



MECHANICAL ENGINEERING DEPARTMENT

FINAL YEAR PROJECT REPORT

TITLE: ADJUSTABLE CAMERA SYSTEM
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ADJUSTABLE CAMERA SYSTEM

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III

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IV

ABSTRACT

The project intends to help people in creating different angles when taking picture. By using a smart adjustable camera system, we can get to a higher or lower angles that we wouldn't be able to reach as easily and comfortably if working hand-held. We also figured that if given the appearance of being hand-held, it is hard to achieve stability while taking pictures or video. Smart adjustable camera system is the assemblies of Radio-Controlled (RC) car, tripod and camera. We decided to choose RC car because the speed is constant and it allows users to control the car's speed and movement through the use. RC car helps in reducing energy while taking pictures. It is also suitable for outdoor activities therefore allows the tripod to be used outdoor which is the main objective. The tripod prevents camera movement and provide stability to the camera to maintain a good quality of pictures. To conclude the reasons of why do we feel this project innovations could help someone in photography are because to allow more careful composition, while framing the shot exactly how we want it and to reduce manpower to produce great quality of pictures or videos while maintaining its' stability. We also opined that this camera system would be useful as a tool for taking photos or videos in risky places that inhabited wild animals, the threat of virus and diseases or even places with gas pollution.

V

CONTENT

Chapter	Content	Pages
	<ul style="list-style-type: none">• Front Page• Declaration of Ownership and Copyright• Acknowledgement• Abstract• Contents• List of Figures	I II III IV V VI
1	<p style="text-align: center;">Introduction</p> <p>1.1 Introduction of Project</p> <p>1.2 Problem Statement</p> <p>1.3 Design Thinking Workshop</p> <p>1.4 Project Scope</p> <p>1.5 Significances Of Project</p> <p>1.6 Chapter Summary</p>	9 - 15

2	<p style="text-align: center;">Literature Review</p> <p>2.1 Introduction</p> <p>2.2 Robotic Vision</p> <p>2.3 Radio Controlled Car</p> <p>2.4 Material</p>	16 - 19
3	<p style="text-align: center;">Methodology</p> <p>3.1 Introduction</p> <p>3.2 Flow Chart</p> <p>3.3 Flow Chart Explanation</p> <p>3.4 Gantt Chart</p> <p>3.5 Conclusion</p>	20 - 25
4	<p style="text-align: center;">Findings and Analysis</p> <p>4.1 Introduction</p> <p>4.2 Cost</p> <p>4.3 Chapter Summary</p>	26 - 28

	Discussion and Conclusion	
5	5.1 Introduction 5.2 Discussion 5.3 Suggestion 5.4 Conclusion	29 - 31
	Reference	

VI

LIST OF FIGURES

No	Figure	Page
1	Figure 1	14
2	Figure 2	15
3	Figure 3	19
4	Figure 4	20
5	Figure 5	24
6	Figure 6	25
7	Figure 7	28

CHAPTER 1

1. PROJECT INTRODUCTION

1.1 Explain the introduction of the project

Tripod is a three-legged stand designed to support a camera. Cameras are mounted to a tripod, also refers to as ‘sticks’ for stability. Tripod allows camera to pan left and right or tilt up and down. In still photography, tripods allow photographer to use slower shutter speeds for long exposure images while reducing the amount of camera shake.

1.1.1 Introduction to the type of research

Tripods may seem as a heavy, awkward and only pros should use them. For someone who love taking pictures, this tripod offers considerable advantages in a whole host of environment. Smart adjustable tripod allows us to take better and sharper pictures.

1.1.2 Define research title

Smart Adjustable Tripod is designed to make photographing easier. They are made to achieve static shots. Static shots are often used when filmmakers want to focus on the precise composition of a shot. In a static shot, the camera is mounted to the tripod in a fixed position.

1.2 DEFINE PROBLEM STATEMENT

1.2.1 Identify and determine engineering problem statement

- 1) Natural lighting when taking night time shots and sunsets is reduced and so to get more light into the lens, the camera will adjust exposure and shutter speed when set to the Night setting. However, with a slower shutter speed, there is the risk of camera shake which results in unwanted blurring. The tripod will reduce camera movement and improves picture quality helping you take the perfect sunrise or sunset.
- 2) Helps with someone who has hands' shakiness. This tripod can help those who have a difficult time holding their camera still for regular photos, whether from age, illness, or a disorder such as essential tremor or Parkinson's disease. Whilst in body and lens stabilization systems can help in these situations, if you still find yourself with blurry photos due to your hands shaking, a tripod can ensure you get sharp photos every time.

- 3) Skills are required when taking close up shots. Minor movements will be crucial to a perfect image. Using this tripod will noticeably reduce unwanted movement of the camera.
- 4) Hard to maintain camera placement or stability. Once the camera is mounted to a tripod and the head is locked, the frame won't change. A stable tripod is hugely useful for planning during action photography as it easily follows the subject as the move past, whereas handholding can be a lot shakier.
- 5) Hard to achieve stability. Given the appearance of being held-hand, and in many cases, shots are limited to what one photographer could have accomplished with one camera.
- 6) Hands' shakiness. This smart camera system can help those who have difficult time holding their camera still for regular photos, whether from age, illness, or a disorder such as Parkinson disease or essential tremor.
- 7) Wildlife filming. This camera system can be used, to film the animals, particularly dangerous animals without putting anyone at risks.

1.2.2 Apply *problem analysis technique*

(a) Identifying priorities

Cost of inventing the prototype can be quite high but the quality will be greater.

Tripod height. An average contemporary tripod's three legs extend 50-63 inches from the ground. An advantage to having a taller tripod is that when we need to shoot on uneven surfaces, we can extend one leg further to balance, for example shooting on a hill side. It also helps shooting over crowds.

Tripod's material. Based on our research, carbon fiber is the lightest and strongest material for tripod legs and so is often preferred by outdoor and travelling photographers. Aluminum tripods are strong and lightweight and while a bit heavier are more affordable than carbon fiber.

Types of RC car. We conducted research and decided to choose a larger size of RC car. This is because it helps in carrying tripod and helps reducing energy while filming.

(b) Decision making

In order to achieve and maintain stability to the camera and the tripod itself, we decided to use aluminum as the material of tripod and avoid using plastic tripods even if they are lightweight and low in price, but are not serious choices due to the vibrations that most plastic tripods transmit. The legs' feet are made of rubber as rubber is easier to find and serves to protect the floors and dampen floor-transmitted vibration. We decided to use RC Car because it can support the tripod and allow the camera to move.

1.2.3 Identify the characteristic of product / innovation developed

1) RC car

RC car allows the tripod to move throughout the use to make photographing easier. RC car's speed is suitable for the camera movement.

2) Tripod

To hold the camera and provide stability so that the videos or photos are captured with good quality.

3) Camera

To take picture or videos. We also downloaded Iriun software application to record video.

1.3 DESIGN THINKING WORKSHOP

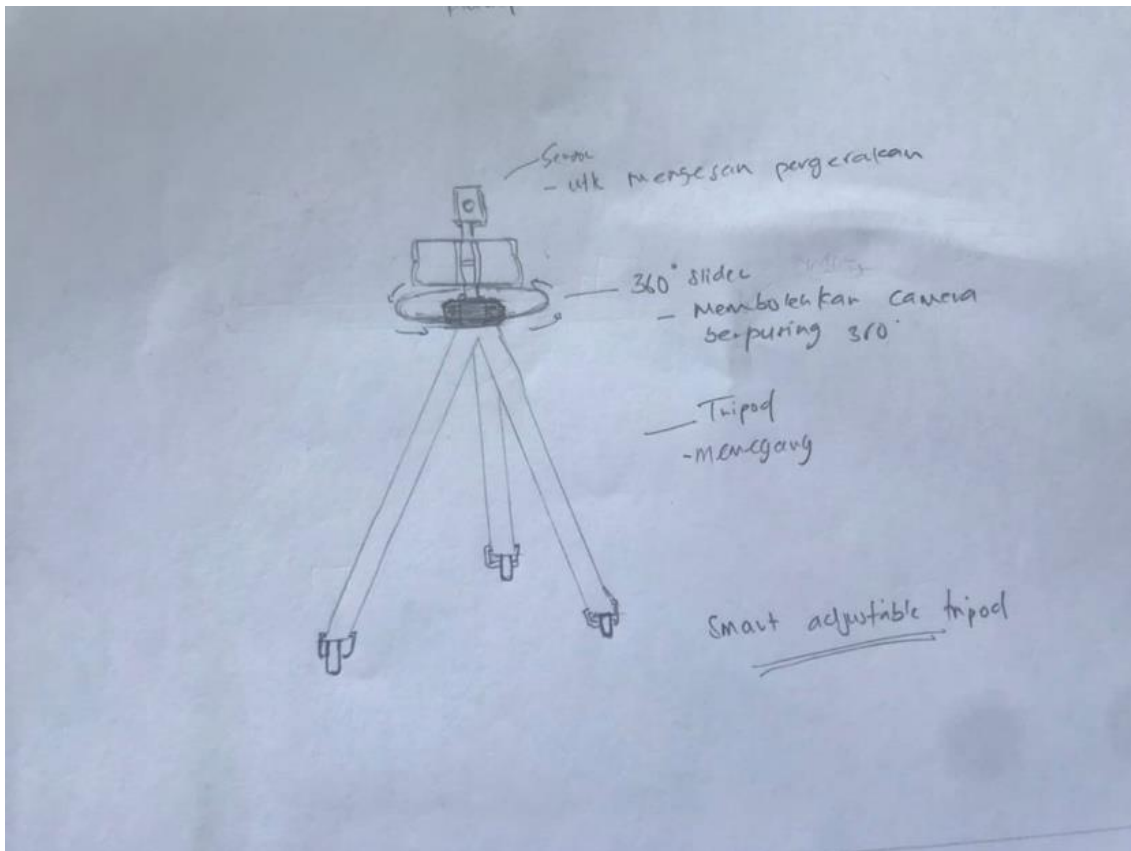


Figure 1

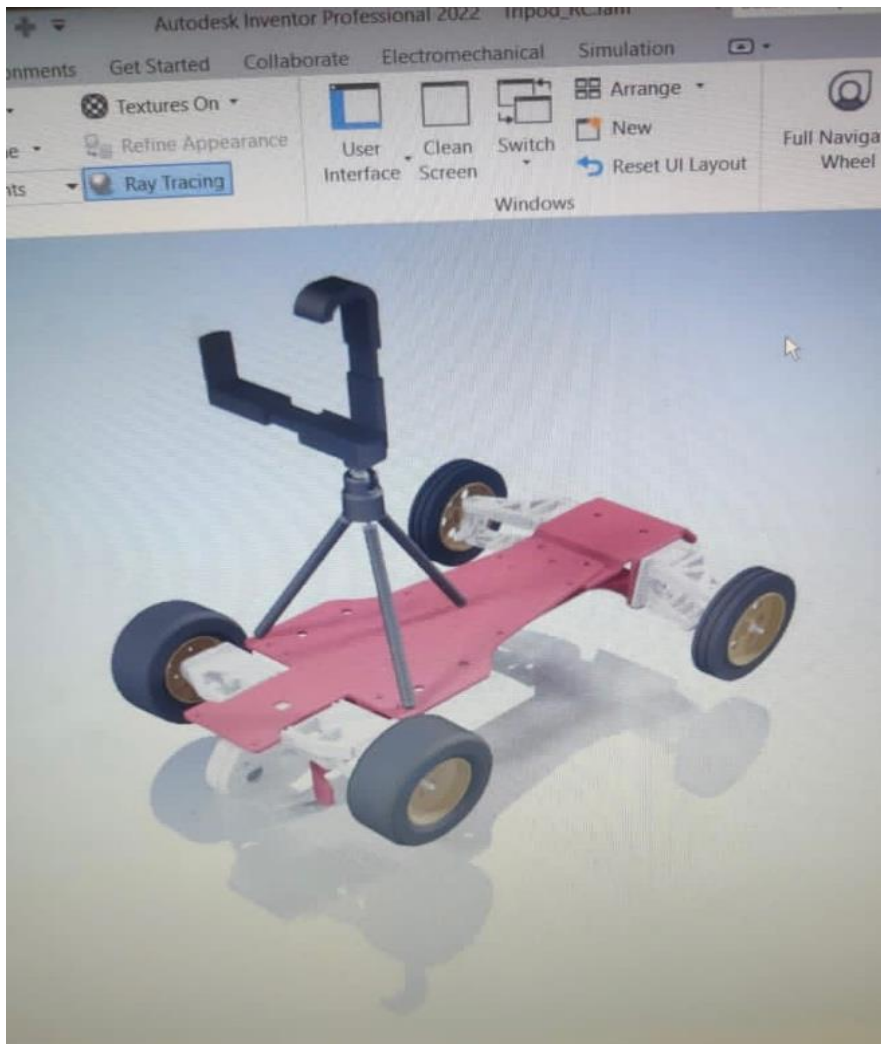


Figure 2

1.4 PROJECT SCOPE

The scope and limits to this research are:

- Can be used in a large/spacious area.
- Suitable for students and photographer.
- Can move approximately 50 m from people.

1.5 SIGNIFICANCE OF PROJECT

Every innovation we create must have its own approach and benefits, so our idea of creating a Smart Adjustable Camera is a good idea. It also can help the underprivileged because the price is affordable and also give benefits to consumer. With this project, it can ease the customer use it on their life.

1.6 CHAPTER SUMMARY

In this chapter, the studies were explained about its origin of ideas and inspirations. All the stated objectives can be achieved through problem statement. Thus, with this Smart Adjustable Camera System we can create an innovation that give benefits to everyone. This project is not only useful for photographer people but many people also can use it as well. Next, the scope of this project explains about this Smart Adjustable camera system operator and the extent of the suitable area for this project. The conclusion is, this Smart Adjustable Camera System can give a good impact and advantages to the user.

CHAPTER 2

2.1 INTRODUCTION

Literature means research articles that are referred to understand and study the research issues. The literature review is used to provide contextual studies by looking at the research that has been conducted in the field of research and not just summarizing the research conducted by other researchers.

In addition, through the study of the literature the researcher can also identify the weaknesses and strengths of the resulting project. Therefore, the literature review is important as it can be used from several aspects as a guide and reference for the researcher in completing this study. The contents of this chapter may contain a brief introduction to the subject of the study, concept or article related to, previous studies related to the field of study and summary of this chapter. The general topic of the issue or area of interest needs to be identified and then provide the appropriate context for the literature review.

2.2 ROBOTIC VISION

Recent trends in pedestrian detection for robotic vision using deep learning techniques. Pedestrian detection has become more and more important in the field of robotic vision, having applications in autonomous driving, automated surveillance, smart homes, as well as mobile robots (or mobot). With the help of smart cameras, mobile robots have been able to detect, localize, and recognize pedestrians in a scene. In recent years, researchers from all around the world have developed robust deep learning-based systems for detecting pedestrians with subpar results. In this chapter, we have presented a review of the most superior deep learning techniques used by robotic vision systems in recent years and how well they have performed on different benchmark datasets available all around the world. All the techniques differ in two major respects, firstly the architecture of the system, and secondly the pre-processing, where input data is used in different capacities. The field of robotic vision is still under constant development and the day isn't far when full automation will be a reality.

2.3 RADIO CONTROLLED CAR

Nowadays the radio-controlled cars have developed to a high level and are used in many cases. Depending on their use, they vary in properties, design and special features. There are two major types of radio-controlled cars, one that uses as energy source a conventional battery and the other type of radio-controlled car utilizes a small internal combustion engine as an energy converter, which uses fossil fuel as energy source [20][21]. Depending on its use a radio-controlled car can be:

- I. an army robot to detonate a buried bomb,
- II. an android robot to do a human job,III.a mobile robot to move around the environment like an automatic guided vehicle(AGV),
- III. children's toy car or an RC car that can be operated with a radio wave.
- IV. a radio-controlled car with the purpose to detect fault on equipment with restricted access.

These are some examples where a radio-controlled car can be used and, in this paper, we will focus on the last case. An Important role plays the way in which the radio-controlled car is controlled. Usually the radio-controlled cars are controlled by a remote control but most of them ate controlled by a computer that has a program and thereby given orders (e.g. Arduino, LabVIEW® etc.) and an Arduino Board inside of the radio-controlled car, in both cases the connection is wireless. Once we have ensured all the properties, then a correct control production should be made. As we mentioned, in the modern era, to develop and manufacture products, before they go to the market, needs checking for functionality and quality, and the role of intelligent systems and CAD software are the tools to ensure both functionality and quality. We provide to the software the appropriate physical properties that radio-controlled car would have if it had

been produced. With [1][3] the motion analysis we can study two major types of problems relating to the motion of solid bodies.

1. Kinematics: Study of the motion of a rigid body without considering the forces that result in the motion of the body.

2.4 MATERIALS

The materials selected must be in accordance with the required features as product durability, reasonable cost, guaranteed product safety level and more.



Figure 3 Tripod

- Tripod is an important part of the system as it provides stability to the camera. It is also adjustable as the height can be adjusted.
- We decided to choose carbon-fibre tripod because it is lightweight thus can reduce energy during photography.
- Tripod holds the camera firmly so that it won't move and cause shakiness.



Figure 4 Radio-Controlled Car

- RC Car helps in reducing energy while taking pictures or videos due to the heavy setup.
- RC Car enables movement to the tripod and therefore make photographing easier.
- The speed is suitable for the movement of camera as it is not too slow and not too fast.

CHAPTER 3

METHODOLOGY

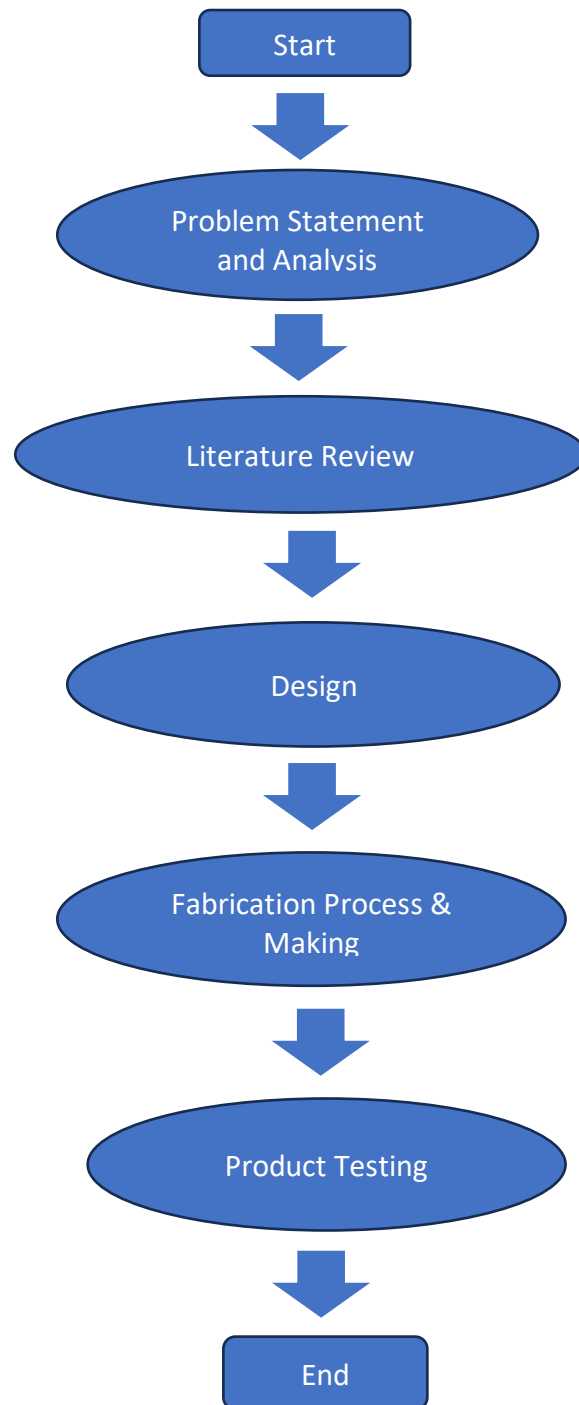
3.1 INTRODUCTION

Methodology is a method and technique for designing, collecting and analysing data to produce evidence that supports a study. Methodology describes how a problem is studied and why a method and technique is used.

Methodological studies are a rigorous planning in the course of this semester. In order to facilitate the final project journey, the methodology must be set as best as possible. With this, every step of the journey of this project will not fall short of the set path or more precisely the end result of the study will meet the needs of the problem to be solved. Therefore, it is very important to know and understand in depth each of the processes involved in structural engineering studies.

In this chapter, there will be a lot of information about processes and travel through the production of our final project. There is a flow chart that shows how we are doing the whole project. This flow chart describes the process we take. Next up is the Gantt Chart, which will showcase and plan for 13 weeks on the journey of our final year project.

3.2 FLOW CHART



3.3 FLOW CHART EXPLANATION

Problem Statement and Analysis

- Hard to achieve stability. Given the appearance of being held-hand, and in many cases, shots are limited to what one photographer could have accomplished with one camera.
- Hands' shakiness. This smart camera system can help those who have difficult time holding their camera still for regular photos, whether from age, illness, or a disorder such as Parkinson disease or essential tremor.
- Wildlife filming. This camera system can be used, to film the animals, particularly dangerous animals without putting anyone at risks.

Literature Review

- We explain the background of the product selected.
- Started a project called Adjustable Camera System.
- Our project priority is to make photographing easier and can be used anywhere.

Design

- We discussed about the materials and product that we decide to assemble to the system.

Fabrication Process & Making

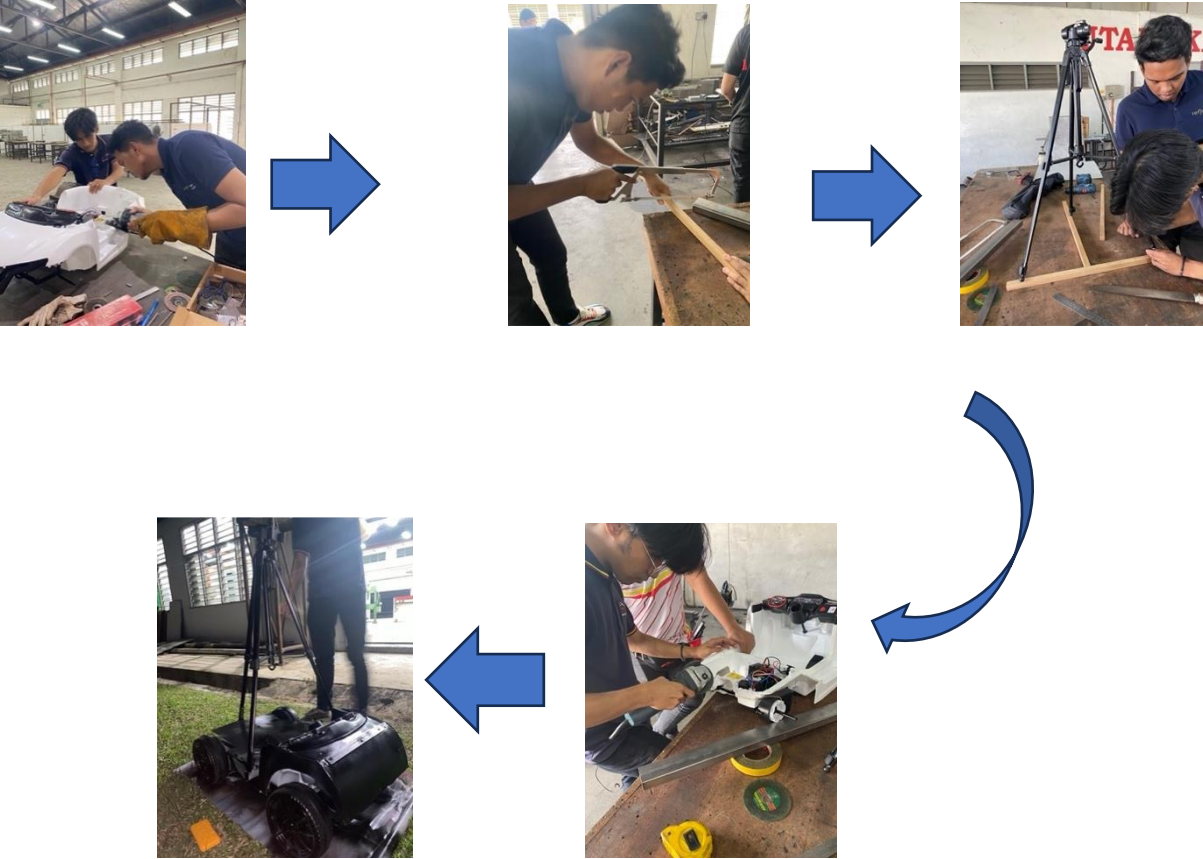


Figure 5

Product Testing

We test the product by making sure of the stability, how far the product could travel, the shakiness of photos, and to check if the motor functions properly. Finally, it can be concluded that the stated objectives were achieved and implemented effectively.

3.4 GANTT CHART



Figure 6

3.5 CONCLUSION

The conclusion that can be made in this chapter is that, after conducting the study of this chapter and gaining the knowledge, how to make the project clearer, more detailed and easy. This simplifies the work that goes into project development. The data that has been collected and analysed is very important in making this final project. These data are collected through a variety of ways such as browsing the internet, reading some related books, in stores and through information from lecturers. This chapter also describes the cost of materials, quantities, prices and overall cost allocated to complete this project. Design study conducted it helps to simplify the process of designing how to fit in and not spend too much and the materials you want to use are easy to find. In addition, this chapter will also know the specifications of the materials available in the market as well as the different prices accordingly different shops. Material selection factors are also very important in the production of this project. This is because choosing the wrong item will cause damage to the project. Failure in this appropriate selection not only will it cause damage to the project but it will also result in higher costs of purchasing new material as a result of the damage caused by the wrong selection of materials.

CHAPTER 4

FINDINGS & ANALYSIS

4.1 INTRODUCTION

This chapter combines all the analysis and important data of Adjustable Camera System and also its materials calculation. The data and analysis is very important to ensure the objective and scope of this project successful. After that, when the data analysis achieves the goals, this shows our project was successful. So, we have decided to collect all of the relevant data to investigate each case in order for this project to work smoothly.

The results obtained in this chapter are the results obtained from the questionnaires and experiments that have been conducted in the study area. Data resulting from experiments in the study area are analysed in more detail to draw conclusions based on the objectives of the study that have been stated.

The study was conducted from the users of tripod photography.

There are few aspects that are the main focus, namely:

1. Demographics of Respondents (gender and age)
2. General view of the study

The sample of responses below was collected based on the questionnaire google form.

Respondent at Politeknik Shah Alam

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
2	5	10	6	7

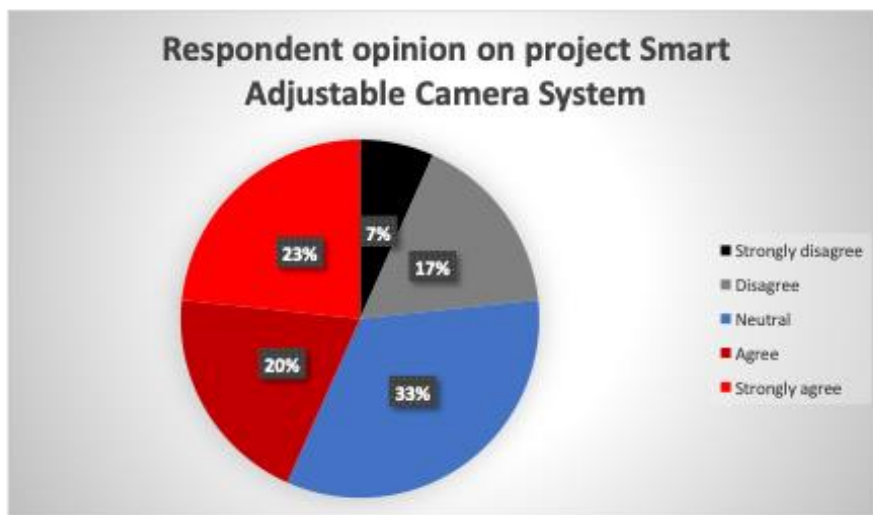
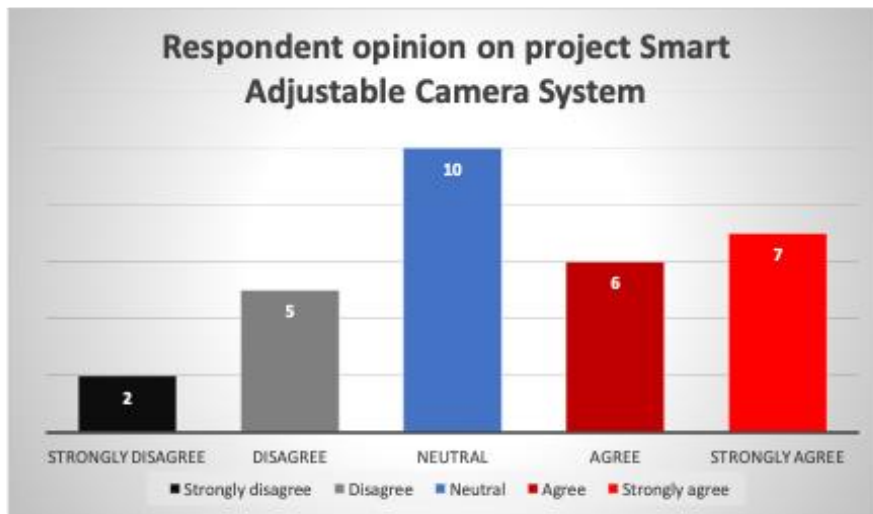


Figure 7

4.2 ESTIMATED COST

No	Materials/Equipment	Quantity	Price/Unit	Total
1	RC Car	1	RM198.70	RM198.70
2	Tripod	1	RM45	RM45
3	Screws and tools	1 pack & 4 pieces	RM3 & RM10	RM13
4	Poster	1	RM17.50	RM17.50
	Total			RM274.20

Table 4.2 shows the cost of materials allocated to implement the Adjustable Camera System project.

4.3 CHAPTER SUMMARY

The conclusion is that in this chapter we can see some questionnaire studies conducted on some respondents for us to know about their opinions regarding this Adjustable Camera System. By doing this questionnaire, we can further improve the project we created.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 INTRODUCTION

Based on the results obtained in Chapter 4, a discussion of the findings is presented in this chapter. The findings from the study are used to discuss whether the proposed hypotheses are supported. All research questions will be answered subsequently and finally the achievement of research objectives are determined. Finally, the contributions of the study are discussed based on theoretical, methodological, practical approaches and end with suggestions for future research.

5.2 DISCUSSION

Generally, tripod is used or created for professional photographer who actually experts in taking photography. We have discussed and conducted product testing to ensure that Adjustable Camera System works well within the prescribed scope of can be used in a spacious area and move approximately 50 m away. After ensuring the objectives are achieved, we had a further discussion to improve our products to be more effective as we decided to add rubbers to the tyres to provide more grip to the movement so that the system can work more smoothly and effectively.

5.3 SUGGESTION


This Adjustable Camera System is innovated to make photographing easier especially in a large or spacious area. So, there are some suggestions for improvements to make this product more effective;

- Adjustable speed so that the product can be used based on one's preferences speed.
- Change to a more powerful power supply such as battery so that the product lasts a day and don't need recharging every few hours.
- Apps and Arduino installation. With apps that can be controlled from just our phone, it will make photographing easier as a person only need to adjust the speed and movement from their phone.
- Foldable. Although this idea will take a longer time to succeed, foldable camera system is going to be helpful especially if you look forward to save more space in a car, house or yard. This camera system is a heavy setup and can be quite challenging to be a foldable product but in the future, it will be easier to carry it.

5.4 CONCLUSION

The use of this Adjustable Camera System is used to provide the stability to the camera in order to help people who has difficulties in taking photography. Aside from photography purpose, the camera system can also be used especially in nowadays' situation such as, places that are experiencing air or gas pollution or wildlife filming. This is because we do not put anybody at risks. This project has many other innovations ideas that we wish we could put it into this project, however it takes so much time then we expected. Aside from considering the cost, we decided to make this project as much as we could according to our budget and energy.

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