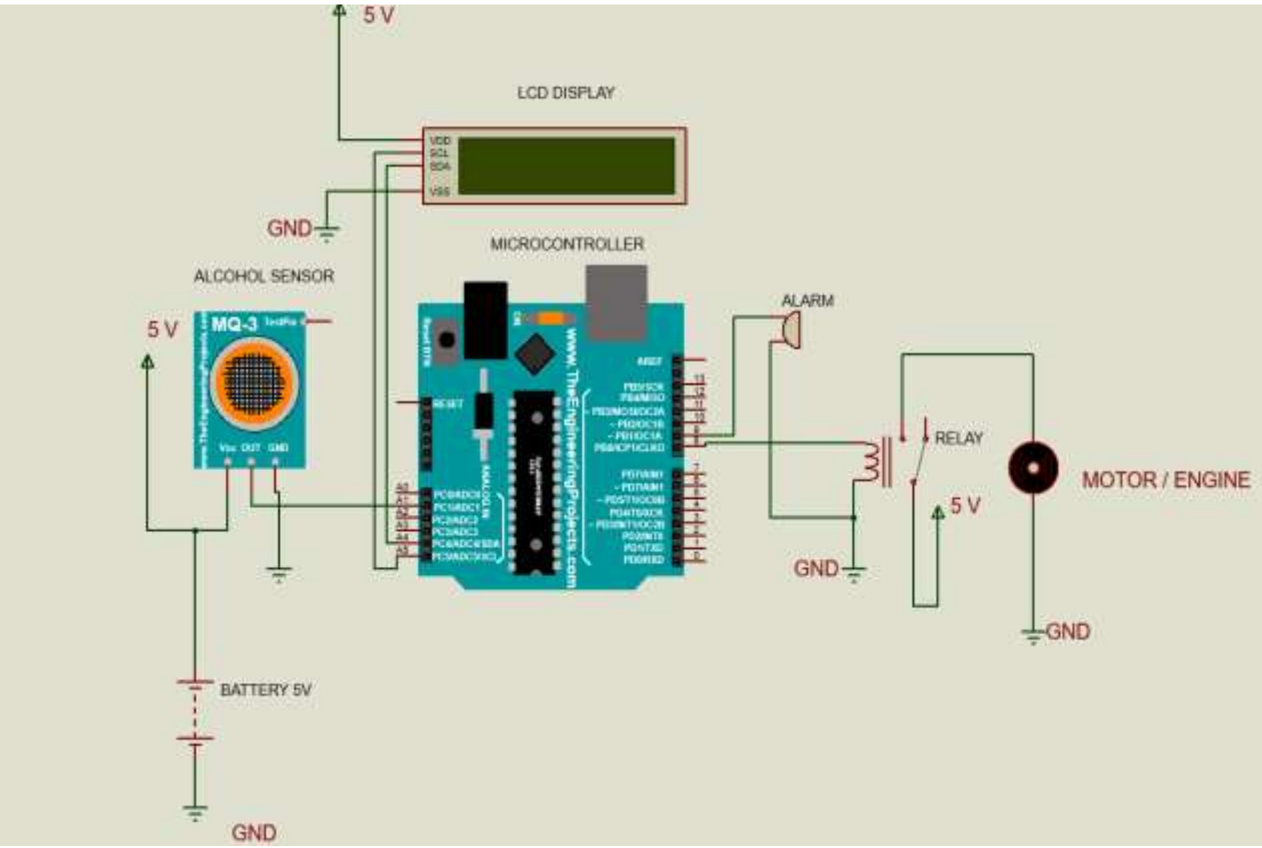

Figure 13: circuit diagram

4.5 Working Principles

The driver's breath is tested for the presence of alcohol using an alcohol sensor, and the results are sent to an Arduino microcontroller. The microcontroller sounds an alarm, shows a warning on the LCD, and operates a relay to stop the vehicle's ignition system, which keeps the engine from starting, if alcohol is found. Driven by a battery, the device makes sure that driving is only permitted when there is no sign of alcohol, which increases road safety.

This circuit diagram uses the MQ-3 sensor as alcohol sensor and an Arduino microcontroller to prevent vehicle ignition if alcohol is detected. The MQ-3 sensor's Vcc is connected to the Arduino's 5V pin, GND to the ground, and OUT to analog pin A0. The LCD display is connected to the I2C pins: SCL to D5 and SDA to D6. The alarm is controlled by digital pin D3, with its Vcc connected to 5V and GND to ground.

The relay is connected to D4 to control the motor/engine, with its Vcc to 5V and GND to ground. The motor is connected in series with the relay. The system reads the alcohol levels and, if detected, the Arduino triggers the alarm, stops the motor, and displays data on the LCD.

4.6. Implementation

Figure 14: alcohol not detected Engine ON

Figure 15: alcohol not detected engine indicator lamp ON

Figure 16: alcohol detected

Figure 17: alcohol detected engine OFF

4.7 Cost estimations

Table 1: Cost Estimation

S/N	Material/devices	quantity	Unity price	Total /price(FRW)
1	Arduino uno	1	15000	15,000frw
2	Alcohol sensor	1	7,500	7,500 frw
4	motor	1	15,000	15,000 frw
5	PCB	1	2000	2000 frw
6	Battery	1	10,000	10,000 frw
7	LCD	1	9,000	9,000 frw
8	Buzzer	1	500	500 frw
9	Relay	1	1,000	1,000 frw
10	Design	--	-	20,000 frw
11	Internet	-	-	10,000frw
12	Transport	-	-	7500 frw
	Total			**102,000 frw**

CHAPTER 5. CONCLUSION AND RECOMMANDATION

5.1. Conclusion

It is concluded that the "**Design and Implementation of an Alcohol Detection System for Driver** " project can make a substantial contribution to improving road safety by preventing driving while intoxicated. In addition to giving us the chance to hone my technical abilities, my project brought attention to how crucial careful driving is to lowering the number of collisions. With the help of my supervisor and teamwork, I was able to build a workable system that combines alcohol detection with vehicle control systems. I was able to have hands-on experience in software analysis, circuit design, sensor integration, and programming through the project. I created a solution that might be used in Rwanda and other countries by integrating real-time alcohol detection and automated car shutdown. In the end, this endeavor has been an invaluable educational opportunity that combines.

5.2. Recommendation

In order to stay up to date with the latest technological advancements and maintain competitiveness in the global market, I, as technicians and engineers, suggest allocating additional time for practical training. I implore ULK Polytechnic Institute and other educational establishments to give practical session’s first priority and to actively promote exceptional projects that tackle urgent problems by assisting them in reaching the market. My alcohol detecting driver system's design and implementation revealed some expensive parts, like motor modules and Arduino. Thus, I advise that students receive the materials they need for their projects from the Electrical and Electronics Department. Furthermore, I urge the Rwandan government to provide final-year students with more funding so that they can conduct advanced research and projects. Additionally, I urge the Ministry of Education to fund and encourage student initiatives that

References

Kumari, A. (2018). "Multilevel Home Security System using Arduino & GSM." Journal for Research| Volume **4**(10).

Bahrudin, M. S. B., et al. (2013). Development of fire alarm system using Raspberry Pi and Arduino Uno. 2013 International Conference on Electrical, Electronics and System Engineering (ICEESE), IEEE.

Balakrishnan, S., et al. (1999). Method and device for input of text messages from a keypad, Google Patents.

Hunter, C. E. (1998). High resolution, high brightness light emitting diode display and method and producing the same, Google Patents.

General electronics notebook of senior four, 2020 - 2021

General electronics notebook of senior six, 2015

Www. Circuitstoday.com

Wikipedia.com

"Push buttons and much more". The builderssupply.com. Retrieved 11 April 2013.

https://www.arduino.cc › tutorial › pushbutton

APPENDICES

APPENDIX A: Project code

```
// include the library code:

#include <LiquidCrystal.h>

// initialize the library by associating any needed LCD interface pin

// with the Arduino pin number it is connected to

const int rs = 4, en = 5, d4 = 6, d5 = 7, d6 = 8, d7 = 9;

LiquidCrystal lcd(rs, en, d4, d5, d6, d7);

const int analogInPin = A7;  // Analog input pin that the potentiometer is attached to

const int analogOutPin = A5; // Analog output pin that the LED is attached to

int sensorValue = 0;

int buzzer = 3;

int buttonState = 0;

const int buttonPin = 10;

int state = 0;

void setup() {

  Serial.begin(9600);

  pinMode(buzzer, OUTPUT);

  pinMode(buttonPin, INPUT);

  lcd.begin(16, 2);
```

```
  lcd.setCursor(0, 0);
  lcd.print("ALCOHOL DETECTION");
  lcd.setCursor(0, 1);
  lcd.print("DRIVER SYSTEM");
  delay(2000);}
void loop() {
  sensorValue = analogRead(analogInPin);
  Serial.print("sensor = ");
  Serial.println(sensorValue);
  buttonState = digitalRead(buttonPin);
  if (buttonState == HIGH && sensorValue < 30 && state == 0) {
    analogWrite(analogOutPin, 255);
    state = 1;
  } else if (buttonState == HIGH && state == 1) {
    analogWrite(analogOutPin, 0);
    state = 0; }
  if (sensorValue > 30) {
    digitalWrite(buzzer, HIGH); // Turn buzzer on
    analogWrite(analogOutPin, 0);
    state = 0;
```

```
  } else {
    digitalWrite(buzzer, LOW);  // Turn buzzer off }
  // LCD display
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("ALCOHOL ");
  if (digitalRead(buzzer) == HIGH) {
    lcd.print("DETECTED");
  } else {
    lcd.print("NOT DETECTED");}
  lcd.setCursor(0, 1);
  lcd.print("ENGINE: ");
  if (state == 1) {
    lcd.print("ON");
  } else {
    lcd.print("OFF"); }
  delay(1000);
}
```