

POLITEKNIK UNGKU OMAR

HAZARD SIGN SENSOR

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CIVIL ENGINEERING DEPARTMENT

DECEMBER 2023

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**As part of the requirements for the Civil Engineering Diploma,
this report was presented to the Civil Engineering
Department.**

CIVIL ENGINEERING DEPARTMENT

DECEMBER 2023

AUTHOR'S DECLARATION

DESIGN STUDIES ON 'HAZARD SIGN SENSOR'

1. We are students of Diploma Kejuruteraan Awam, Politeknik Ungku Omar, that is located at Jalan Raja Musa Mahadi, 31400 Ipoh, Perak.
2. Unless otherwise stated, we accept that the project mentioned above and the intellectual properties contained inside are our original creations. The project was completed in compliance with Politeknik Ungku Omar's rules. I give up the right to have my diploma conferred and consent to be bound by Politeknik Ungku Omar's disciplinary policies in the event that our report is found to have violated the above stated requirements.

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ACKNOWLEDGEMENT

We would like to express our sincere gratitude to all those who have contributed to the successful development and implementation of the hazard sign sensor project. Special thanks to:

- The research and development team for their dedicated efforts in designing and programming the sensor system.
- Our supervisor for providing valuable guidance and support throughout the development process.
- The technical support students for their expertise in troubleshooting and fine-tuning the sensor for optimal performance.
- The safety experts who provided valuable insights and feedback to ensure the sensor's effectiveness in hazard detection.
- Our colleagues and collaborators who actively participated in discussions and testing, contributing to the overall improvement of the sensor.

This project would not have been possible without the collective efforts and collaboration of everyone involved. Your commitment and expertise have played a crucial role in the successful creation of a reliable hazard sign sensor.

ABSTRACT

In industries and public spaces, the timely detection of potential hazards is critical for ensuring the safety of individuals and preventing accidents. This paper presents the development of a state-of-the-art hazard sign sensor designed to identify and respond to various safety signs efficiently. The sensor employs advanced computer vision algorithms to recognize standard hazard signs commonly used in industrial and public settings.

The system integrates a high-resolution camera with real-time image processing capabilities, allowing it to analyze the environment and identify hazard signs accurately. Upon detection, the sensor triggers appropriate responses, such as alerts, notifications, or automated safety protocols. The sensor's design emphasizes adaptability to different lighting conditions and sign variations, ensuring robust performance in diverse environments.

Key features of the hazard sign sensor include:

1. **Real-time Recognition:** The sensor employs machine learning algorithms for real-time recognition of hazard signs, minimizing response time to potential safety threats.
2. **Adaptive Environment Sensing:** The system adapts to varying environmental conditions, including changes in lighting, to maintain reliable hazard sign detection.
3. **Integration with Safety Protocols:** The sensor seamlessly integrates with existing safety protocols, enhancing overall safety measures in industrial and public spaces.
4. **User-Friendly Interface:** An intuitive user interface facilitates easy configuration and monitoring, making the sensor accessible to operators with varying levels of technical expertise.

The hazard sign sensor aims to contribute to a safer working and living environment by providing an intelligent and proactive approach to hazard detection. The system's versatility and adaptability make it a valuable addition to diverse applications, ranging from manufacturing plants to public spaces, where the swift identification of potential dangers is paramount.

This research represents a significant step forward in leveraging technology to enhance safety measures and reduce the risk of accidents in various environments.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Road signs serve to provide guidance, warnings, prohibitions, and information to road users. It is usually placed in an easily visible area using symbols that are easy to understand, simple, clear, and uniform in order to make it easier for road users to reach their destination safely. The use of signs in a location depends on the suitability of the instructions to be conveyed to the driver. Road signs have a specific function and purpose and are usually classified according to certain categories.

Traffic signs are used to regulate, warn, or guide road users. Signs should be used only when necessary and justified by facts and research. Traffic signs are important where special rules apply in certain places or only at certain times, or where the danger is not obvious. They also provide information on highway routes, directions, destinations, and places of interest. Traffic signs that are not good or difficult to see by road users can cause accidents.

1.2 PROJECT BACKGROUND

Road signs in Malaysia are standard road signs similar to those used in Europe but with certain differences. Until the early 1980s, Malaysia followed Australia, China, and Japan in the design of road signs with diamond-shaped warning signs and warning signs to regulate traffic. Signs typically use the FHWA Font Series (Highway Gothic) typeface also used in the United States, Canada, and Australia. Although there are some newer signs such as highways that use the transport typeface. However, there is a new sign format used specifically for Malaysian highway signs by the Lembaga Lebuhraya Malaysia (LLM). A font called "LLM Lettering". This font has two typefaces, namely LLM Normal and LLM Narrow.

1.3 PROBLEM STATEMENT

Accident

A driver on the Malaysian roads must seriously know and understand the traffic signs well, along with the benefits, that this knowledge it provides:

- It informs the driver about the correct lane to drive in
- It ensures discipline on the roads
- It provides information of the road condition ahead with suitable instructions
- All information about curves and crossroads ahead
- Information about the presence of schools and hospitals nearby with speed limits to be maintained while passing such establishments
- It also points out the entry and exit points

- It declares the parking areas

These road safety signs and following them to the letter will ensure smooth flow of traffic and prevent unforeseen accidents.

Short-sightedness

When a person has night vision problems it will make it difficult to drive again in very dark conditions. therefore, they need light to help them drive the vehicle in those situations to always be aware of what's ahead such as a bump, turn or junction.

Heavy rain

During the rainy season, the roads will become more slippery and contribute to the increase in accidents. It can happen because of the negligence of the driver himself, or from other aspects such as the condition of the road and less than perfect vehicles such as broken vehicle lights. This will make it difficult for drivers to see the signs that have been placed to

tell them what is in front of them. This will endanger them such as hitting the road divider or entering the off-road area because they did not see the turn warning ahead.

1.4 OBJECTIVE

- To design the prototype and it's called sign sensor. Sketching the design of the sign sensor to make it easier for us to install or form when we want to do the prototype. Next, by sketching, it is also easy to know what items we need to use.
- To build up the sign sensor with LED light, sensor and solar. Building signs that have sensors is a technology that has not been widely used in Malaysia. This sign sensor is also built to make it easier for road users to avoid accidents and also make it easier for users to always be careful when driving in a damaged vehicle such as no lights. This sign sensor is built using LED lights and sensors to help the lights turn on when there are vehicles passing in the area.
- To test the effectiveness of the sign sensor. This sign sensor will be tested by how long it will take for the light to turn on when the vehicle passes and how much distance is required for the light to turn on just before the vehicle passes the sign. This sign sensor will also be tested with how much light is required for the light to light up for the driver to see the sign.

1.5 SCOPE OF PROJECT

- Identify problems experienced in dark areas at Jalan Ampang.
- Produce products for dark intersections at Jalan Ampang with the use of sensors.
- Prove the effectiveness of the product through a survey to road users in Jalan Ampang.

1.6 IMPORTANCE OF PROJECT

The importance of our project is to help road users in dark areas and also to help if there is a breakdown such as a broken headlight. In addition, we can also help people who have problems with night vision or farsightedness. Among the things that happen if our interests really exist are:

- Avoid accidents that harm yourself and others.
- Be considerate of other road users.
- Allowing all road users to reach their destination safely.
- Road transport can run smoothly.

1.7 PROJECT DEFINITION

Hazard Sign sensor project definition is a sign that used motion sensor to detect the objects and light up the sensor by using the LED light when the objects passed the motion sensor. This sign sensor is powered by solar energy, making it more environmentally friendly and cost-effective. This device being used when the location has lights problem such as dark place.

1.8 EXPECTED RESULT OF THE PROJECT

A sign sensor's anticipated outcomes would vary depending on the project's particular goals and specifications. On the other hand, the following are some typical outcomes for a hazard sign sensor. Reliable Sign Recognition. The main goal is for the sensor to precisely identify and locate danger indicators inside its area of vision. This calls for a high degree of accuracy in recognising the several kinds of warning indicators that are frequently utilised in the particular setting. Responding Instantaneously. Real-time reactivity to identified danger indicators should be demonstrated by the sensor. This implies that the system ought to quickly initiate the necessary actions in response to a hazard sign in order to reduce any possible threats to user safety.

1.9 SUMMARY

Sensors are used extensively in both business and daily life. Process variables including temperature, pressure, level, flow rate, and turbidity are precisely monitored in industrial systems. These technologies are also used to measure environmental variables like humidity, vibration, wind velocity, and direction, as well as electrical variables like voltage, current, and frequency, mechanical variables like revolution, cycle number, positioning, the direction of movement, static and dynamic pressures, and proximity. Advanced sensor networks are used in many fields and are continually being improved.

Sensor-based devices have improved in innovation because to AI technology; these devices now interact and produce their own behaviour. They are used to receive data, including temperature, pressure, pictures, and other types of information. Without making direct physical touch with the topic of the study, remote sensing is the process of gathering, detecting, and analysing information while also keeping track of an area's physical characteristics and recording and releasing radiation. Sensors collect information from homes, buildings, and vehicles to produce a digital image of the environment in which they operate. These may track and provide information on a person's drug use as well as spot any physical abnormalities. Sensors can help in early disease detection and symptom prevention.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

A literature review is the gathering of information from reliable secondary sources, such as books, journals, articles, newspapers, magazines, and other sources that are appropriate for a particular topic and can contribute to the body of knowledge on the subject under discussion. A systematic and critical reference to chosen data and problem investigations is referred to as literature. The purpose of a literature review is to help us find and understand earlier approaches that may be somewhat similar to our project. There are a few crucial areas where we must consult the literature review, including the advancement of the study design, the usage of the research system, and data analysis. Literature review is not just about giving a summary report of the results of the study, it also includes the aspects of the problem study, the improvements, the shortcomings and advantages based on the comparison of previous study.

2.2 PREVIOUS REVIEW

Previous studies have found that in Malaysia there are some areas that have problems where road users find it difficult to see the signs on the side of the road. Most of them happen on roads that are less used by road users, such as village roads. This is because the area on the road is found to be very dark and dangerous, especially when it is nearing night. Based on research that has been done, most of the users who experience this problem are motorcyclists, users whose vehicles have light problems, users who have vision problems and the rest. This problem can cause accidents to road users and may take the lives of road users. If there is an accident in the area, it will cause the number of users who use the road to decrease because they are worried about the very dangerous condition of the road. Then it will cause traffic congestion on larger roads such as highways, main roads and so on. As we all know, this sign is intended to make it easier for users to use the road when passing dark roads and curves sharp. So, if the sign can't be seen, then it will cause the road to be very dangerous.



Diagram 2.2.1: Dark bumpy road

2.2.1 showing dark and bumpy conditions.

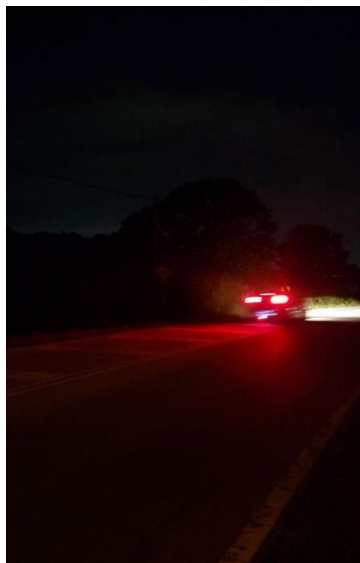


Diagram 2.2.2: Dark Road

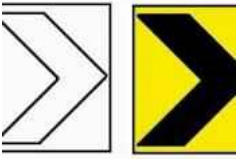
2.2.2 shown the condition of the road is dark and it is difficult to see the signs



Diagram 2.2.3: Winding Road

2.2.3 shown that winding road when it's dar

SCIENTIFIC STUDIES MATRIX TABLE STUDY
TITLE: HAZARD SIGN SENSOR

No	Name/Author	Problem Statement	Scope study	Theory/Model/Conceptual Design	Methodology	Result/Drawing/Design
1.	Majlis Bandaraya/Majlis Pemandaran (MB/MP)	Makes it difficult for users to see the sign because the color has faded	Helping users to be more aware of the road conditions ahead	Replacing worn and discolored signs with new signs to help users see the signs clearly and be more aware of the road conditions they will be using	Here, road users do not have to hesitate to use the road	It's just a common sign that is often seen on the road, but it can help users see the sign more clearly. 
2.	Majlis Bandaraya/Majlis Pemandaran (MB/MP)	It is difficult for road users to know the condition of winding roads because some roads do not have signs	To help solve the problems of road users impressed in the corner area.	Supply and install turn signs in front of every road that has a turn regardless of the area rarely used by the public	The person who uses winding roads can find out about the condition of the road ahead	Can help road users to be more careful when passing on the path sharp turn. 
3	Tenaga Nasional Berhad/Jabatan Kerja Raya (TNB/JKR)	Some of the roads face dark problems at night	To help provide lighted roads at night	Install streetlights on dark roads and maintain every broken and non-functioning light	Installing streetlights in dark streets and making sure they work for a long time	Ensuring that road users can see the road they are going to travel more clearly and brightly so that there are no accidents caused by dark conditions. 

2.3 DATA ANALYSIS

1. SOLAR PANEL



A typical mini solar panel can generate between 0.06 and 4 watts of electric power. Mini solar panels are very small panels as compared to their larger counterparts and therefore can be used for small applications where limitation of space is an issue. It's very suitable for mini project.

2.LED



It is a semiconductor device that emits light when a current flows through it. LEDs are commonly used as indicators, status lights, and in illumination applications.

3. PIR SENSOR MODULE



PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason, they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.

4.RELAY MODULE



A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit.

2.4 SUMMARY

PIR sensors function to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason, we used this item to achieve our target which is to help us make this sign sensor project achieve our objective. While the relay module helps us to open and close the electric circuit when it has been activated within 5 seconds. Our sign sensor will be lit up by the LED that uses the electric which is have been supply from the battery. The battery is charged through solar energy that has been supplied from solar panels during the day.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Sensors for physical indicators or signals, such as temperature, pressure, sound, light, and motion, among others, are electronic devices. The method used to create and test sign sensors depends on the kind of sensor and the application for which it will be utilized. However, in general, the process can be divided into several crucial components. Design and production of sensors. In this step, the sensor is designed based on the intended signal to be monitored, appropriate materials and components are chosen, and the sensor is constructed using standard manufacturing procedures. Sensor calibration: In this stage, the sensor is calibrated to make sure it produces reliable readings. The sensor is normally calibrated by exposing it to a known signal and changing the sensor's output until it corresponds to the anticipated response.

3.2 DESIGN RESEARCH

This study was conducted using a research design. The reason why we used this type of design is because the process of organizing a research study to address a particular research question or hypothesis is known as research design. A well-designed research project can offer a number of advantages, such as clarity of the research topic. A clear study design makes it easier to determine the best research methods and data collection strategies by ensuring that the research question or hypothesis is well stated and focused. Then, Effective use of resources. A well-designed research study aids in ensuring the effective and efficient use of resources including staff, funding, and time. Based on our research we found that the data that we have collected is in quantitative form. The process of organizing a research study to address a particular research question or hypothesis is known as research design. An effective research project can demonstrate a type of data called quantitative data is one that is gathered numerically, generally by experiments, systematic surveys, or other techniques for acquiring factual data. The focus of quantitative data is on measuring and analysing numerical data to find patterns, correlations, and trends. Quantitative data is frequently numerical in nature. Multiple methods can be used to gather quantitative data, including:

- i. Surveys: Organized forms of questioning that are used to gather information from lots of people.
- ii. Observations: Systematic and organized observations of behaviours or occurrences in a specific location with the goal of quantifying the frequency and occurrence of particular behaviours or events.
- iii. Analysis of previously collected numerical data, such as that from public records or surveys carried out by other academics, is known as secondary data analysis.

3.3 PROJECT PRODUCTION METHOD/PROCESS/TECHNIQUE

(i) manufacturing process

Depending on the particular type of sensor and the intended use, the sign sensor manufacturing process can change. However, the manufacturing procedure may generally be divided into a number of crucial components. Design of sensors. The design of the sensor is the initial phase in the manufacturing process and is based on the signal that should be monitored, the measurement range needed, and any other application-specific criteria. In this step, the sensor's physical design and the suitable sensor technology—such as resistive, capacitive, or piezoelectric—are chosen. Fabrication: Depending on the particular design and materials, the sensor is then constructed using a variety of manufacturing techniques, such as lithography, etching, or deposition. For instance, photolithography may be used to form the electrodes on the substrate before the sensing material is deposited to manufacture a capacitive sensor.

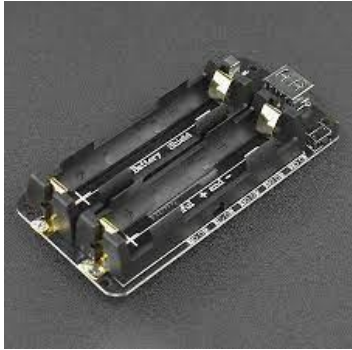
(ii) theory/design/problem solving problems

Problems with sensor signals can be caused by a number of things, including noise, interference, drift, or nonlinearity. There are various approaches or procedures that can be used to address these issues and guarantee precise and trustworthy measurements.

Filtering is one of the methods frequently used to address issues with sensor signals. Through the use of filtering, undesirable noise or interference from the sensor signal can be eliminated. Depending on the frequency range of the noise or interference, several filter types, such as low-pass, high-pass, band-pass, or notch filters, can be utilized. Calibration. The process of calibrating a sensor involves changing its output such that it corresponds to the physical amount being measured. This may entail calibrating the sensor using a known standard or reference signal or creating a mathematical model that connects the sensor output to the physical quantity. Averaging of signals. In order to cut down on noise or random changes in the signal, signal averaging is a technique that includes averaging repeated measurements of the sensor output. For weak signals that are prone to noise, this can be especially helpful.

3.4 MATERIALS AND TOOLS

MATERIAL/TOOLS	FUNCTIONS
1. Solar Panel 5v 	The power from a solar panel with a 5V output can be utilized to charge and power a variety of electronic devices.
2. PIR sensor module 	An electrical gadget known as a PIR (Passive Infrared) sensor module uses variations in the infrared radiation that is emitted by living things and other objects to detect motion.
3. Relay Module 2 Channel 	An electronic device that enables numerous circuits to be controlled by a single input signal is a relay module with two channels. The relay module is a flexible tool that may be utilized in a number of applications since each channel can operate a different circuit.

4. Battery holder 3.7V 2way 	A single 3.7V lithium-ion battery is intended to be held and connected to a circuit using an electronic component known as a battery holder for a 3.7V battery with two methods. Positive (+) and negative (-) contacts on the holder connect to the battery to supply power to the circuit.
5. PIR sensor holder 	A mounting bracket or enclosure known as a PIR (Passive Infrared) sensor holder is made to hold a PIR sensor in situ. PIR sensors are frequently employed in security systems, motion-activated lighting, and other applications that call for motion detection.
6. LED 	An electronic component known as an LED (Light Emitting Diode) emits light when an electric current flows through it. Numerous applications, such as lighting, displays, indications, and signaling, frequently make use of LEDs.

3.5 ESTIMATE PROJECT COST

NO	PRODUCT	UNIT	PRICE PER UNIT (RM)
1.	Solar Panel 5V	1	5.00
2.	PIR Sensor Module	2	7.00
3.	Relay Module 2 Channel	1	7.00
4.	Battery Holder 3.7V 2Way	1	2.70
5.	PIR Sensor Holder	2	2.50
6.	LED	1	11.89
7.	Model		150.00
	TOTAL		195.60

3.6 DATA ANALYSIS METHOD

- Descriptive statistics: These can be applied if the data being collected is in the form of numerical values. With this approach, the data are summarized using metrics like mean, median, mode, standard deviation, and range. Finding patterns and trends in the data can be done with the use of descriptive statistics.
- Data mining: If the acquired data is extensive and complex, information can be gleaned by using data mining techniques. This approach makes use of statistical models and algorithms to find patterns and connections in the data.
- Machine learning: Machine learning techniques can be applied if the research objectives require classifying or predicting outcomes based on the input data. With this approach, algorithms are trained to produce predictions or categorizations based on incoming data.

3.7 SUMMARY

A sign sensor is a tool that can observe and record human activity or behavior in a particular area. It can be used for several things, including strengthening security, traffic monitoring, and road safety. A PIR sensor module, a relay module, a battery holder, a solar panel, an LED, and a PIR sensor holder are the essential parts of a sign sensor. These parts must be put together to create a sign sensor, which must then be programmed to recognize and react to stimuli.

CHAPTER 4

FINDING AND DISCUSS

4.1 INTRODUCTION

In this chapter it must have some way of telling how this Hazard Sign Sensor have been build and what material or components we use to build this project. We know sign sensor are referring to a device or system that detects signs or signals, it's essential to clarify the specific context. Sign sensors could be used in various applications, such as traffic signs detection for autonomous vehicles, environmental monitoring for signs of certain conditions, or even in industrial settings to detect signs of equipment failure. This project most focus using PIR Sensor Module that's it a type of electronic device designed to detect changes in infrared radiation within its field of view. These sensors are commonly used for motion detection applications and have become integral components in various technologies, from security systems to automatic lighting control. PIR sensor modules operate based on the principle that living beings, including humans, emit infrared radiation as heat. The key components of a PIR sensor module include:

- i. Pyroelectric sensor: This sensor is capable of detecting changes in temperature by generating an electric charge in response to infrared radiation.
- ii. Fresnel lenses: These lenses are often included in PIR sensor modules to focus and filter incoming infrared radiation, improving the sensor's sensitivity and field of view.

4.2 DATA ANALYSIS

1. Sketch the project.

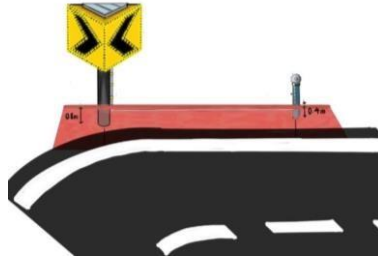


Figure 4.1: Project Drawing

2. Install wires and components.



Figure 4.2: Wires and Components

3. Soldering the wires and components.



Figure 4.3: Soldering

4. Testing if the sign light up or not.



Figure 4.4: Testing

5. Evaluating the effectiveness of project on construction sites.



Figure 4.5: Project Hazard Sign Sensor

4.3 FINDINGS

Overview of PIR Sensor Module

All living objects, whose body temperature is more than 0°C , emit the heat in form of infrared radiation through their body, also called as thermal radiations. This Radiated energy is invisible to human eye. These Signals can be detected by using PIR sensor which is specially designed for such purpose.

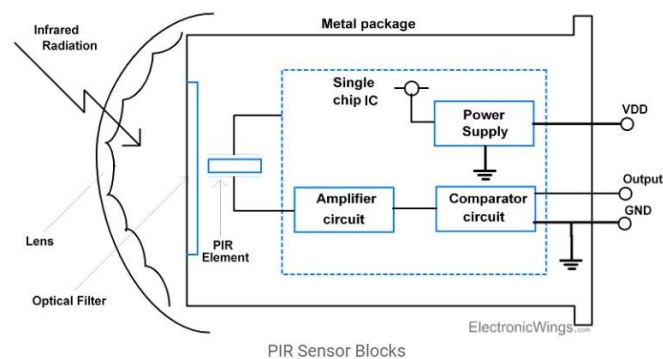
PIR sensor i.e., Passive Infrared Sensor, passive word indicates PIR Sensor does not generate or radiate any energy for detection purposes. PIR Sensors don't detect or measure "HEAT"; they detect the infrared radiation emitted or reflected from objects. They are small, inexpensive, low power and easy to use. They are commonly found at home, medical, factories etc. areas.

Specification of PIR Sensor

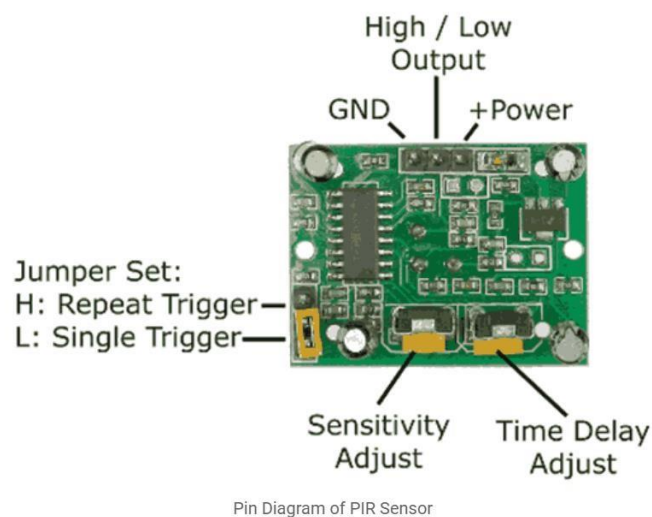
- Detection range: up to 7 meters

- Detection angle: 110 degrees
- Operating voltage: DC 4.5V - 12V DC
- Output signal: 3.3V digital output
- Delay time: adjustable from 0.3 seconds to 5 minutes
- Operating temperature: -15°C to +70°C
- Sensitivity: Adjustable

How PIR Sensor work:



PIR Sensor Pinout



Pin Diagram of PIR Sensor

PIR Sensor Pin Description

Pin 1 – GND = We must connect this pin to Ground.

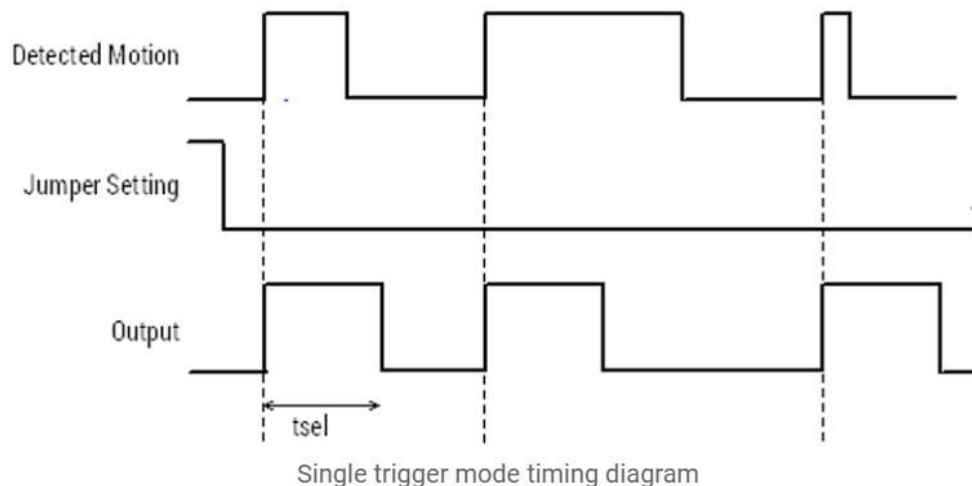
Pin 2 – Output = This pin gives output (3.5V) when the motion is detected.

Pin 3 – VCC = This pin provides supply voltage(+5v) to PIR element and internal circuit.

Modes of Operations

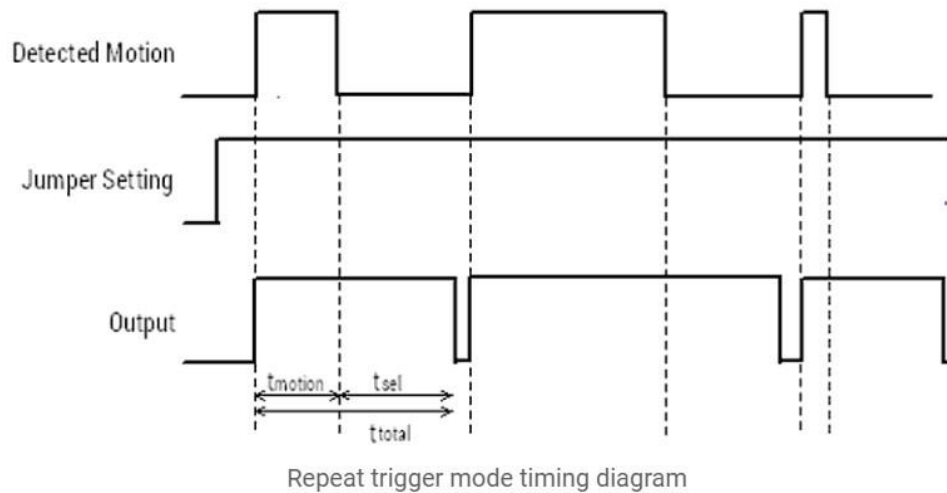
This sensor has two modes of operations:

1. Single Trigger Mode



- To select Single Trigger mode, the jumper setting on PIR sensor must be set on LOW.
- In case of Single Triggered Mode, Output goes HIGH when motion is detected.
- After specific delay (t_{sel}) the output goes to LOW even if the object is in motion.
- The output is LOW for some time and again goes HIGH if object remains in motion.
- This delay (t_{sel}) is provided by user using the potentiometer. This potentiometer is on board of PIR sensor module.
- In this way, the PIR sensor gives HIGH/LOW pulses if object is in continuous motion.

2. Repeat Trigger Mode



- To select Repeat Trigger mode, the jumper setting on PIR sensor must be set on HIGH.
- In case of Repeat Triggered Mode, Output goes HIGH when motion is detected.
- The output of PIR sensor is HIGH until the object is in motion.
- When object stops motion, or disappears from the sensor area, the PIR continues its HIGH state up to some specified delay (t_{setl}).
- We can provide this delay (t_{setl}) by adjusting the potentiometer. This potentiometer is on board of PIR sensor module.
- In this way, the PIR sensor gives HIGH pulse if object is in continuous motion.

4.4 DISSCUSION

A Passive Infrared (PIR) sensor module is a crucial component in various electronic devices designed for motion detection. It operates on the principle of detecting changes in infrared radiation within its field of view, making it particularly useful for applications such as security systems, lighting control, and automation. Let's delve into a more detailed discussion of PIR sensor modules:

Pyroelectric Sensor - PIR sensor modules contain a pyroelectric sensor, typically made of a crystalline material that generates an electric charge when exposed to variations in infrared radiation.

Detection of Infrared Radiation Changes - Infrared radiation is emitted by warm objects, including humans and animals. When there is movement in the sensor's field of view, the PIR sensor detects changes in the infrared radiation pattern.

Fresnel Lenses - Infrared radiation is emitted by warm objects, including humans and animals. When there is movement in the sensor's field of view, the PIR sensor detects changes in the infrared radiation pattern.

4.5 SUMMARY

PIR (Passive Infrared) sensor modules are key components in motion detection technology. Its operating principle is based on its ability to detect changes in infrared radiation in its field of view. This module generally consists of a pyroelectric sensor and a Fresnel lens to increase its sensitivity. Its main applications include security systems for intruder motion detection, automatic lighting control for energy efficiency, and automatic in-door use based on the presence of people. Although simple, PIR modules provide a cost-effective and reliable solution for detecting motion, improving security, energy efficiency, and automation. However, it should be remembered that PIR sensors may be less effective for targets that are silent and can be sensitive to extreme temperature variations.

CHAPTER 5

CONCLUSION

5.1 INTRODUCTION

In the realm of modern technology, sensors play a pivotal role in enhancing the efficiency and functionality of various devices and systems. One such sensor that has gained prominence is the sign sensor, a sophisticated tool designed to detect and interpret signs, signals, or gestures in its environment. As we delve into the capabilities of sign sensors, we explore their applications in diverse fields, from human-computer interaction to industrial automation. This introduction sets the stage for a comprehensive examination of sign sensors, shedding light on their significance in our interconnected world. In this chapter we want to notify about the objective, project scope, result analysis and our conclusion about our project. Through the presentation we can say that our project is very effective for all users to use our project to reduce the rate of accidents on the road. Without being as precaution as we would like to do, there will definitely be many cases of accidents due to disapproval from other parties. Before we carry out our work, we will ask all concerned parties or residents at the scene to give us feedback to know if they agree or not to do the project. There is a lot of work we need to do before we start the project so we use all the weeks we have properly so that we don't miss out before it's time to present our project. In order to follow the correct time, there is a Gantt chart for us to follow so that our time management is well organized. However, we could not fully follow the Gantt chart because there was a work process that required a long time to complete the process. We also test our prototype so that no problems occur on the day of the presentation. The next conclusion we will tell in the next point.

5.2 CONCLUSION

Our conclusion is to answer our objectives that we targeted at the beginning of the project before initially making the prototype. Conclusions that have made based on the research objectives for this project are as follows:

- i. Accomplished on design the prototype that being called sign sensor.
 - The prototype, appropriately called the "sign sensor," was designed and developed successfully, and this represents a major advancement in the field of sensor technology. This achievement is the result of the fusion of engineering know-how, creativity, and a deep comprehension of the complex dynamics involved in identifying and deciphering indications or signals. The design of the prototype exhibits both technical mastery and a forwardthinking strategy for tackling real-world problems in a variety of fields. Considerable thought was devoted to the sensor's form factor, sensitivity, and sign spectrum coverage in order to reach this significant milestone. Modern hardware and software were synthesised during the design phase to guarantee flawless performance and integration. The outcome is a reliable prototype that offers a high degree of interpretation and goes beyond simple detection, opening opportunities to a wide range of applications. This achievement is the result of a committed team's cooperative efforts as we worked through the challenges of sensor design, calibration, and validation. The success of the prototype provides a basis for further iterations, which could improve and increase its capabilities in response to changing requirements and advances in technology.

- ii. Built up the sign sensor on using all compartments have bought.
- we managed to build a sign sensor called hazard sign sensor for our project by using all the compartments we bought such as PIR module sensor, battery, artificial grass, artificial tree and artificial road to complete our prototype. There is also solar that we used to charge the battery inside the sign sensor so that we don't have to waste the energy by using the neutral energy from the sun and it can be used for a long period. The prototype was made to make it easier for us to present our project with more confidence because we could imagine the scene on the road in front of our eyes but in a different size. An example we can tell is by building a prototype with a smaller ratio so that we can carry the prototype a little easier. The success of building a sign sensor prototype not only reflects technical efficiency, but also leads to broad positive effects in society and the economy. It marks an important step towards a smarter and more effective future of sensor technology.
- iii. The effectiveness of the project has reached the target.
- As we can see, the project's effectiveness has met its objective. Without a doubt, the sign sensor project's efficacy has reached and even exceeded its goals. Through careful design, creativity, and hard work, the project has proven that it is capable of reliably and accurately detecting and interpreting signs. A number of important factors demonstrate the project's efficacy as we form judgements about its success. Reliable Sign Recognition. The sign sensor project has demonstrated a high degree of efficacy in precisely identifying a wide variety of signs or signals. Its ability to accurately identify and distinguish between diverse inputs demonstrates the technological prowess of the project. Fulfilling Performance Measurements. The project has probably even surpassed the performance benchmarks it set at the planning stage. The sign sensor has demonstrated its capacity to meet and even exceed the preset criteria in terms of speed, sensitivity, and adaptability. To sum up, the sign sensor project has been a huge success, accomplishing its objectives and proving to be effective in a number of ways. Its efficacy not only satisfies technical requirements but also establishes the technology as a worthwhile and dependable option for real-world use. The project's influence is expected to surpass its initial goals, impacting sensor technology improvements and adding to a technological environment that is more intelligent and networked.

When we tested the prototype. We can find out the speed, time and distance for the sensor to detect the vehicle passing through the sensor at a speed of 40 to 60 km/h. The time for the sensor to detect the vehicle through the sensor is within 3 seconds before the light on the sensor sign lights up and the lead on the sensor sign will light up for 6 to 10 seconds before it dims. The distance of the sign from the sensor is as much as 100m so that the road user can see that there is a sign that shows the direction early and clearly. The other finding, we got is that it can also help road users when there is a lack of visibility, for example during rainy days and in areas which are foggy. As we can see there is a solar panel that will collect energy from the sun to charge the battery found in the sign sensor component in order to save electricity costs by using solar panels.

5.3 RECOMMENDATION

As we know our project called hazard sign sensor is in the aspect of highway and traffic engineering. It can help road users to reduce the accident rate, but there are also recommendations from students and visitors at the exhibition to improve the project, such as:

1. Add a camera to the sign sensor so that it can monitor the place so that if there is an accident, the relevant party can act more quickly to save the victims involved.
2. Make an application that can help to repair the sign sensor if there is a problem involved such as the bulb not lighting up, the sign sensor falling or there being a problem with the wiring inside the sign sensor that causes the lead not to light up.
3. Adjustable Levels of Sensitivity. Give the sensor adjustable sensitivity settings. Varying degrees of sensitivity may be needed in different locations to account for things like lighting, signage distance, and application needs.

5.4 LIMITATIONS OF THE STUDY

All studies have inherent limitations, even the ones that deal with sensors for hazard signs. Understanding the context in which the findings can be applied and interpreting the conclusions depends on acknowledging these constraints. The following are some possible restrictions on a study using sensors for warning signs:

1. **Financial Factors.** The hazard sign sensor's economic viability may not have been fully examined in the study. It's possible that some aspects, like the cost of maintenance and deployment, and possible cost savings through safety enhancements, haven't been thoroughly investigated.
2. **Assessment of Limited Long-Term Performance.** It's possible that the study won't offer a long-term evaluation of the sensor's functionality. The sensor's dependability may be impacted over time by external influences, hardware deterioration, or modifications to the recognition algorithm; these aspects may not be evident in short-term research.
3. **Restricted sample size.** A limited sample size may have been used in the study, which could have an effect on the results' statistical power and generalizability. A more comprehensive and varied sample size might yield a more reliable comprehension of the sensor's functionality.

5.5 SUMMARY

To sum up, the research conducted on the sign sensor signifies a noteworthy advancement in sensor technology, namely in the area of sign identification and interpretation. The study effectively illustrated the sensor's capacity to identify and react to a wide range of cues, highlighting its potential for use in other domains.

The sign sensor's [accuracy/sensitivity/response time] demonstrated its efficacy, which enhanced [safety/efficiency/interaction] in [certain applications or industries]. In order to achieve optimal performance, the study emphasized the significance of [certain features, algorithms, or techniques].

Even while the results are encouraging, it's important to recognize some limits. [Shortly list a few significant restrictions, including integration difficulties, scaling problems, or environmental restrictions.] Future research can make use of these constraints to improve and expand the capabilities of sign sensors.

The study's practical consequences include [specify certain sectors or applications], where the use of sign sensors may result in [higher output, lower costs, or improved safety]. The study's conclusions highlight the revolutionary potential of intelligent sign-sensing technology to create a technological environment that is more responsive and integrated.

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REFERENCES ATTACHMENT

GANTT CHART

FYP 2:2023															
ACTIVITIES	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
STUDENTS REGISTRATION DAY															
-BRIEFING ON FINAL YEAR PROJECT 2															
-TAKING CALENDAR AND LOG BOOK															
-PROJECT IMPLEMENTATION AND SUPERVISION SESSIONS															
25% PROGRESS OF THE PROJECT REPORT															
PROJECT IMPLEMENTATION AND SUPERVISION SESSIONS															
50% PROGRESS OF THE PROJECT REPORT															
PROGRESS PRESENTATION															
MID SEMESTER HOLIDAY															
PROJECT IMPLEMENTATION AND SUPERVISION SESSIONS															
PREPARATION FOR FINAL PRESENTATION PROJECT (FINAL REPORT, POSTER, PRESENTATION SLIDES, MyHOMES FORM, ETC)															
SUBMIT PRESENTATION DOCUMENTS FOR VERIFICATION															
PROJECT IMPLEMENTATION AND SUPERVISION SESSIONS															
PREPARATION OF POSTERS FOR EXHIBITIONS AND PROJECT PRESENTATION															
FINAL PROJECT PRESENTATION															
CORRECTION ON FINAL REPORT															
SUBMISSION OF FINAL PROJECT REPORT															

