POLITEKNIK UNGKU OMAR

TRAFFIC LIGHT SENSOR SYSTEM

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CIVIL ENGINEERING DEPARTMENT

JUN 2023

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This report was submitted to the Civil Engineering Department as partially fulfilling the conditions of the award

DIPLOMA OF CIVIL ENGINEERING

Jun 2023

DECLARATION OF ORIGINAL AND OWNERSHIP

TRAFFIC LIGHT SENSOR SYSTEM

1. I**, Muhamad Hariz Bin Mohd Radzi (IC NUM: 030322-08-0021)**are the students of **Diploma in Civil Engineering, Politeknik Ungku Omar**, with address at **Jalan Raja Musa Mahadi, 31400, Ipoh, Perak.**

2. We acknowledge that 'The above project' and the intellectual property contained therein are the work of our original work/invention without taking or imitating any intellectual property from any other party.

3. We agree to transfer ownership of the intellectual property of the 'Project' to the Politeknik Ungku Omar to meet the requirements for the award of the **Diploma in Civil Engineering** to us.

Made and truly acknowledged by the said;

MUHAMAD HARIZ BIN MOHD RADZI (……..)

(IC Num:030322-08-0021) Muhamad Hariz Bin Mohd Radzi

In front of me, PN ROZINA BINTI MUHAMMAD(781029-08-6536)

as project supervisor on date: ……. (……)

Pn Rozina Binti Muhammad

DECLARATION OF ORIGINAL AND OWNERSHIP

TRAFFIC LIGHT SENSOR SYSTEM

1. I**, Muhammad Muqri Umair Bin Mohd Hairul (IC Num: 030227-08-0533)** are the students of **Diploma in Civil Engineering, Politeknik Ungku Omar**, with address at **Jalan Raja Musa Mahadi, 31400, Ipoh, Perak**.

2. We acknowledge that 'The above project' and the intellectual property contained therein are the work of our original work/invention without taking or imitating any intellectual property from any other party.

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Made and truly acknowledged by the said;

MUHAMMAD MUQRI UMAIR BIN MOHD HAIRUL (IC Num: 030227-08-0533) (……..……..……)

Muhammad Muqri Umair Bin Mohd Hairul

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Pn Rozina Binti Muhammad

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2. We acknowledge that 'The above project' and the intellectual property contained therein are the work of our original work/invention without taking or imitating any intellectual property from any other party.

3. We agree to transfer ownership of the intellectual property of the 'Project' to the Politeknik Ungku Omar to meet the requirements for the award of the **Diploma in Civil Engineering** to us.

Made and truly acknowledged by the said;

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as project supervisor on date: ……. (……..……)

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DECLARATION OF ORIGINAL AND OWNERSHIP

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2. We acknowledge that 'The above project' and the intellectual property contained therein are the work of our original work/invention without taking or imitating any intellectual property from any other party.

3. We agree to transfer ownership of the intellectual property of the 'Project' to the Politeknik Ungku Omar to meet the requirements for the award of the **Diploma in Civil Engineering** to us.

Made and truly acknowledged by the said;

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as project supervisor on date: ……. (……..……)

Pn Rozina Binti Muhammad

ACKNOWLEDGMENT

Without the participation and support of many parties, this project would not have been completed. We greatly appreciate and value their contributions.

However, this group would like to record the highest appreciation and thanks to Pn. ROZINA BINTI MUHAMMAD and PN NORHAZMI BINTI HASSAN for their unwavering support, compassion and understanding throughout our FYP project. They give us a lot of information, and we use their feedback to constantly improve our project.

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ABSTRAK

Sistem penderia lampu isyarat mewakili komponen kritikal infrastruktur bandar moden, memainkan peranan penting dalam pengurusan trafik kenderaan dan pejalan kaki yang cekap. Sistem ini direka bentuk untuk meningkatkan keselamatan, mengurangkan kesesakan dan mengoptimumkan aliran kenderaan melalui persimpangan. Abstrak ini memberikan gambaran keseluruhan sistem penderia lampu isyarat, menyerlahkan ciri dan faedah utamanya. Sistem sensor lampu isyarat menggunakan pelbagai teknologi, termasuk penderia gelung induktif, kamera video, radar dan penderia inframerah, untuk mengesan kehadiran dan pergerakan kenderaan dan pejalan kaki di persimpangan. Penderia ini memberi suapan data masa nyata kepada sistem kawalan trafik, membolehkan pelarasan dinamik pemasaan isyarat untuk menampung keadaan trafik yang berubah-ubah. Objektif utama sistem penderia lampu isyarat adalah aliran trafik yang dipertingkatkan dengan mengesan dan bertindak balas kepada corak trafik dalam masa nyata, sistem ini membantu meminimumkan kelewatan dan mengurangkan kesesakan di persimpangan, akhirnya meningkatkan aliran trafik keseluruhan. Ia juga untuk meningkatkan keselamatan, penderia lampu isyarat menyumbang kepada jalan raya yang lebih selamat dengan memastikan isyarat trafik bertindak balas terhadap kehadiran kenderaan dan pejalan kaki. Ini membantu mengelakkan kemalangan dan konflik di persimpangan. Seterusnya, kecekapan tenaga melalui kawalan isyarat adaptif, sistem penderia lampu isyarat boleh mengurangkan melahu dan penggunaan bahan api yang tidak perlu, menyumbang kepada penjimatan tenaga dan mengurangkan pelepasan. Kemudian, pengumpulan dan analisis data bagi kebanyakan sistem penderia lampu isyarat moden menggabungkan keupayaan pengumpulan data, memberikan cerapan berharga untuk pengurusan trafik dan perancangan infrastruktur. Selain itu, kebolehcapaian dalam sistem lanjutan boleh termasuk ciri untuk membantu pejalan kaki, seperti isyarat boleh didengar dan masa lintasan yang dilanjutkan. Selain itu, tindak balas kecemasan untuk beberapa sistem direka untuk memudahkan laluan pantas kenderaan kecemasan melalui persimpangan, meningkatkan keselamatan awam. Sistem penderia lampu isyarat terus berkembang dengan kemajuan dalam teknologi penderia dan analisis data. Mereka adalah komponen penting bandar pintar, menyumbang kepada rangkaian pengangkutan yang lebih cekap, mengurangkan kesan alam sekitar dan meningkatkan kualiti hidup penduduk bandar. Sistem penderia lampu isyarat memainkan peranan penting dalam pengurusan trafik bandar moden, menyediakan cara untuk mengoptimumkan aliran trafik, meningkatkan keselamatan dan mengurangkan kesan alam sekitar. Apabila populasi bandar terus berkembang, pembangunan dan penggunaan sistem penderia lampu isyarat termaju adalah penting untuk mewujudkan bandar yang lebih mampan dan boleh didiami.

ABSTRACT

Traffic light sensor systems represent a critical component of modern urban infrastructure, playing a pivotal role in the efficient management of vehicular and pedestrian traffic. These systems are designed to enhance safety, reduce congestion, and optimise the flow of vehicles through intersections. This abstract provides an overview of traffic light sensor systems, highlighting their key features and benefits. Traffic light sensor systems utilise various technologies, including inductive loop sensors, video cameras, radar, and infrared sensors, to detect the presence and movement of vehicles and pedestrians at intersections. These sensors feed real-time data to the traffic control system, enabling dynamic adjustments of signal timings to accommodate changing traffic conditions. The primary objectives of traffic light sensor systems are to improve traffic flow by detecting and responding to traffic patterns in real-time, these systems help minimise delays and reduce congestion at intersections, ultimately improving the overall flow of traffic. It is also to enhance safety, traffic light sensors contribute to safer roadways by ensuring that traffic signals respond to the presence of vehicles and pedestrians. This helps prevent accidents and conflicts at intersections. Next, energy efficiency through adaptive signal control, traffic light sensor systems can reduce unnecessary idling and fuel consumption, contributing to energy conservation and reduced emissions. Then, data collection and analysis as for many modern traffic light sensor systems incorporate data collection capabilities, providing valuable insights for traffic management and infrastructure planning. Other than that, accessibility in advanced systems can include features to assist pedestrians, such as audible signals and extended crossing times. Besides that, emergency responses for some systems are designed to facilitate the rapid passage of emergency vehicles through intersections, enhancing public safety. Traffic light sensor systems are continually evolving with advancements in sensor technology and data analytics. They are a vital component of smart cities, contributing to more efficient transportation networks, reduced environmental impact, and improved quality of life for urban residents. Traffic light sensor systems play a pivotal role in modern urban traffic management, providing the means to optimise traffic flow, enhance safety, and reduce environmental impact. As urban populations continue to grow, the development and deployment of advanced traffic light sensor systems are essential for creating more sustainable and livable cities.

SENARAI KANDUNGAN

SENARAI RAJAH

SENARAI SIMBOL

Simbol	
m	Meter

SENARAI SINGKATAN

JKR	**JABATAN KERJA RAYA**

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Traffic lights in Malaysia are a key component of the country's efforts to improve transportation infrastructure. These traffic lights are connected to a central control system that uses real-time data to adjust signal timing based on traffic patterns. Traffic lights detecting vehicles using motion sensors mounted on the lights themselves, or through an inductive loop embedded in the surface of the road. Both methods allow the traffic system to keep tabs on stopped vehicles occupying the intersection and help traffic to flow smoothly. But for some cases, the sensor could not detect a motorcycle because it doesn't touch the inductive loop. This will make the motorcyclist feel impatient and decide to go even though the traffic light is still red. This will lead to major accidents to the motorcyclist with other road users. They also will be against the law in Malaysia which is in Section 79 (2) Road Transport Act 1987 (Act 333), every driver of a motor vehicle on the road must obey the traffic light signs that are legally placed on the road. They must always be alert, watchful, prudent and seriously observe the actions of other road users and avoid possible accidents.

1.2 PROJECT BACKGROUND

This project is about an upgraded version of traffic light in Malaysia. This type of project will be solving a main traffic problem in Malaysia which is Poor timing of traffic lights that causing congestion at the road of Malaysia. By investing in the upgrade of traffic lights in Malaysia is taking a significant step toward creating safer roads, reducing congestion, and fostering a more sustainable transportation system. This project aligns with the country's commitment to improving infrastructure, ensuring public safety, and embracing smart technologies for a better future. It also could reduce accidents and improve pedestrian safety due to clear and efficient signaling and optimized traffic flow will decrease congestion, leading to reduced travel times and fuel consumption when the problem is solved.

Figure 1.0 METRO NEWS

1.3 PROBLEM STATEMENT

In Malaysia, the existing traffic light infrastructure faces significant challenges leading to inefficient traffic management, increased congestion, compromised road safety and environmental concerns. Outdated technologies, inconsistent signal timings, lack of synchronization, and insufficient consideration for varying traffic patterns have resulted in a standard traffic control system. This failing in the traffic light management system slows the flow of vehicles, escalates commuting time, causes unnecessary fuel consumption and causes risks to both motorists and pedestrians. Additionally, the energy inefficiency of current traffic lights contributes to higher energy consumption, thereby negatively impacting the environment. Addressing these issues is crucial for creating a safe, efficient and sustainable transportation network in Malaysia.

1.3.1 FACTOR OF THE PROBLEM

i. The size of the traffic light sensors in Malaysia are not fully-filled the road space.
ii. The traffic light does not have a motion sensor to scan the vehicles more efficiently.
iii. Inconsistent signal timings at intersections of the road to switch from stop (red) to go (green) too slow.

1.3.2 EFFECT AND IMPACT TO COMMUNITY

i. Inefficient traffic light systems contribute to traffic congestion, especially in densely populated urban areas, causing delays and frustration among commuters.
ii. Traffic lights often lack synchronization will leading to inefficient traffic flow. This can cause unnecessary delays and congestion, especially during peak hours.
iii. Inconsistent signal timings at intersections can confuse drivers and pedestrians, will causing to accidents and traffic jams.

1.3.3 ARTICLE AND JOURNAL

Figure 1.1

1.4 OBJECTIVE.

i. To design sensor that can detect all type of vehicle.
ii. To build a SMART system of traffic light to prevent accidents due to traffic congestion.
iii. To test the distance of detection montion sensor to vehicle

1.5 RESEARCH QUESTION

There are several questions that arise in this study as below:

Question 1: Where was the motion sensor placed?

Question 2: How can the motion sensor detect the vehicle?

Question 3: How much does this project cost?

Question 4: why you want to design an traffic light smart sensor?

1.6 SCOPE OF THE PROJECT

The Smart Traffic Management project aims to enhance the safety and efficiency of motorcyclists at the T-junction road during off peak hours(1.00 a.m - 2.00 a.m). The implementation of motion sensor technology will contribute to real-time traffic monitoring and control, ensuring a smoother flow of traffic and reducing the risk of accidents.

1.7 THE IMPORTANCE OF THE PROJECT

Traffic light sensor systems are essential for efficient and safe urban transportation, contributing to improved traffic management, reduced congestion, energy conservation, and enhanced safety.Traffic light sensor systems are crucial for several reasons:

1. Traffic Flow Management: These systems help optimize traffic flow by adjusting signal timings based on real-time traffic conditions. This minimizes congestion and reduces travel times for motorists.

2. Safety: Traffic light sensors enhance road safety by ensuring that intersections function efficiently. They detect the presence of vehicles and pedestrians, helping prevent accidents and improve overall safety.

3. Energy Efficiency: By adapting signal timings to actual traffic demand, traffic light sensor systems reduce energy consumption and emissions by minimizing the idling of vehicles at red lights.

4. Reduced Traffic Jams: The adaptive nature of these systems can alleviate bottlenecks and reduce the likelihood of gridlock, making urban commuting more predictable and less stressful.

5. Emergency Vehicle Response: Traffic light sensors can give priority to emergency vehicles, ensuring that they can pass through intersections quickly and respond to emergencies more effectively.

6. Pedestrian Safety: Many traffic light systems incorporate sensors for pedestrians, allowing them to request crossing assistance and ensuring safe passage.

7. Data Collection: These systems collect valuable data on traffic patterns, which can be used for transportation planning, infrastructure improvements, and overall city development.

1.8 EXPECTED FINDING / RESULTS OF THE PROJECT

In a traffic light sensor system project, several expected findings and outcomes can be anticipated, including:

1. Traffic Flow Patterns: The project should reveal insights into traffic flow patterns at specific intersections, including peak traffic hours, congestion points, and typical vehicle speeds.

2. Optimal Signal Timings: The data collected and analyzed can help determine the most efficient traffic signal timings, reducing waiting times and improving traffic flow.

3. Safety Enhancements: The project may identify safety concerns, such as high-risk pedestrian crossing areas or accident-prone intersections, leading to improvements in safety measures.

4. Emergency Vehicle Response: Findings may highlight the effectiveness of providing priority to emergency vehicles, ensuring swift responses to emergencies.

5. Energy Savings: The project should demonstrate energy savings by reducing unnecessary idling and emissions at traffic signals.

6. Reduced Congestion: By adapting signal timings to traffic demand, the project can help reduce congestion and traffic jams at intersections.

7. Data for Planning: The collected data can be valuable for urban planning, infrastructure development, and transportation management, aiding in evidence-based decision-making.

8. User Satisfaction: Measuring user satisfaction through surveys or feedback can gauge the impact of the system on the public's commuting experience.

9. Operational Efficiency: The project may reveal the operational efficiency of the sensor system, including reliability, maintenance requirements, and the need for updates or improvements.

10. Environmental Impact: Assessing the project's environmental impact by quantifying reduced emissions and improved air quality due to reduced congestion.

11. Cost-Benefit Analysis: An analysis of the costs of implementing and maintaining the system versus the benefits in terms of improved traffic management and safety.

12. Integration with Smart City Goals: Examining how the project aligns with broader smart city initiatives and contributes to sustainability and urban development goals.

These expected findings are essential for evaluating the success and effectiveness of the traffic light sensor system project and guiding future improvements and investments in urban transportation systems.

1.9 SUMMARY

Traffic light motion sensor systems use motion sensors to detect the presence of vehicles, motorcycles at intersections, enabling real-time data analysis and adaptive signal control. These technologies improve safety, reduce congestion and contribute to more efficient traffic management, offering cost-effective solutions for better urban mobility within the framework of smart cities.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

A literature review is the collection of data from trustworthy secondary sources, including books, journals, articles, newspapers, magazines, and other sources that are relevant to a certain topic and can add to the body of knowledge on the subject being discussed. Literature is a systematic, critical reference to particular data and problem inquiries. A literature review is essential since it enables us to locate and discover past methods that may be somewhat related to what we're doing. The improvement of the study design, the use of the research system, and data analysis are a few essential areas where we must consult the literature review. A literature review covers the study's features of the problem, its advancements, shortcomings, and benefits in comparison to past studies in addition to describing the study's findings.

2.2 PREVIOUS STUDIES/COMMENT/INQUIRIES

Traffic lights and sensors on each traffic light are one of the ways to control the traffic situation at the intersection, where they allow vehicles to move from one direction to another. However, in the use of common traffic light systems, their use is less efficient for intersections that have major roads and minor roads. This is because the major road is the main road that has a large number of vehicles while the minor road is the road that has

the volume of vehicles less However, at the same time each sensor on the traffic light works in the same time and method, meaning that vehicles on minor roads have to wait a longer time before moving to another intersection. When there is a difference in terms of major and minor roads, then this will result in an imbalance in terms of flow and movement at the intersection. By only using traffic lights at certain times, the right of way between major and minor roads is unbalanced.

In order to accomplish this, algorithms are used to govern the actions of the traffic system. While there are many different programming languages today, some programming concepts are universal in Boolean Logic. We need to understand the function of traffic signals so that we can improve driving habits by controlling the speed in order to reduce the number of associated traffic accidents. The more number of drivers who know about the operation of traffic signals, the less frustrated they are going to be while waiting for the lights to change. The main aim in designing and developing of the Intelligent Traffic Signal Simulator is to reduce the waiting time of each lane of the cars and also to maximize the total number of cars that can cross an intersection given the mathematical function to calculate the waiting time. The traffic signal system consists of three important parts. The first part is the controller, which represents the brain of the traffic system. It consists of a computer that controls the selection and timing of traffic movements in accordance to the varying demands of traffic signal as registered to the controller unit by sensors. The second part is the signal visualization or in simple words is signal face. Signal faces are part of a signal head provided for controlling traffic in a single direction and consist of one or more signal sections. These usually comprise of solid red, yellow, and green lights. The third part is the detector or sensor. The sensor or detector is a device to indicate the presence of vehicles. One of the technologies, which are used today, consists of wire loops placed in the pavement at intersections. They are activated by the change of electrical inductance caused by a vehicle passing over or standing over the wire loop. Recent technology utilization is video detection. A camera feeds a small computer that can "see" if a vehicle is present.

There are two types of traffic lights that are used in Malaysia, namely the traffic light system with a fixed time period setting and the traffic light system with actuator control full or half full (JKR 1987). Then, traffic light detectors are divided into two types, namely intrusive and non-intrusive. Coleri et al. (2004) stated that the use of intrusive traffic lights is better than non-intrusive traffic lights; however, the installation and maintenance costs are higher.

Therefore, several studies using simulation have been carried out to optimize the function of traffic light sensors at intersections street Among them is a study using infrared sensors in a two-phase traffic light system with a real situation in adaptation at the International Islamic University of Malaysia (Albagul et al. 2006) as well as a study of sensor traffic lights at railway junctions using the track circuit system which has been programmed (Isyanto et al. 2016). The simulation in this research was built using Arena Software where the software this has also been used in other fields such as health (Al-Refaie et al. 2014), manufacturing (Ruzanita & Wan Rosmanira 2013), transportation (Hani et al. 2008), laundry services (Hambali & Liong 2014), precast concrete stock room layout (Marasini & Dawood 2002), and more.

In a study related to traffic lights, Abdul-Yasser et al. (2011) have compared the performance of traffic lights that have sensors with traffic lights that use the system fixed time basis. The results of the study found the average waiting time for less busy intersections decreased by 62.5 percent, from 20 seconds to 7.5 moments when using a traffic light system that has a sensor. Meanwhile, busy intersections also saw a decrease in average waiting time from 19.97 seconds to 17.43 seconds. Apart from that, Kamrani et al. (2014) have made a traffic simulation at peak times for two intersections that do not have traffic lights. Findings show that the use of traffic lights at the intersection can reduce waiting time by 53 percent. This study proves that traffic lights are a solution to reduce congestion on the road.

In fact, in 2017, Muhammad Zulqarnain et al. have successfully created a simulation of real traffic conditions with a 90 percent confidence interval rate. Next, Kamran et al.

(2017) have successfully created a simulation to find the optimal time for a traffic light intersection that has three phases. The alternative model that was built can reduce the average waiting time per vehicle from 64.67 seconds to 53.9 seconds. Therefore, Arena software can be used in the construction of lighting control system model signals. In addition, improvements can be made from several angles such as the type of lamp the signal used, the turn of the vehicle exiting the junction and the time cycle of the traffic lights depending on the traffic conditions at an intersection.

Diagram 2.2.1: Common Traffic Light Sensor

- shows how traffic light sensor looks like before

Diagram 2.2.2: Satellite Images Traffic Congestion

- shows traffic congestion at Jalan Raja Musa Mahadi

Diagram 2.2.3: Upgraded Design for Sensors

- shows the new and upgraded design for traffic light sensors

2.3 SUMMARY

In summary, the most cutting-edge method of modern traffic management is an upgraded traffic signal sensor system. Thanks to its increased precision, adaptability, resilience, and connectedness, traffic authorities may make data-driven decisions to reduce congestion, enhance safety, and support larger smart city objectives. This state-of-the-art technology will make traffic control more efficient and quick, which will benefit both commuters and the urban environment.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

To make a more clear view of proposal it is essential to provide a simple and clear picture of our project describing, explaining, and predicting phenomena called methodology. This chapter will cover a details explanation of the methodology that is being used to make this project complete and work well. Many methodologies or finding from this field are mainly generated in journals for others to take advantage of and improve as upcoming studies. Typically, it encompasses concepts such as paradigms, theoretical models, animation, phases and quantitative or qualitative techniques. In implementing the project, the process of carrying out the project is very important to get the outcome of what had been planned from the beginning. In this chapter explain a bit about the summary execution of work done to produce our product to achieve the objective and get quality results.

3.2 PROJECT DESIGN

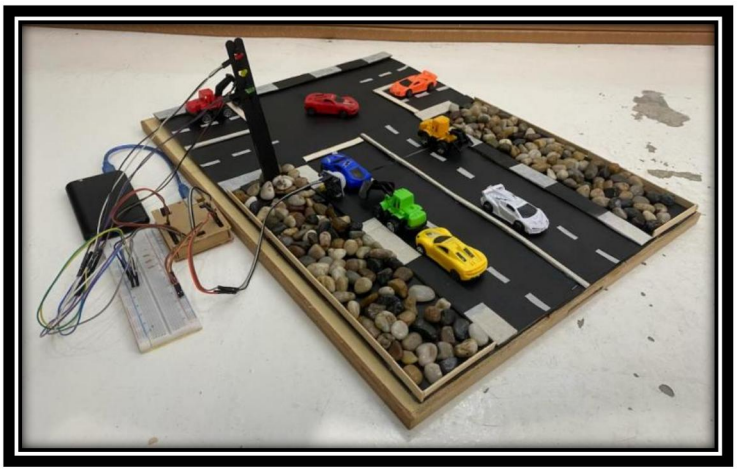


Figure 3.2.1

3.2.1 PROJECT PRODUCTION METHODS/PROCEDURES/TECHNIQUES

Procedure:

1. Design

    a. Prepare the items.
    b. A model project is to be based on a plywood board of A3 size (297mm width x 420mm length).
    c. Create a frame inside the board using some pieces of A4 paper that have been colored black using graffiti spray as the main road.
    d. Then, divided three junction road (width = 10cm) using cardboard pieces as a road divider that already customizes.
    e. Once completed, decorate the three-junction road such as a bold line as a divider at the middle of the road (5 cm from the divider), the dotted line as a lane marker for driver (width = 1.5cm gap), and road sensor line using tape, cardboard pieces, hot glue gun and white and black spray.
    f. After that, cut white sticker paper and paste it on the road as direction sign.

g. Then, decorate the model using river stone as a pebble and toy vehicle.
h. Lastly, insert the electric components to the model project.

2. Build a System
   a. Installing an motion sensor at divider
   b. Connect a detection motion sensor to traffic light
   c. Connect the sensor and 3 light (Red) (Yellow) (Green) to traffic control system.

3. Testing the System
   a) Vehicle stop for red light
   b) Motion sensor detect the vehicle
   c) The data sent to traffic control system
   d) Traffic light change to green

Techniques:

The study will use the motion detection technique, in which the sensor is triggered when cars pass through it. Following then, data on the sensor's identification of vehicle presence will be provided to the traffic controller. The traffic control system will change the timing of the traffic lights at the same time. The data will be collected and reanalyzed to determine the efficiency of the methodologies used in this research project.

3.2.2 MATERIALS AND TOOLS

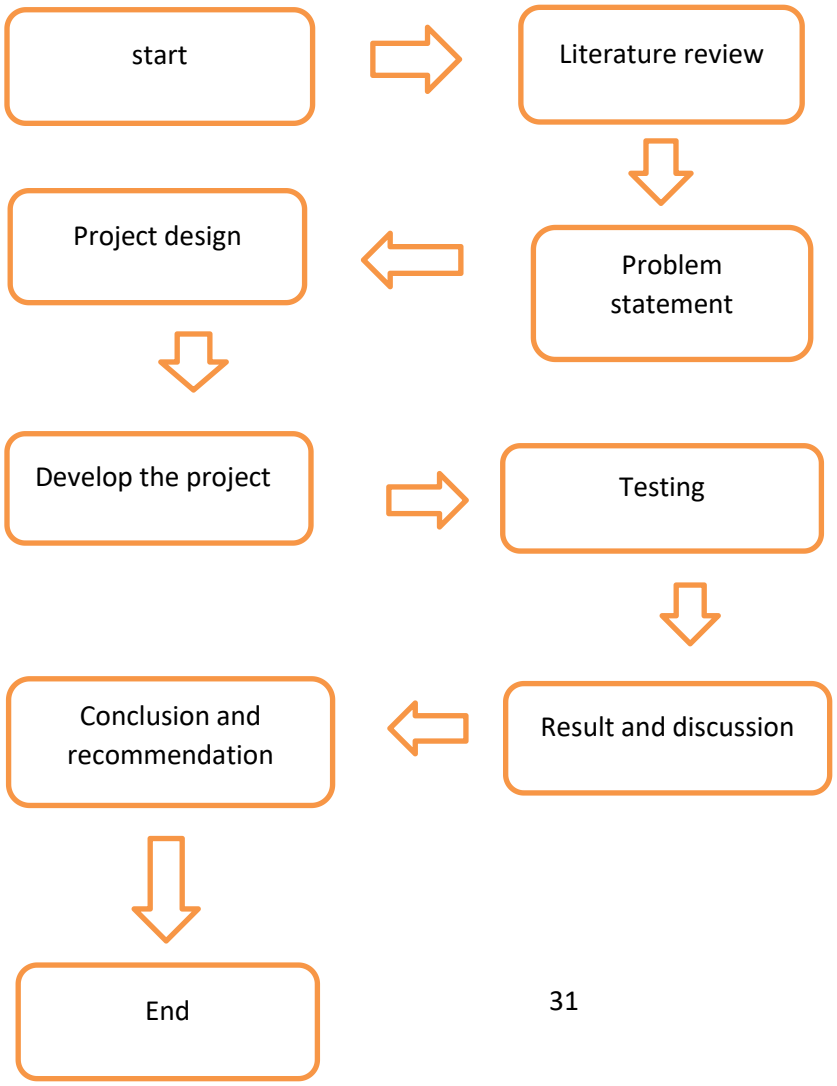
1. Arduino or Raspberry Pi (for control)
2. Motion sensor (e.g., PIR sensor)
3. Traffic light model or LEDs
4. Breadboard
5. Power source (e.g., battery or power supply)
6. Resistors and transistors
7. Jumper wires

8. Soldering iron and solder (if needed)
9. Computer with the necessary software (Arduino IDE or Raspberry Pi software)

3.2.3 DATA ANALYSIS METHOD

Data collection for this research is we use to collect data, analyze the data, and what methods we can use in this project. The first is to get statistics for traffic sensors from the public works department or more easily for users who use the road. Later, it also included a traffic sensor study in this research that consisted of peak hours.

Flowchart



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3.3 SUMMARY

After all the data and records are compiled and analyzed, the solution is to design that can detect all kind of vehicle with using SMART system. We also want to test the detection of vehicles and control traffic lights for efficient traffic management. The proposed solution is supported by the staff and also students of Ungku Omar Polytechnic.

CHAPTER 4

RESEARCH FINDINGS AND DISCUSSION

4.1 INTRODUCTION

In the fast-paced world of modern transportation, efficient traffic management is paramount for ensuring smooth and safe movement of vehicles. One innovative solution that addresses this need is the integration of motion sensor technology with traditional traffic lights. By harnessing the power of motion sensors to detect the presence of vehicles, traffic lights can dynamically adjust their signals, optimizing traffic flow and enhancing overall road safety.

Traditional traffic light systems operate on predefined timers, often leading to suboptimal traffic management, especially during periods of low or irregular traffic. The incorporation of motion sensors revolutionizes this approach by enabling traffic lights to respond in real-time to the actual presence of vehicles at an intersection. This not only reduces unnecessary delays but also enhances fuel efficiency and minimizes environmental impact by reducing idling times.

The motion sensor technology employed in this system utilizes various sensing mechanisms such as infrared sensors, radar, or computer vision. These sensors can accurately detect the movement and presence of vehicles, allowing the traffic light to adapt its signaling patterns accordingly. As a vehicle approaches an intersection, the motion sensor triggers the traffic light to prioritize the direction with the highest demand, effectively allocating green time where it is needed most.

This intelligent traffic management system contributes to a safer and more efficient road network by preventing unnecessary delays, reducing congestion, and enhancing the overall traffic experience for both drivers and pedestrians. Additionally, it lays the foundation for the implementation of smart city initiatives, where interconnected technologies work together to create a more sustainable and responsive urban environment.

4.2 STUDY/TEST FINDINGS

Project Test Equipment:

1. Model design traffic light
2. Component circuits
3. Detection of sensor to vehicle

Testing Method:

1. Connect the circuit to power supply
2. Vehicle pass the motion sensor
3. Motion sensor detect the vehicle
4. The microcontroller will make the light turn green after 5 sec
5. Green light stay 20 sec following the actual traffic light

Table 3.1: Peak hour traffic composition

(a) AM Peak Hour

Junction	Car	Medium Lorry	Heavy Lorry	Bus	Motor	Total
Screenline 1 (SL 1)	42.25%	0.70%	0.70%	0.70%	55.63%	100%

(b) PM Peak Hour

Junction	Car	Medium Lorry	Heavy Lorry	Bus	Motor	Total
Screenline 1 (SL 1)	55.97%	3.73%	0.00%	0.75%	39.55%	100%

It could be observed that cars, which include 4 wheel drives and vans, constitute the highest percentage of the total traffic composition of some 40% to 50% followed by motorcycles (30% to 60%) and heavy vehicles of lorries and buses a marginal (0% to 1%).

The Table 3.1 above is taken from a journal published by jkr

Before using motion sensor:

Type vehicle	Motor	Car	Others
Percentage detection	80%	95%	100%

-The sensor cannot detect the vehicle efficiently.

After using motion sensor;

Type vehicle	Motor	Car	Others
Percentage detection	100%	100%	100%

-The sensor can detect vehicle more efficient.

Time (s)	T1	T2	T3
1st 20	Green	Red	Red
2nd 15	Red	Green	Red
3th 20	Red	Red	Green

Table: Time for traffic light

Expected Result:

Traffic light system circuit is successfully connected to the power supply. Verify that the motion sensor reliably senses the motorcycle's presence, demonstrating its ability to detect vehicles passing through. Validate the sensor's accuracy in detecting vehicles, especially motorcycles, as intended for optimal traffic control. After detecting the vehicle, the microcontroller should initiate a 5-second delay before transitioning the traffic light to green. Confirm that the green light timing aligns with standard traffic light intervals, ensuring synchronization with existing traffic management systems.

4.3 DISCUSSION

Discussion about the integration of motion sensors in traffic light systems, highlighting the key aspects of reliability, accuracy, and synchronization for optimal traffic control. The successful operation of a traffic light system depends on the reliability of its motion sensors. These sensors play a crucial role in detecting the presence of vehicles, with a particular emphasis on motorcycles, to initiate timely and appropriate traffic light responses. A traffic signal system's efficiency is dependent on accurate vehicle detection. The debate should go into ways for validating and improving the accuracy of motion sensors, particularly those used to recognize motorcycles as well. This might include looking at potential advancements in traffic control systems. This might entail incorporating new technology such as linked and driverless cars, improved

communication systems, and sustainable energy sources for traffic signals. The potential influence of these technologies on overall traffic efficiency, safety, and environmental sustainability lends a forward-thinking perspective to the discussion.

4.4 SUMMARY

A motion sensor in the traffic light system provides reliable identification of vehicles, notably motorcyclists. The precision of the system is critical for effective traffic control. Following vehicle detection, the microcontroller initiates a 5-second delay to ensure smooth traffic flow. The alignment of green light time with standard intervals provides smooth connection with current traffic management systems, resulting in a comprehensive and coordinated traffic light system.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The use of intelligent transportation systems has grown in importance as a means of tackling the escalating problems of energy efficiency, road safety, and traffic congestion. Motion sensor integration with traffic light systems is one notable development in this field. Motion sensor technology improves traffic flow and increases pedestrian and vehicle safety by enabling a more dynamic and responsive traffic management system. In order to build a smart traffic management system, the development and use of motion sensors in conjunction with traffic lights is the main goal of this project.

It's important to consider the aims and objectives established at the beginning of the project as we dive into the conclusions and suggestions for this traffic light motion sensor project. The main goal was to use real-time data from motion sensors to improve the effectiveness of conventional traffic light systems. This goal was the focus of intensive research, testing, and implementation efforts made throughout the project lifespan. As the project draws to a close, it is critical to assess the results and offer suggestions for future developments that will lead to even more advancements and broad implementation.

5.2 CONCLUSION

In conclusion, the objectives stated in this project have been successfully achieved. This project was successful in producing a design sensor that can detect all types of vehicles as well as build a SMART system of traffic light. This is also include to test the distance of detection motion sensor to vehicle. The motivation came from when looking at the condition of road users who have to wait for slow traffic lights. Sometimes this situation can really get in someone nerves. There are a lot of significance of this project. For example, it can reduce the accumulation of vehicles. This will avoids unnecessary traffic jams. This also improves traffic flow and thus reduces CO2 emissions into the air. The proposed solution in this project is to design a motion sensor that can detect all types of vehicles. The benefits to the road users will be ensure the orderly movement of vehicles, improve safety, shorten travel times and increase the volume of traffic that the intersection can handle. This project is open to any future ideas or innovatives that can make any improvements to this project.

5.3 RECOMMENDATIONS

Selecting the Location: It is important to choose the location with three junction road for easy to record the data and analysis about the sensor on the road for project purposes.

Size of Project: The size of this project is created based on our project location. But the size can be redesign depending on comes out the other project site size measurements.

Motion Sensor: Sensor is the most important things that used in this project because it can help the driver to detect their vehicle all day. It also can help all the people with their efficiency.

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APPENDIX

Gantt Chart FYP 2

Project Title: Traffic Light Sensor System

Activities	Week															Start Date	End Date
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Student Registration																21.08.2023	27.08.2023
Project briefing																04.09.2023	04.09.2023
Project implementation and supervision sessions(Design,Develop,Test)																28.08.2023	9.11.2023
Submit at least a 25% progress report on the project																11.09.2023	17.09.2023
Send at least 50% progress of the project report																02.10.2023	08.10.2023
Present a Progress Presentation																09.10.2023	09.10.2023
Preparation for Final Presentation																13.11.2023	26.11.2023

Present for Final Presentation																**27.11.2023**	**28.11.2023**
Submit the Final Year Project report																**08.12.2023**	**10.12.2023**

Note:

	Planned Date
	Implementation Date

i. Estimate Project Cost

Table 6.2.1: Estimate Project Cost

NO	PRODUCT	UNIT	PRICE (RM)
1.	Spray Paint (Black)	1	5.60
2.	Cardboard	1	3.00
3.	Ice-Cream Stick (Per-Pax)	1	2.60
4.	Small Stones (Per-Pax)	1	2.60
5.	Car Toy (Per-Pax)	1	2.60
6.	Plastic Straw (Per-Pax)	1	2.60
	Total		