KEMENTERIAN PENGAJIAN TINGGI

POLITEKNIK MALAYSIA
SULTAN SALAHUDDIN ABDUL AZIZ SHAH

POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

ASL HELMET

NAMA	NO PENDAFTARAN
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MUHAMMAD SHAFFUAN BIN MUSTAFA	08DKM18F1114
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JABATAN KEJURUTERAAN MEKANIKAL

JUNE 2020

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Laporan ini dikemukakan kepada Jabatan Kejuruteraan Mekanikal sebagai memenuhi sebahagian syarat penganugerahan Diploma Kejuruteraan Mekanikal

JABATAN KEJURUTERAAN MEKANIKAL

JUNE 2020

AKUAN KEASLIAN DAN HAK MILIK

TAJUK : ASL HELMET

SESI : JUNE 2020

1. Kami, **1. KHAIRI AUNI AMIRAH BINTI KHAIRISHAM (08DKM18F1122)**
2. MUHAMMAD SHAFFUAN BIN MUSTAFA (08DKM18F1114)
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Adalah pelajar tahun akhir **Diploma Kejuruteraan Mekanikal, Jabatan Kejuruteraan Mekanikal, Politeknik Sultan Salahuddin Abdul Aziz Shah**, yang beralamat di **Persiaran Usahawan, 40150, Shah Alam, Selangor**. (selepas ini dirujuk sebagai 'Politeknik tersebut').

2. Kami mengakui bahawa "Projek tersebut di atas' dan harta intelek yang ada di dalamnya adalah hasil karya/reka cipta asli kami tanpa mengambil atau meniru mana-mana harga intelek daripada pihak-pihak lain.

3. Kami bersetuju melepaskan pemilikan harta intelek 'projek tersebut' kepada 'Politeknik tersebut' bagi memenuhi keperluan untuk peanugerahan **Diploma Kejuruteraan Mekanikal** kepada kami.

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SITI KHALIJAH BT JAMAL

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ABSTRACT

Bluetooth technology has improved over the last few years, and it's a feature in helmet technology. Nowadays, motorcyclist challenge to cope dealing with information while riding, for instance, GPS directions, communication, and calls. Bulky and tangled wired speakers may unpleased motorcyclists beside it considered as an expensive accessory. Offering a solution to this problem, helmet Bluetooth kits are developed and proudly brand as "ASL Helmet" Universal Bluetooth Accessory. The objective is to design a Universal Bluetooth speaker which capable of fitting most of the helmet design. ASL Helmet kits eliminate wires to connect devices allow you to precisely switch between functions, such as music, intercom, and phone calls, which can pair with your smartphone. The button's position on the right outer side of the helmet for fingertip control. The critical aspect is safety, but connectivity is close behind. This project will ease and aid the daily motorcycling experience. Functionality test performed to ensure the best performance in any riding condition. The fabrication methods started from generating and brainstorming idea followed by engineering design exploit technical drawing before the selection of parts. The fabrication continues by soldering and joining all selected elements. Functionality test performed to ensure the best performance in any riding condition. The results analysed to defeat problem and solution offered attained design purposes. Product and market review, financial management and mass production study engaged ready for market viable. "ASL Helmet" Universal Bluetooth Accessory offer functionality at a reasonable price, bid 40% cheaper than its competitor. The slender design makes them concealed and comfortable inside the helmet. For further improvement, noise cancellation rate advisedly increases to reduce unwanted ambient sounds and deliver excellent audio.

Keyword: Universal Bluetooth Kit, Bluetooth Helmet

ABSTRAK

Teknologi Bluetooth helmet telah berkembang pesat di dalam pasaran dan ciri ini telah diaplikasikan di dalam teknologi helmet. Pada masa kini, penunggang motosikal menghadapi masalah untuk menangani maklumat semasa menunggang, misalnya, petunjuk GPS, komunikasi, dan panggilan telefon. Pembesar suara yang memakan ruang dan kedudukan wayar yang tidak tersusun mungkin menyebabkan penunggang motosikal tidak selesa serta aksesori ini terlalu mahal. Kaedah yang diperkenalkan bagi menghadapi masalah ini adalah kit Bluetooth helmet yang telah direka cipta dan dijenamakan sebagai “ASL Helmet”. Objektif projek ini adalah untuk mereka bentuk pembesar suara menggunakan teknologi bluetooth yang boleh dipadankan ke telefon bimbit selain sifat kebolehulang pasang dan universal yang boleh dimuatkan pada sebahagian besar reka bentuk topi keledar dipasaran. Kit ASL Helmet merupakan peranti tanpa wayar yang membolehkan pertukaran antara fungsi, seperti muzik, interkom dan panggilan telefon. Selain itu, kedudukan butang di bahagian luar kanan topi keledar untuk pengawalan dihujung jari. Rekabentuk ASL Helmet mementingkan aspek keselamatan dengan mengurangkan pengendalian telefon pada penunggang motosikal. Tetapi dalam masa yang sama dapat mengunakan telefon dan menyediakan hiburan kepada penunggang. Kaedah fabrikasi bermula dari penjanaan dan percambahan idea diikuti dengan reka bentuk kejuruteraan dan pemilihan bahan. Seterusnya, ujian kefungsian dilakukan untuk memastikan prestasi terbaik dalam pelbagai keadaan menunggang. Kajian pasaran produk dan pengurusan kewangan produk juga dilaksanakan. Aksesori Bluetooth Universal "ASL Helmet" ditawarkan pada harga yang berpatutan, 40% lebih murah daripada pesaingnya di pasaran. Reka bentuk yang sesuai menjadikannya tersembunyi dan selesa di dalam topi keledar. Untuk penambahbaikan selanjutnya, ‘noise cancellation’ dicadangkan untuk mengurangkan bunyi persekitaran yang tidak diingini dan memberikan audio yang lebih baik.

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CHAPTER 1

1 INTRODUCTION

1.1 RESEARCH BACKGROUND

The proportion of the motorcycle population on Malaysian roads varies from state to state. In less developed stated such as Perlis and Kelantan (northern part of Malaysia), the motorcycle population is more than three-quarters of the total motor vehicle population. In more developed states like Selangor (Western a part of Malaysia), motorcycles constitute one-third of the entire automobile population. The motorcycle is the primary mode of personal transport for the urban community and requires persons driving or being carried on motorcycles to wear protective helmets as regulated in-laws.

Riding a motorcycle can be dangerous due to road hazards. As a result, motorcyclists must be aware of the risks and wearing protective gear such as a helmet. In general, motorcycles are the main contributor to road fatalities, with no sign of decreasing. Ironically, riders still do not wear helmets while riding because of comfort issues and motorcyclist also banned from holding and using their mobile phones while riding.

The Internet of Things refers to the physical devices around the world that are now connected to the internet because of the arrival of cheap computer chips and the availability of wireless networks. Despite what its called, the Internet of Things is not restricted to purely internet-based connectivity. Bluetooth connection is increasing the functionality of IoT devices more effective and producing more reliable connectivity. IoT is mainly used for devices that wouldn't usually be generally expected to have an internet connection, for this case helmet. Hence, the concept of the communications-enabled helmet with an embedded speaker and mic, allows riders to sync their smartphone audio to their helmet over Bluetooth connection brings a lot of advantages to a motorcycle rider.

Therefore, all three of us decided to do a project that will ease and help riders to enhance the daily motorcycling experience at an affordable price. We came up with the name 'ASL Helmet' for our project. This product consists of headphones, mic, Bluetooth receiver, noise-cancelling and battery

1.2 PROBLEM STATEMENT

Riders will sometimes have to deal with taking in and processing information while riding. For example, voice directions, communicate with the rider and manage calls. Bluetooth motorcycle helmets are generally on the pricey side. Since a Bluetooth motorcycle helmet can be quite expensive, it is not suitable for a certain person. The downsides can include increased legal issues and import restrictions, language and cultural barriers, lengthy lead times, and complex payment and shipping terms.

The most important feature of any Bluetooth helmet is safety, but comfort and connectivity are very close behind. Bluetooth helmet comes with a variety of features and sometimes lacking some of the essential features. For example, they are not equipped with noise cancellation, rechargeable lithium battery and so on. Bluetooth helmet is perfect and great for the motorcyclist who travels on long trips. Just press a button to take the call, and you can already talk as you drive. This function will also be helpful when listening to music or directions for more straightforward navigation.

In Malaysia, a huge majority of motorcyclist wearing open face helmets. Open-face helmets are much lighter and less fatiguing. Its also help motorcyclist to see better and with a wider range of view. So there are no blind spots. There are a ton of different models for Bluetooth helmet on the market today, but the most popular are full-face helmet and modular helmet. Motorcycle helmets with built-in and integrated BlueTooth device not always the best choice. The helmet is no longer serviceable after 3- 5 years old or impacted in a crash.

1.3 RESEARCH OBJECTIVES

The objectives of this research are:

i. To design universal Bluetooth smart headphone.
ii. To innovate helmet equipped with Bluetooth call receiver.
iii. To test the functionality of the product.

1.4 RESEARCH QUESTIONS

This study will answer the following research questions:

i. Have you heard about Bluetooth helmet?
ii. Did you find it difficult to answering phone calls while riding a motorcycle?
iii. Did ASL Helmet ease the motorist to answering calls while riding a motorcycle?
iv. What improvements would you most like to see?

1.5 SCOPE OF RESEARCH

The scopes and limits of this research are:

Motorcycling to work is a great way to start your day, motorcyclists are not affected by traffic jams and hold-ups on the road. Riding a motorcycle to work daily means riding in an environment where the workload can sometimes be heavy and intense. Being on the road on a motorcycle means driving in a non-isolated environment and being in a vulnerable position to the hazards of the road and riders will sometimes have to deal with taking in and processing information while riding. These Wireless Bluetooth helmets propose clear and dependable communication, congenial with Bluetooth smartphones and suitable for any riders. The Bluetooth helmet will have a talk time of several hours, allowing you to ride long distances without worrying and not suitable for usage for more than 8 hours. This product is for an open face helmet only because open-face helmets tend to cost a little less than full-face. The majority of people in Malaysia own open-faced helmet and much more comfortable with them.

1.6 SIGNIFICANCE OF RESEARCH

For motorcyclists involved in the p - hailing sector, especially grab food and food panda. Several accidents involving p-hailing riders result in them sustaining severe injuries, permanent disability, or even death is very concerning. ASL Helmet can help solve the problems of daily motorcycling communication experience for P- hailing riders.

The product is manufactured in Malaysia and sets up a shop on an E-commerce website such as Shoppe to Improve ASL helmet Product Availability. Shopee is a popular eCommerce business in Malaysia that is visited by millions of visitors monthly. A vast audience to market our products online.

The audio from the kits is designed specifically to allow riders to listen to music but, at the same time, doesn't block external sounds like horns and approaching cars. The slender design of the ASL Helmet makes the kits concealed and comfortable inside the helmet. Along with the proper helmet, make rides stress-free.

1.7 DEFINITION OF OPERATIONAL TERMS

i. Helmet
   - A helmet is a form of protective gear worn to protect the head. More specifically, a helmet complements the skull in protecting the human brain.

ii. Bluetooth receiver
   - Bluetooth audio receiver is one of those awesome inventions, which allow us to connect our audio devices to other audio gadgets and stream music.

iii. Noise-cancelling
   - Headphones that reduce unwanted ambient sounds using active noise control.

iv. Headphone with Mic
   - Headphone with Built-in Microphone or milk means the headphone which can be used for listening music as well as you can talk on calls by using the same but in without built-in Mic headphones you can only listen to music but can't use the same to respond calls.

1.8 CHAPTER'S SUMMARY

In conclusion, the Telephone kits Bluetooth system which is based on a smartphone core and a wireless Bluetooth medium. The system is focused to increase the safety level of a motorcycle and perform the same function as a traditional helmet, hence this tool will be a great help in times of need and a perfect choice for any type of situation from a daily commute into the office to a fun ride. In this paper, we have introduced the draft and implementation of a low cost, flexible and wireless solution to our product.

CHAPTER 2
2 LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter, will be shown some of the material used in making a helmet Bluetooth system in the current market. These three materials have their advantages and disadvantages. Hence, all the characteristics of those materials will be compared to our product which has its specialities and benefits. The first material used is a helmet. A motorcycle helmet is a type of helmet used by motorcycle riders. The primary goal of a motorcycle helmet is motorcycle safety, to protect the rider's head during impact, thus preventing or reducing head injury and saving the rider's life. Some helmets provide additional conveniences, such as ventilation, face shields, ear protection, intercom etc.

Motorcyclists are at high risk of traffic crashes. A 2008 systematic review examined studies on motorcycle riders who had crashed and looked at helmet use as an intervention. The review concluded that helmets reduce the risk of head injury by around 69% and death by around 42%. Although it was once speculated that wearing a motorcycle helmet increased neck and spinal injuries in a crash, recent evidence has shown the opposite to be the case, that helmets protect against cervical spine injury, and that an often-cited small study dating to the mid-1980s, "used flawed statistical reasoning".

There are five basic types of helmets intended for motorcycling, and others not intended for motorcycling but which are used by some riders. All of these types of helmets are secured by a chin strap, and their protective benefits are greatly reduced, if not eliminated if the chin strap is not securely fastened to maintain a snug fit. The five basic types are full face, Off-road, Modular or "flip-up", Open face or 3/4 helmet and half helmet. Modern helmets are constructed from plastics. Premium price helmets are made with fibreglass reinforced with Kevlar or carbon fibre. They generally have fabric and foam interiors for both comfort and protection. Motorcycle helmets are generally designed to distort in a crash (thus expending the energy otherwise destined for the wearer's skull), so they provide little protection at the site of their first impact, but continued protection over the remainder of the helmet.

2.2 The History Of Bluetooth System

prepared by Muhammad Luqman

2.2.1 Introduction

The development of the "short-link" radio technology, later named Bluetooth, was initiated in 1989 by Nils Rydbeck, CTO at Ericsson Mobile in Lund, Sweden. The purpose was to develop wireless headsets, according to two inventions by Johan Ullman, SE 8902098-6, issued 1989-06-12 and SE 9202239, issued 1992-07-24. Nils Rydbeck tasked Tord Wingren with specifying and Dutchman Jaap Haartsen and Sven Mattisson with developing. Both were working for Ericsson in Lund.[12] In 1990, Jaap Haartsen was nominated by the European Patent Office for the European Inventor Award. From 1997 Örjan Johansson became the project leader and propelled the technology and standardization.

In 1997, Adagio Sanchez, then head of IBM ThinkPad product R&D, approached Nils Rydbeck about collaborating on integrating a mobile phone into a ThinkPad notebook. The two assigned engineers from Ericsson and IBM to study the idea. The conclusion was that power consumption on cell phone technology at that time was too high to allow viable integration into a notebook and still achieve adequate battery life. Instead, the two companies agreed to integrate Ericsson's short-link technology on both a ThinkPad notebook and an Ericsson phone to accomplish the goal. Since neither IBM ThinkPad notebooks nor Ericsson phones were the market share leaders in their respective markets at that time, Adagio Sanchez and Nils Rydbeck agreed to make the short-link technology an open industry standard to permit each player maximum market access. Ericsson contributed the short-link radio technology, and IBM contributed patents around the logical layer. Adagio Sanchez of IBM then recruited Stephen Nachtsheim of Intel to join and then Intel also recruited Toshiba and Nokia. In May 1998, the Bluetooth SIG was launched with IBM and Ericsson as the founding signatories and a total of five members: Ericsson, Intel, Nokia, Toshiba and IBM.

The first consumer Bluetooth device was launched in 1999. It was a hands-free mobile headset that earned the "Best of show Technology Award" at COMDEX. The first Bluetooth mobile phone was the Ericsson T36 but it was the revised T39 model that made it to store shelves in 2001. In parallel, IBM introduced the IBM ThinkPad A30 in October 2001 which was the first notebook with integrated Bluetooth. Bluetooth's early implementation into consumer electronics products occurred at Vosi Technologies in Costa Mesa, California, USA, initially overseen by founding members, Bejan Amini and Tom Davidson. Voice Technologies

had been created by, real estate developer, Ivano Stegmenga with the United States Patent 6085078 for the communication between a cellular phone and a vehicle's audio system.

2.2.2 Advantages and Disadvantages of Bluetooth System

Bluetooth is a wireless technology that allows data transmission between 2 devices. It is used to connect different devices such as headphones, speakers, etc. Today it is closely impossible to find any mobile phones without Bluetooth technology. It is mostly seen in cell phones. Like every other technology, Bluetooth isn't perfect. It has got its limitations. While using Bluetooth you could experience both advantages and disadvantages.

For the advantages of Bluetooth system are wireless, availability, usability and efficiency. Firstly for the wireless, One of the major advantages of Bluetooth is that it does not require any form of wires for it to transmit data. through this, you can conveniently send and receive files without needing to worry about the cables. Many other applications to make use of wireless Bluetooth technology. Such applications include personal security system, locating devices and health monitoring.

Secondly for availability, today Bluetooth is an exclusive feature available in most devices such as smartphones and tablets. These numerous kinds of devices with Bluetooth indicate its universal availability. For the next advantages is usability, due to its simplicity Bluetooth can be used by any rookie user. You don't have to be knowledgeable in the field of technology for using Bluetooth. Moreover, the pairing process is relatively easy in Bluetooth. There is no software or driver installation process involved here. Additionally, the pairing process is even made simpler. All you have to do is turn on Bluetooth on both of the devices and make them discoverable. As long as they are in the coverage range, the devices will be connected instantly. Some devices require you to entering PIN authentication.

Last but not least is efficiency, another primary advantage of Bluetooth is its energy efficiency which drives to low power consumption. This is generally because of the low power signals being used by the Bluetooth. Especially for the Bluetooth Low Energy (BLE) standard. This makes them ideal for electronic devices with small form factor, so that the minimal battery life can be maintained.

For the next disadvantages of Bluetooth, systems are speed, range, etc. For the speed, all the wireless technologies have a relatively slow transmission of data. This is especially true in the case of Bluetooth. In general Bluetooth 3.0 and Bluetooth 4.0 has the transmission rate of 25Mbps. Since Bluetooth is energy efficient the mechanism of transferring data is slower here. Moreover, Bluetooth cannot be compared with Wifi direct which has significantly faster transfer rates. Therefore Bluetooth will not be ideal for transferring large forms of files such as Audios and Videos. Most probably this could be used for transferring small image like documents.

For the range, the maximum range offered by a Bluetooth connection is of 100m. Generally, Bluetooth has a small range of communication (typically lower than a Wifi connection). Depending on the version and the nature of the devices, the range of a Bluetooth connection varies. Devices that need to be connected has to be in this range.

2.3 MATERIAL SELECTION

1) Bluetooth receiver

The first material we used is the Bluetooth receiver. we buy this device at Low Yat Kuala Lumpur. This device is very friendly used. the music receiver (hands-free) is designed to receiver music from mobile phones or transmitters that feature Bluetooth technology. The device can be used with almost any audio receiver with an audio jack, including to mobile, listen to music from your smartphone or mp3 player on your existing home or everywhere.

2) Bluetooth helmet

prepared by khairi auni

The helmet comes with a built-in Bluetooth sensor to connect to the smartphone through Bluetooth, Bluetooth speakers to listen to music and answer calls, Arduino Uno microcontroller, push buttons with specific functionality, microphone to talk on the phone. By pressing the buttons user can play music, pause music, shuffle between music files, get directions to a destination, receive incoming phone calls and in case of accident send SOS messages to emergency contacts. Stated by (Khaja, M., Aatif., & Manoj, A., 2017).

Although there are some attempts to utilize Bluetooth technology in the helmet industry, those attempts have not been able to provide a system that is capable of interfacing with various electronic components such as a cell phone, a second helmet, an audio device, a global positioning system, and the likes. Moreover, these attempts at utilizing Bluetooth technology within the helmet industry have the components installed directly into the helmets themselves, making it impossible to update the Bluetooth components without replacing the entire host helmet itself (Rong and X. U.Xiang, 2010).

Figure 2.3.1 - Bluetooth Helmet

3) Headphone with Mic

prepared by khairi auni

The present invention relates to a headphone with a microphone, particularly for use instead of the handsets of telephone apparatus, and comprising a microphone, an earphone, and means for maintaining the headphone on the head of the user, the maintaining means comprising a carrying ear hanger in the form of a disc-like 10 member adapted to the back of the ear and a hook member extending forward on the top side of the ear when in a working position.

Different headphones, so-called hands-free headsets or headphones, are well known wherein one or two earphones (telephones) are mounted on a band which is placed above or below the head of the user, while a microphone is placed in an arm which is cantilevered by the band and in such a manner that it can be turned to a position in front of the user's mouth. (Strand, S., Dwyer, P. E. L., Application, F., & Data, P., 1992).

According to the configuration, a sound signal is generated by inverting the phase of noise inside a Sound tube picked up by a microphone unit that is provided in proximity to an earphone (headphone) unit within the Sound tube worn on the ear of a user, and this sound signal is outputted as a Sound from the earphone unit, thus reducing external noise.

In the related art, so-called noise-cancelling systems exist and have been put into practical use which are adapted for use in a headphone device and which are configured to actively cancel an external noise that is heard when reproducing the Sound of content Such as a tune via a headphone device. Field of the Invention The present invention relates to a headphone device having a noise-cancelling function, and a signal processing device having a noise-cancelling function. (Application, F., & Data, P. Application, F., & Data, P. (2008).

Figure 2.3.2- Headphone with mic

4) Bluetooth receiver

Prepared by Muhammad Shaffuan

Bluetooth is a wireless technology standard used for exchanging data between fixed and mobile devices over short distances using short-wavelength UHF radio waves in the industrial, scientific and medical radio bands from 2.400 to 2.485 GHz, and building personal area networks(PANs). It was originally conceived as a wireless alternative to RS-232 data cables. There's been a lot of publicity about Bluetooth 4.0, also called Bluetooth Smart Ready and its technological advantages. In the past, Bluetooth has disillusioned users with its high battery consumption and pairing issues. Bluetooth Smart Ready is known as a wireless connectivity tool that consumes very low energy. Data can be easily transferred from one device to another across different platforms and hardware. You can also transfer data to devices that have older classic versions of Bluetooth. Bluetooth 4.0 was announced in late 2011 and first appeared in Apple's 2012 releases of the MacBook Air and MacBook Mini. The first smartphone to utilize the new Bluetooth 4 technology was Apple's iPhone 4s. Bluetooth 4.0 is also expected to play a key role in the development of advanced, long-lasting wearable computing devices like smartwatch and fitness monitoring devices.

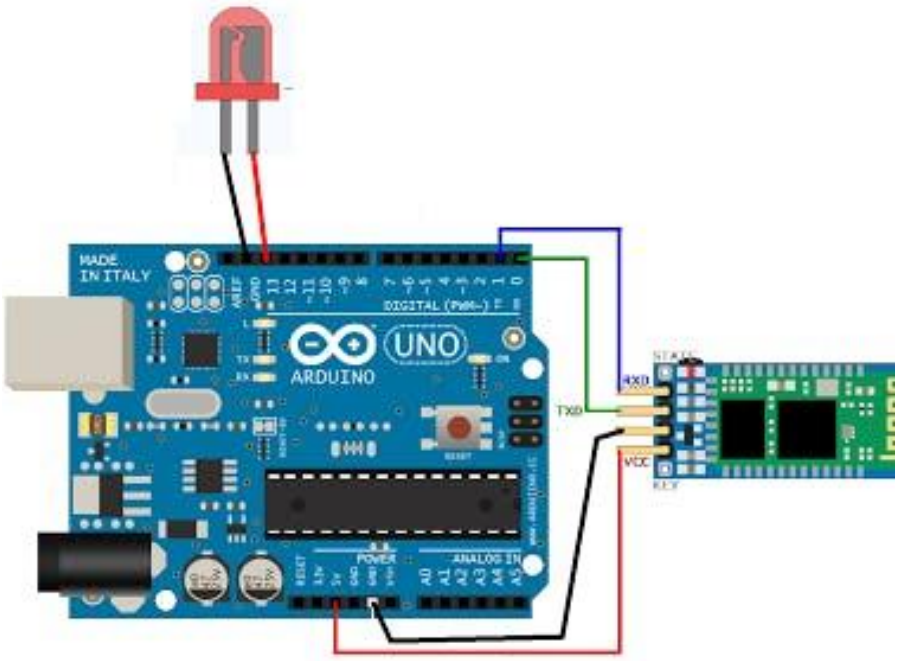


Figure 2.3.3 - Bluetooth receiver

Advantages

- A new central nervous system

  It appears as if version 4.0 has a new think-tank. The aim of Bluetooth 4.0 is to pair and maintain the connectivity between two electronic devices but with lower consumption of power.

  Some of the areas where it will prove highly needed are:

- The connection between all your smartphones, tablets, notebooks, laptops and desktops,
- Connecting wireless computer peripherals like keyboard and mouse,
- Gaming device remote controls,
- Wristwatches and smartphones that track heart rate, blood glucose and other critical levels during sports activities,
- To use wireless apps like exercise and fitness programs,

- The commercial value of Bluetooth 4.0

  Its maximum advantage is perceived in gymnasiums and fitness centres where Bluetooth 4.0 enabled computers can monitor your workout and upload the statistical data on to a cloud. The trainers can track a person's performance and modify the sessions for improvement. This is will prove extremely beneficial for those involved in sports and athletics, especially at a competitive level.

  Industrial and personal safety is another field that will gain an advantage from this version of Bluetooth. Remote sensing and control of gadgets, security appliances like alarm systems, are a necessary part of our daily lives. Homes, banks, supermarkets and malls, etc. can be vulnerable to theft. With Bluetooth, computers can sense and prevent dangerous situations, thus improving safety measures.
  Bluetooth 4.0 can be divided into its Bluetooth Smart Ready features and Bluetooth Smart features. These two aspects of the software focus on battery usage and compatibility issues. The segregation ensures that your smartphone or tablet, once paired with another device, can maintain its connectivity for a long time without using too much energy.

5) Battery

Prepared by Muhammad Luqman

For the battery we use inside of Bluetooth receiver is Lithium Cells type. The battery power voltage is 3.7V and for the capacity is 1500mAh. This battery provides up to 8 hours depending on the usage. This battery only needs 1.5 hours to charge it fully. The use of lithium-ion, li-ion batteries has grown significantly in recent years. They offer some distinct advantages and improvements over other forms of battery technology. However, like all technologies, lithium-ion batteries have their advantages and disadvantages. To gain the best from the li-ion battery technology, it is necessary to understand not only the advantages but also the limitations or disadvantages of the technology. In this way, they can be used in a manner that plays to their strengths in the best way. There are many advantages to using a li-ion cell of the battery. As a result, the technology is being used increasingly for a huge number of widely varying applications. Everything from small electronic devices, through smartphones and laptops to vehicles and many other applications. For the first advantages is high energy density, self-discharge, low maintenance, etc. Firstly for high energy density is The high energy density is one of the chief advantages of lithium-ion battery technology. With electronic equipment such as mobile phones needing to operate longer between charges while still consuming more power, there is always a need to batteries with a much higher energy density.

In addition to this, there are many power applications from power tools to electric vehicles. The much higher power density offered by lithium-ion batteries is a distinct advantage. Electric vehicles also need battery technology that has a high energy density. Secondly is One issue with many rechargeable batteries is the self-discharge rate. Lithium-ion cells are that their rate of self-discharge is much lower than that of other rechargeable cells such as Ni-Cad and NiMH forms. It is typically around 5% in the first 4 hours after being charged but then falls to a figure of around 1 or 2% per month. And for the last advantages is major lithium-ion battery advantage is that they do not require and maintenance to ensure their performance. Ni-Cad cells required a periodic discharge to ensure that they did not exhibit the memory effect. As this does not affect lithium-ion cells, this process or other similar maintenance procedures are not required. Likewise, lead-acid cells require maintenance, some needing the battery acid to be topped up periodically

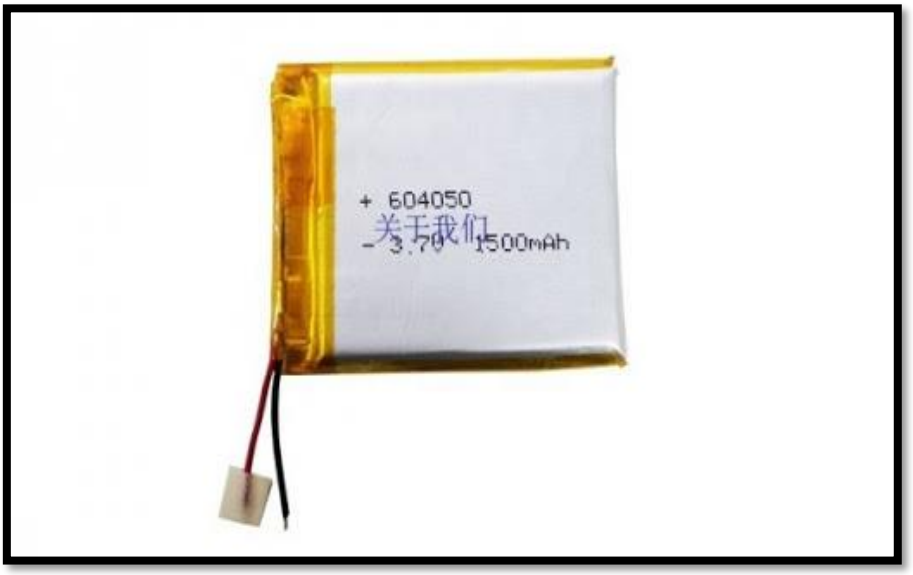


figure 2.3.4 – Battery

6) Universal earpad cushion

Prepared by Muhammad Luqman

Moreover, the next material is earpad cushion. The function of earpad is for our speaker like headphone and we connect the headphone to Bluetooth receiver. The function of universal earpad cushion is they play a very important role not only in the comfort of the headphones while you are wearing them but also the quality of the sound coming from the speakers. Despite how important they are, not many people think about them and they do even less to take care of them or make sure they are in good condition. There is a picture of how the earpad cushion are connected with Bluetooth receiver ;

Figure 2.3.5 -universal earpad cushion

7) Micro-USB

Prepared by Muhammad Luqman

This device can rechargeable. What type this device used is Micro- USB. Why we used Micro-USB because it very easer to provide everywhere. Next, here are the advantages and disadvantages of micro USB. For the first is waterproofness. The advantage of micro-USB is that it is sealed and can be effectively waterproof and dustproof. For the second is portability. One of the advantages of micro-USB is portable because micro-USB can be placed in a pocket or even a wallet. For the next is disadvantages are easy to lose. Because Micro- USB is small, it's easy to get lost. The next disadvantages are this cable cannot be the data transmission.

Figure 2.3.6- Mirco USB charge

2.4 CHAPTER'S SUMMARY

As to conclude this chapter, the literature review is very important to showcase all the studies of materials and methods to enhance the knowledge on this project. Every thesis and other projects that are related to this bio-friendly polymer composite prosthetic leg is really helpful, especially for us to understand it fully.

After a lot of materials and methods were discussed and researches were done, the materials that are the most compatible for our project is thermoset. Due to its characters and advantages, meanwhile, the methods that we decided to carry on is hands layup method. This is because of its low-cost benefits and great for beginner's process.

Last but not least is this product is very suitable and affordable. As we can see the Bluetooth helmet is existed at out there but the price is expensive so that we created the same device with low cost and the same purpose.

CHAPTER 3
3 METHODOLOGY

3.1 INTRODUCTION

According to ("methodology - definition of methodology in English from the Cambridge English Dictionary," n.d.), the methodology is defined as a system of ways of doing, teaching, or studying something. The purpose is to describe the research methodology used for this project, explain how to design the proposed product, elaborate on the process used in creating the product, data collection, and analyse the collected data.

Several tools and requirements need to be used to run the research. Personal laptop computer with Windows 10 platform to store all files, documents, and browse research papers. Moreover, Microsoft office is a graphical word processing program to process, manipulate, save, and share a text-based document made by Microsoft's computer company also being used. Google Chrome help the author to browse files, photos and provide the resources or information for the product research.

This chapter will cover the details explanation of methodology throughout the making of the final project. There will be a flow chart showing the operation of the whole project and the approaches we took. Meanwhile, the Gantt chart shows the project timeline chart with the lists of project activities. Next, the project activity, which will display the actual and planning throughout all the 14 weeks of final year project development. Moreover, in this chapter, we also will show two methods of research to carry out the final year project. Yet, these two methods have their pros and cons.

Among those two methods are circuit wiring and soldering modelling materials using a hot glue gun. The most common way of making telephone kits Bluetooth system is by using the method of soldering. This method has a lot of advantages and disadvantages. Hence, in this chapter, we will discuss these two methods and which one we chose.

3.2 FLOW CHART

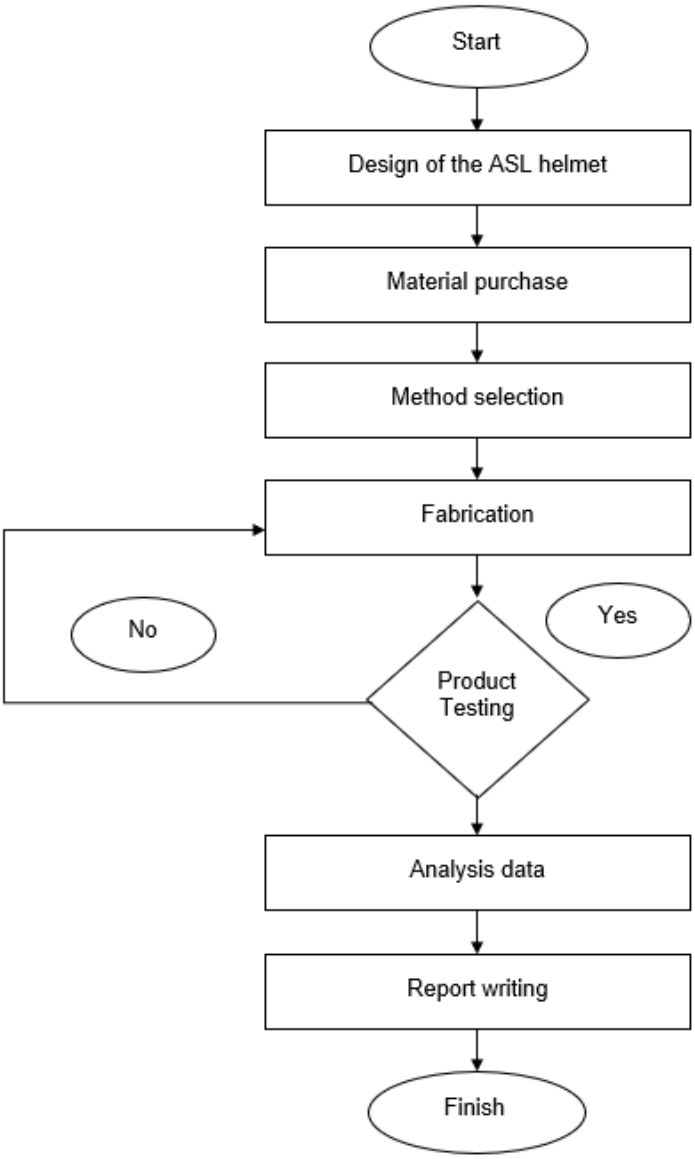


Figure 3.2.1 – flow chart

A flowchart is a visual representation of steps and decisions needed to perform a process. Each step in the series is noted within a diagram shape. Connecting lines and directional arrows link the steps in the process. This charts allows anyone to view the chart workflow and logically follow the process from beginning to end.

3.3 FLOW CHART EXPLANATION

1) START

The main thing is to get started, yet it is the first step for anything. A good start makes the rest more manageable, and it lays a foundation to build upon in completing the project. Somewhere down the line when anything ends its outcome is partly depended on how it began. Define and identify the project main meaningful goal that will ultimately lead to project success. The goals will save time in the long run by accelerating the overall project strategy. Identify specific Achievements, actions and obstacles associated with each goal along with a step-by-step action plan for accomplishing goals and overcoming obstacles.

2) PRODUCT DESIGN

prepared by muhammad shaffuan

Every product that is manufactured by any organisation is supposed to have a distinguishing physical characteristic which will make it attractive to customers, also known as a design. A well-designed product makes a significant difference to a customers perception of the product, and individual factors influence the decision of a customer about the creation of a particular product, these factors are the value attributes perceived by a customer. This project come up with a new design of helmet Bluetooth kits with a solution to redesign the currently available product. Redesigning means changing some aspect of the design so that it can be manufactured at a lower cost.

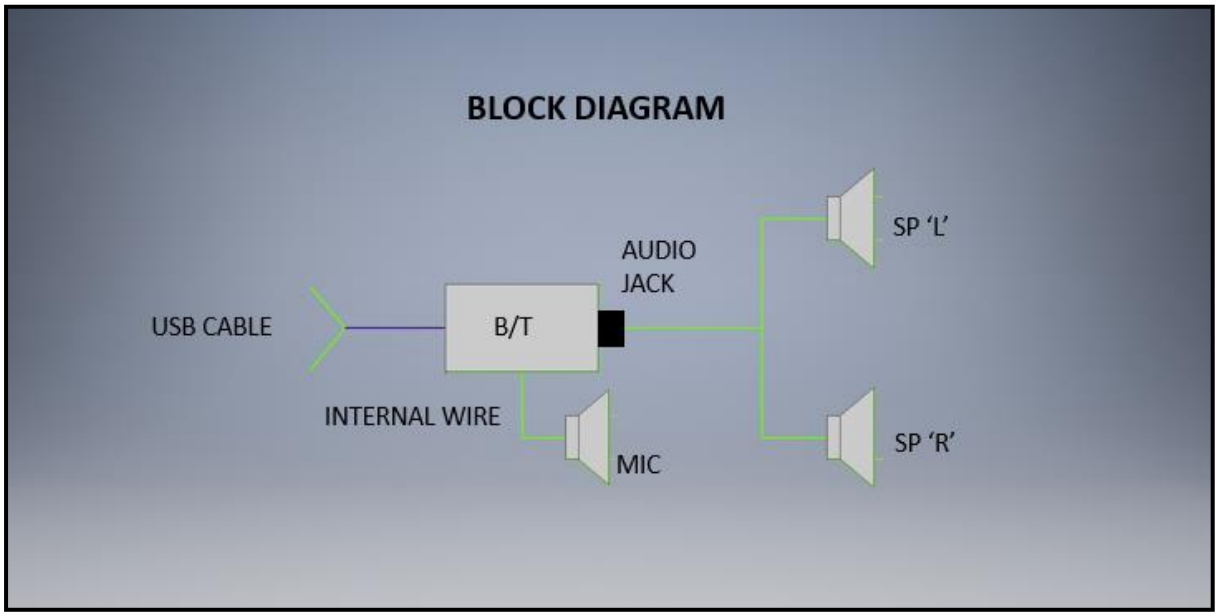


Figure 3.3.1 – block diagram

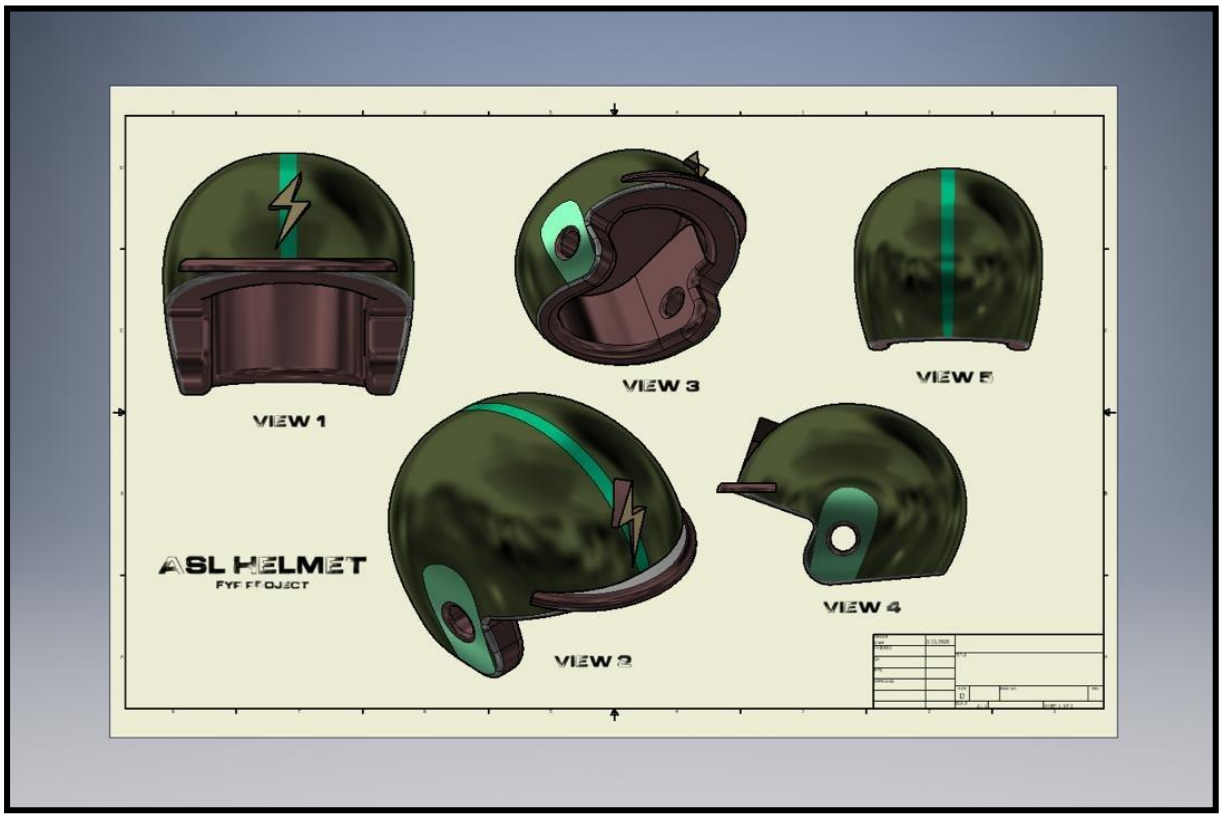


Figure 3.3.2 – Helmet

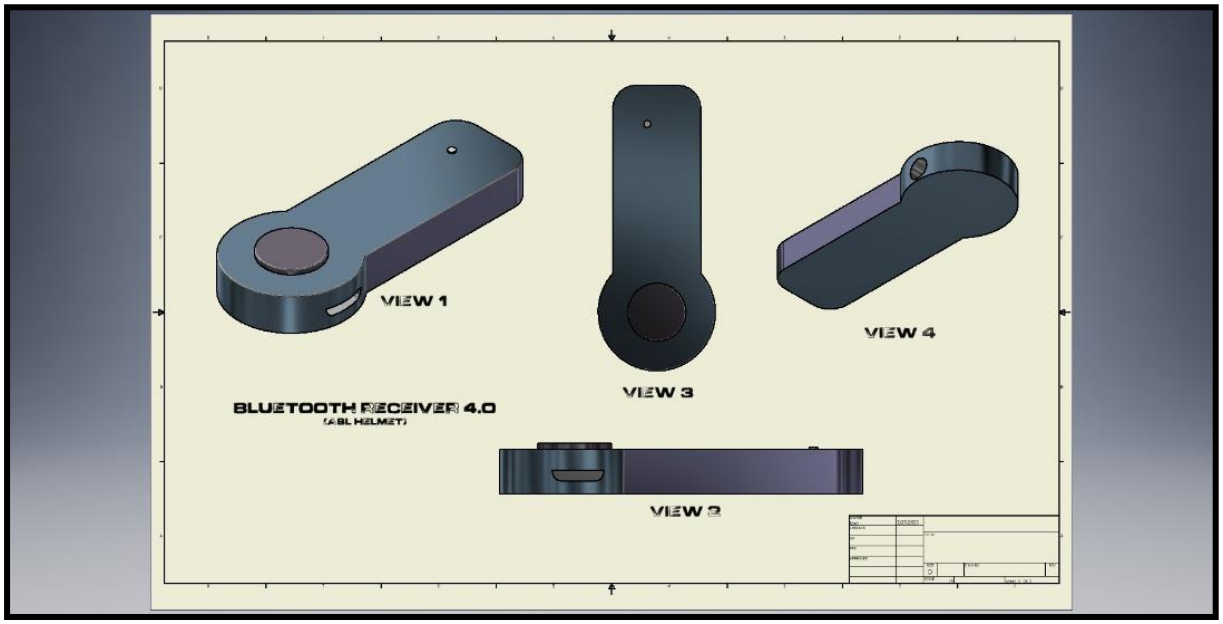


Figure 3.3.3 – Bluetooth Receiver

Figure 3.3.4 - Headphone with mic

3) MATERIAL PURCHASE

Prepared by: khairi Auni

Material selection begins with the identification and prioritisation of critical design criteria. Material selection is the act of choosing the material best suited to achieve the requirements of a given product. Many different factors determine the selection requirements, such as mechanical properties, physical properties, and cost.

The main functions of material purchase are to obtain the required amount of materials at a reasonable price. Investment in the raw material is of 50% to 60% of the total cost of the product. So, it is vital to buy raw material at a low price. The first step of material purchasing, classify all the material according to the nature of the material. Studies the purchase requisition which it gets from product design and makes the list of necessary material requirement. Aware of the market conditions and must know the sources of supply. Purchased materials should be entered in the note, and receipt of the materials is kept for budget calculation.

Headphone

The headphone is a pair of speakers attached to a band positioned across the wearer's head to enable the speakers to be placed over the ears to ensure that the sound waves from this diaphragm are coupled straight to the ear cavity.

Specifications

Mic Dimension	6.0x5.0 mm
Sensitivity	-58dB±
Directivity	Omnidirectional
Impedance	2.2kΩ
Driver Diameter	40.0mm
Impedance	32Ω±15%
Frequency Responses	20-20KHZ
Input Plug Diameter	100mw
Sensitivity (S.P.L)	98dB±3dB
Cord Length	≥2.2meters

Table 3.3.1- Specifications

Figure 3.3.5 - Headphone

Microphone

A microphone is a tool or device that captures audio by converting sound waves into an electrical signal. This signal can be amplified as an analogue signal or may be converted to a digital signal, which can be processed by a digital audio device.

Bluetooth receiver

Bluetooth receivers typically connect to your non-Bluetooth devices via an AUX. Some of these receivers are small and entirely operated with batteries, tiny enough to plug into the AUX connection on headphones for instant Bluetooth connectivity.

Figure 3.3.6-.Bluetooth receiver

Velcro

Velcro fastening systems are provided on paired woven tapes. The materials used in producing these woven tapes are typically one or more of nylon, polyester, and Nomex. Each paired tape has a loop tape, with loops made from the same fibre as the woven tape and a hook tape.

Figure 3.3.7 - Velcro

Universal earpad cushion

Earpad cushion plays a significant role in the comfort of the headphones while wearing them and the sound's quality coming from the speakers.

Figure 3.3.8 - Universal earpad cushion

4) METHOD SELECTION

prepared by khairi auni

Method Selection plays an important part in the overall design of production and operations to satisfies the needs of the product. Method selection involves strategically choosing which types of work processes to include in the production of a product. Each step in the production process can be completed in a variety of ways. Choosing the right processes most efficiently can increase production output, decrease operational costs and enhance product quality

The goal of method Selection is to realise the form of a method that fulfils the needs of the product and contributes many potentially beneficial ways explored, hence the development of better products for users.

Soldering Process

Solder is melted by using heat from an iron connected to a temperature controller. It is heated up to temperatures past its melting point at around 315 Degrees Celsius, which then causes it to melt and immediately cools, producing the soldered joint in the circuit board. Solder can also be easily removed using a desoldering tool and a solder sucker. Solder is a metal alloy used to produce strong permanent bonds, such as copper pipe joints and copper joining in circuit boards.

Circuit wiring

Wiring is a process of attaching different accessories for the distribution of electrical energy from the supplier to various machines and equipment based on the wiring diagram, which is a simple visual representation of the physical connections and physical set-up of an electrical system or circuit. The wires in a circuit carry the electric current to various parts of an electrical or electronic system.

5) FABRICATION

prepared by khairi auni

Fabrication is the process of making something from semi-finished or raw materials rather than from ready-made components. In other words, it is the process of making something from scratch rather than assembling something. Fabrication term referring to any process that cuts, shapes, or moulds metal material into a final product. Fabrication depends on both the beginning material and the desired end product.

Headphone disassembly

1. Wired headphones consist of a pair of audio drivers and a plug that connects to a device.
2. Detach the speakers from the headband for it parts
3. Two left and right speakers separated from the headphone body.
4. The speaker and Bluetooth receiver are modular

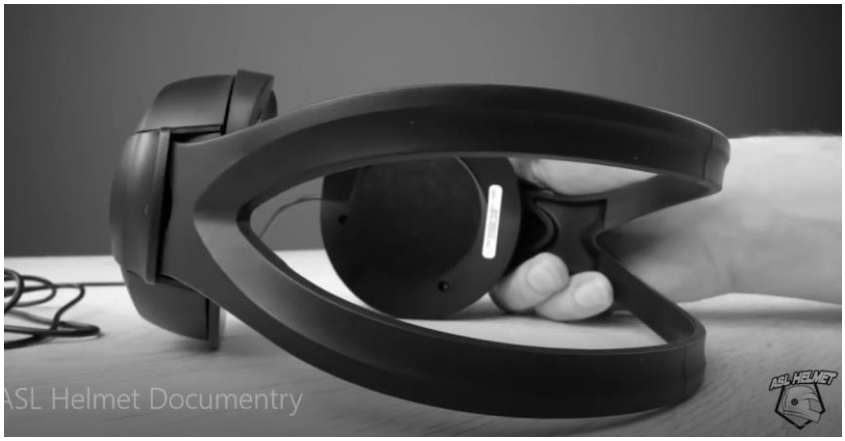


Figure 3.3.9 – Headphone disassembly

Soldering

Make a solder joint between two wires

1. The mic cable on the speaker was melt using the soldering iron, then removes excess solder by sucking the molten solder away
2. Heat the soldering iron and point to the red cable (microphone cable)
3. Melt the existing soldering to remove the red cable. This is because the Bluetooth receiver has its mic.

Figure 3.3.10 – soldering process

Multimeter digital

A digital multimeter is a test tool work to measure two or more electrical values at the same time

1. Test on the audio jack that the speaker is electrically conductive
2. There are four types of cable used, namely red, gold, blue, green. This cable has different functions, red (microphone), green (left side of the speaker), blue (right side of the speaker), and all of them work well on the test.

Figure 3.3.11 – test the functionality audio jack

6) PRODUCT TESTING

prepared by khairi auni

During the testing phase, Several tests will be employed to ensure that the product operates as expected and also intended to determine the limitations and weaknesses of the product. It is not difficult to test against real-world scenarios because the results are surprisingly predictable for ASL Helmet. The test performed to meet the quality and reliability of a product and all parts working together. Through product testing, we can develop technical standards for the products to produce a working product that is safe for customer use.

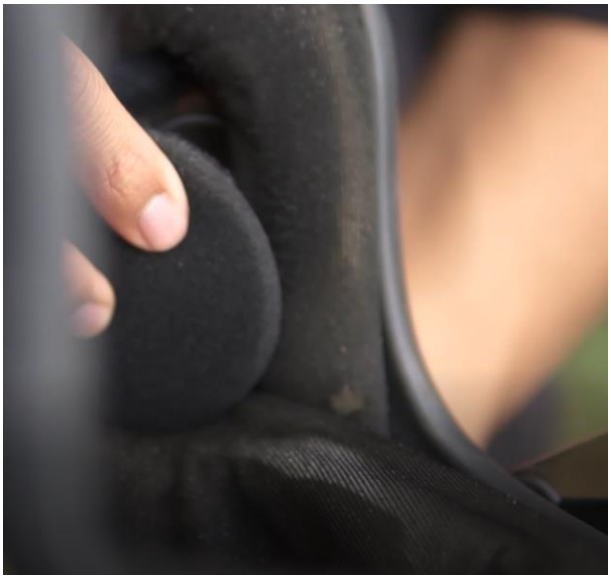


Figure 3.3.12 – Product Testing

i. Safety and Quality Check

Figure 3.3.13 – Types of helmet

Safety and Quality Check is a test related to safety such as field vision, and Bluetooth kits compatibility is among the requirements for product safety. The Bluetooth kits tested on a few types of helmets, namely open face helmet and a full-face helmet. The test Guaranteed product safety, compliance with quality standards, and to create value for consumers. Quality and safety are critical to building trust by offering products and services that match users expectation and preference.

Result

The overall rating of the helmets are based on our review

Details Information	Open Face Helmet A	Open Face Helmet B	Full Face Helmet
Bluetooth Kits Compatibility	✓	✓	✓
Speaker Pocket	X	X	✓
Field Vision	✓	✓	✓
Comfort	7/10	6/10	5/10
Push Button Control	✓	✓	X

Table 3.3.2 – Result review

i. Bluetooth and Microphone Test

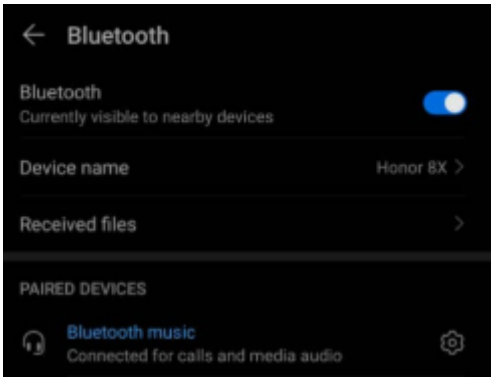


Figure 3.3.14 – Bluetooth Test

Bluetooth pairing test also performed with the iPhone and Android phones to ensure that these features are correctly integrated into the gear. We were checking Bluetooth Signal Strength and the Bluetooth connection range because there is a lot of difficulties hidden behind connecting Bluetooth that can potentially go wrong. Next, checking to see if the microphone is working properly is an essential step in product testing. The microphone is checked with a test call, either it was working and properly configured to evaluate the quality of sound produce when calling.

Result

Bluetooth depends on both hardware and software to work correctly. When the phone and the Bluetooth are connected, the device shows as "Connected." After you pair a Bluetooth device for the first time, the phone now can pair automatically later on. The phone and Bluetooth must be in close enough within 1 meter of one other. For power saving reasons, some phones may attempt to connect less aggressively after being connected for more extended periods. The ASL Helmet are out of range with a range of 10 meters. The effective, reliable range between Bluetooth devices and the phone is anywhere from 5 meters and will be down to less effective connectivity within 8 meters. The microphone is connected correctly to the ASL Helmet and working like a charm. The microphone helps to communicate easily with producing a clear sound even during highspeed driving,

ii. Riding Test

Figure 3.3.15 – Riding test

Riding test conducted to measure the ability of the motorcyclist to handle a motorcycle when equipped with ASL helmet and the result of rechargeable battery lasting time. The test will benefit safety and wellbeing enormously, as well as being concerned for the impact of riding with ASL helmet on other road users and the environment. The test is regarded as the most comprehensive and challenging test that we conducted.

Result

The test aim is reached, the product enhances normal daily ride to an advanced level and a new experience, thus reducing the likelihood of being involved in a crash. ASL Helmet is easy to use, and the speakers are clear at high speeds. The helmet Bluetooth speakers are made with a lightweight plastic shell that allows it to be lighter and comfortable earpad. The button controls plays or pauses music tracks and also answering incoming calls. The button is a bit difficult to reach and operate with gloves on due to the small size button. On a single charge, has a talk time of 4 hours. Users recommend charging at least once each month to maintain a long life from the internal polymer battery.

7) ANALYSIS DATA

Data analysis is defined as a process of cleaning, transforming, data to discover useful information for project decision-making. Analysis data is the process of preparing data for analysis by removing or modifying data that is incorrect, incomplete, irrelevant, duplicated, or improperly formatted. The purpose of data analysis is to extract useful information, taking the decision based upon the data analysis and lastly derive conclusions based on the data.

8) REPORT WRITING

Reports cover a varied range of topics but usually focus on transmitting information with a clear purpose, to a specific reader. A report is a result of research and analysis of data. Requirements for the precise content of a report should refer to specific guidelines. Reports may contain some of the following elements, introduction, literature review, methodology, findings and conclusion. Students required to write short reports and also in engaging video format for Pitex Innovation 2020. Good final reports are documents that are accurate, objective and complete. Essentially, it's must be well-written, clearly structured to meets examiner expectations.

9) FINISH

Completing and delivering a project invites learning something meaningful that helps the project move forward. The greatest obstacle known to finish what that has started is anxieties, doubts and hesitation. Achieving an end product and something excellent comes with expected issues to arise and need to deal with it empathetically. Doing so helps learn what to improve, and it gives the project a fighting chance to make a difference.

3.4 BUDGET CALCULATION

prepared by khairi auni

No	Materials/Equipment	Quantity	Price
1	Headphone with Mic	1	RM18
2	USB Microphone	1	RM12
3	Bluetooth Receiver	1	RM18
4	Universal earpad cushion	2	RM6.00
5	Speaker Cable	1 meter	RM0.80
		Total	RM60.80

Table 3.4 – Budget calculation

3.5 PROJECT ACTIVITY

Project Activity	Weeks													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Briefing and Project Planning														
Material Selection Pemilihan bahan yang menepati kehendak dalam penghasilan produk ini														
Materials Purchase Pembelian barang merujuk kepada pemilihan yang dibuat agar tiada pembaziran yang berlaku														
Project Design Penghasilan design circuit dapat membantu sekiranya berlaku sebarang kerosakan dalam pendawaian														
Method Selection Kaedah yang digunakan amat penting agar tiada sebarang permasalahan yang berlaku														
Report Writing Penghasilan report yang merangkumi 5 chapter yang dihasilkan oleh setiap kumpulan dalam masa yang diperuntukkan														
Video and Slide making Video disediakan yang sesuai dengan pemasaran produk yang bakal dipertandingkan pada minggu ke 10														

Table 3.5 – Project activity

	Planning
	Actual

CHAPTER 4

4 RESULT

4.1 INTRODUCTION

For this chapter, we combine data from the questionnaire of the telephone kits Bluetooth system. This data is very important for this project to know that our project it's suitable for all society. After getting all of this data, we analyse every single thing that can make it perfect.

4.2 ADVANTAGE & DISADVANTAGE

prepared by Muhammad shaffuan

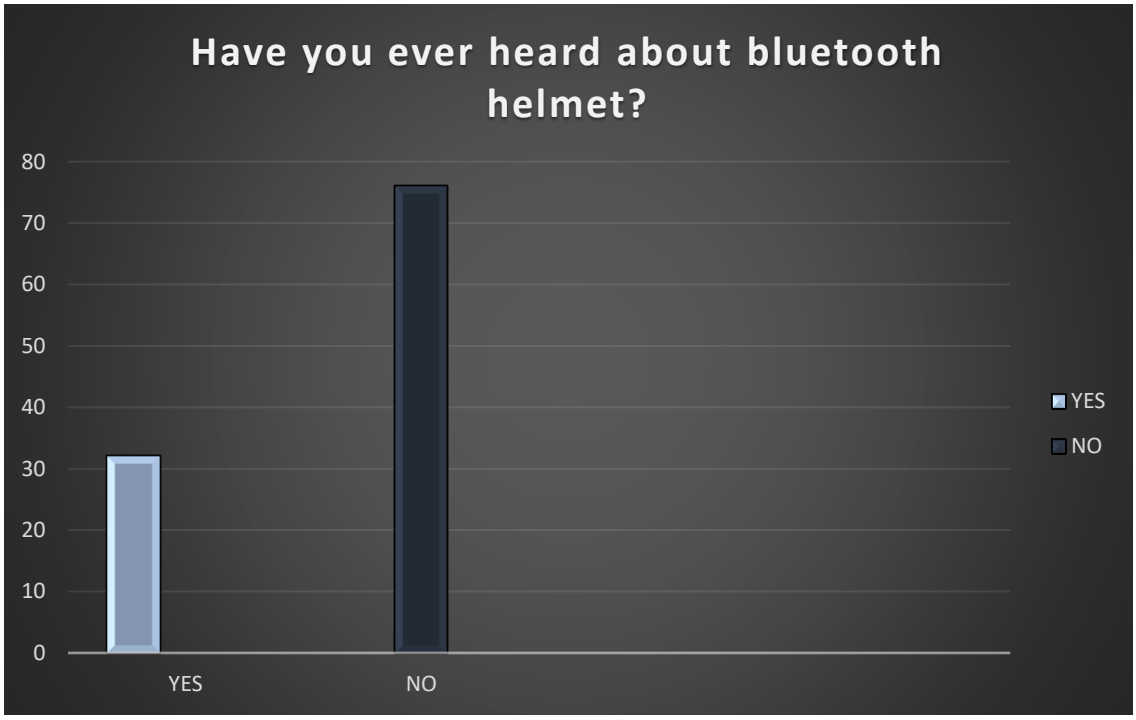
Every project has its pros and cons, the pros of this project are will help our rider to be more safety while riding a motorcycle and also to minimize the accident that relates to a motorcycle. Also, this product will make it easier for the community to communicate phone calls while riding a motorcycle and indirectly be able to keep motorcyclists safety to stop by side the road.

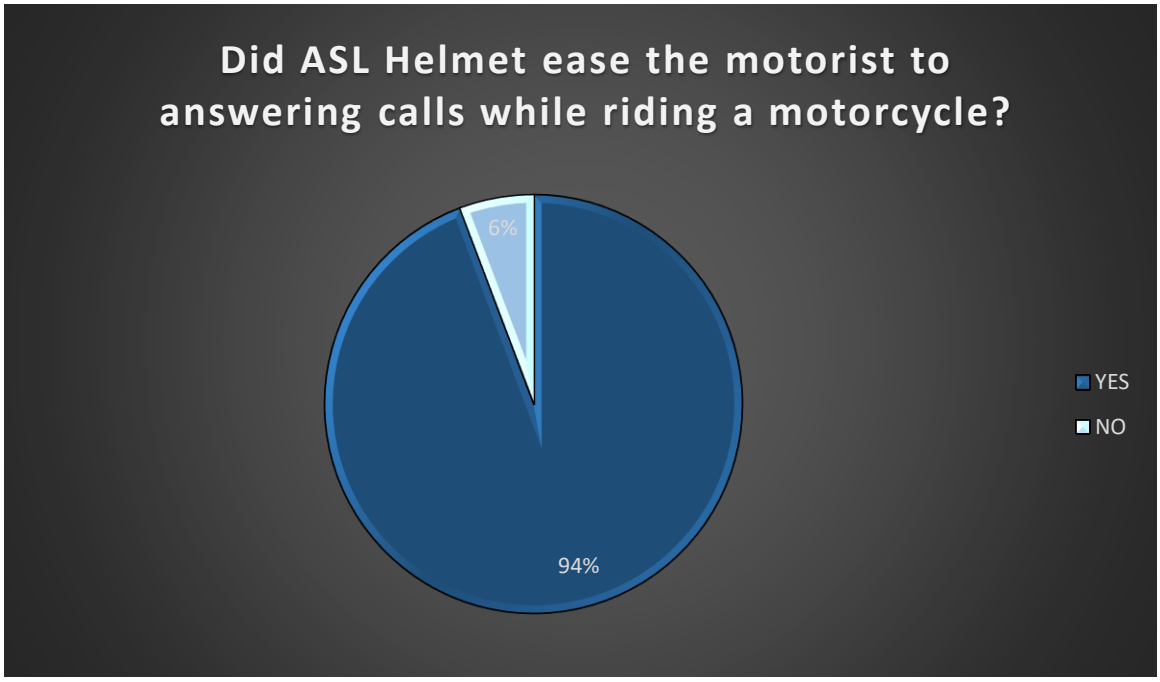
However, the cons or disadvantages must be improved or change for the future so that we could enhance the good and very efficient products that hardly find a disadvantage of the project. Each new product must have certain aspects that are needed improvement that needs to be done to raise the value of its product. As in our products requires an addition in terms of wires that are easily unplugged. We will find the best solution to solve this problem.

4.3 ANALYSIS

prepared by Muhammad shaffuan

This is one of result from the questionnaire:





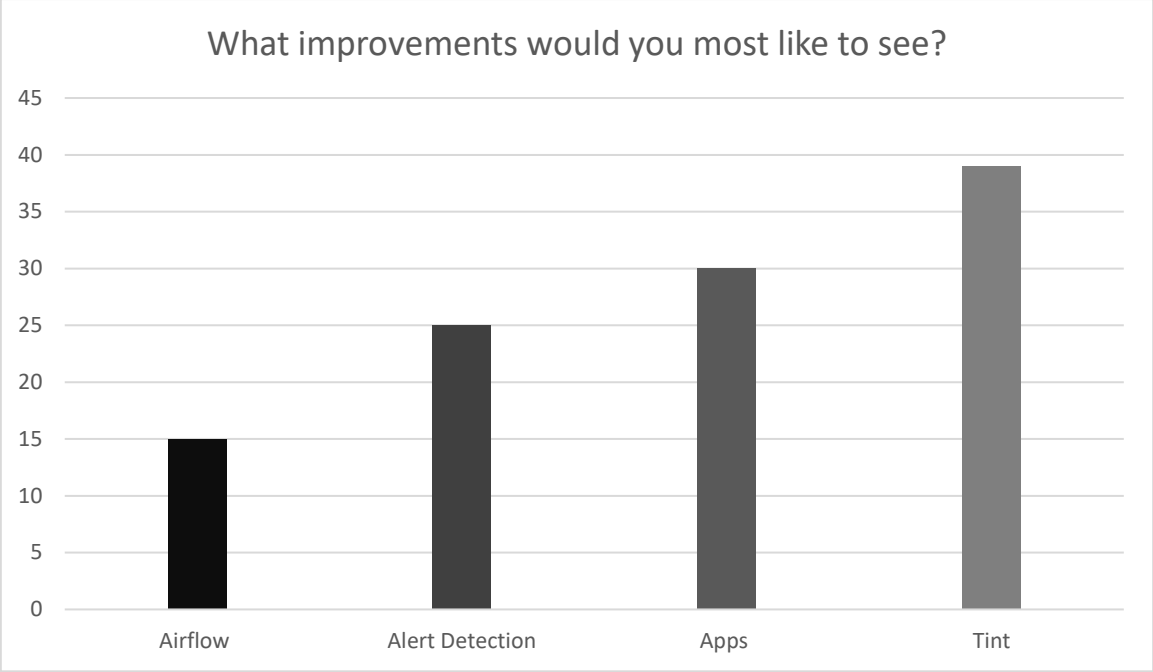


Figure 4.3.1 – Result

For the result, we combine the data from the questionnaire of the telephone kits Bluetooth system. This data is very important for this project to let us know that our project is suitable for all society. After receiving all of this data, we analyze every single thing that can make it perfect. Every project has its pros and cons, the pros of this project are will help our rider to be safer while riding a motorcycle and also to minimize the accident that relates to a motorcycle. However, the cons must be improved or change for the future so that we could enhance the good and very efficient products that hardly find a disadvantage of the project.

From the data, we analyse that 94% agreed that our asl helmet can ease the motorist to answer calls while riding a motorcycle and 6% did not agree that asl helmet can ease the motorist.

4.4 CHAPTER'S SUMMARY

As a conclusion for this chapter, the analysis and findings have been made. This ASL Helmet a lot of advantages however there are every cons to pros. Hence, the challenges are taken as a room for improvements and more developments for future generation and well as to enhance their knowledge on the project we carried out. The test run is carried out to determine the fullest potential of ASL helmet and it is proven that very strong and stiff. The relationship is well shown in the grafts.

CHAPTER 5
DISCUSSION

5.1 INTRODUCTION

The conclusion allows presenting the last word on the issues and innovation have raised in the report paper which is to demonstrate the importance of the project and opportunity to make a good final impression on a positive note. The conclusion also is intended to help the reader understand the project should matter after finished reading the paper.

This chapter covers the conclusion for the overall of this project. The conclusion will be concluded the future recommendation and improvement for future innovation with a better result for the Bluetooth system. In promoting a good explanation, the following sections also present the discussion of the project and recommendations to improve quality.

5.2 DISCUSSION

prepared by khairi auni

Throughout this project, the product was a progress from the rough draft to the polished product. It encourages creativity in creating the project and improve the existing project to be more affordable and user-friendly with new fabrication methods. The Innovation of ASL Bluetooth kits is the slender design makes it concealed and comfortable inside the helmet yet significant towards road safety.

The ASL Helmet positively tested as quick and easily paired to the smartphones but importantly, fit any motorcycle helmet. The effectiveness of the project used during riding motorcycles which is it allows having a hands-free phone conversation and listening to phone media. The project has the potential to be supplemented to the motorcycle enthusiasts or even the delivery service representative. Advertising and commercialization are recommended to help informs the customers about the ASL Bluetooth kits availability in the market.

5.3 PROBLEM

prepared by khairi auni

In the life cycle of any project, there will almost always be unexpected problems and questions that crop up because every project is different and unique. Most importantly, deal with the problem quickly and effectively.

- The circuit board was burn due to hot temperature during soldering that heat around 300°C. Reliable operation of a circuit with soldered connections depends on good soldering practices.

- During product testing, technical difficulties occur, which is the sound only coming from the right side due to faulty wiring that comes loose from their terminals. Resolder joints on the left side of the speaker that comes loose referring to the block diagram drawing provided

- When disassembling the speaker from the headphone, It was not easy to dislodge every component, and as a result, several elements were damaged.

- ASL Helmet should be okay in light rain or if you sweat on them when riding. But the product still needs properly dry before returning them to the case and could be damaged when it comes to heavy rain due to the product do not meet specific water resistance standards.

5.4 RECOMMENDATION

prepared by khairi auni

Based on the observations and explanations offered after completing the ASL Helmet Project, some suggestions to meet the product requirements and satisfy the user even more. However, increasing the quality and the features of products is not an easy task. Talking to users and prospects are ways that have helped the project and stayed inspired to employ a more strategic approach toward product development. The popular ways to make product improvements are to add new product features or improve existing ones.

- Wire are the essential components of any electrical system and could cause potential hazards. When it comes to electrical wiring and cable, make sure of getting the right materials that built on a solid foundation of quality, reliability and safety to improve the product.

- Design a waterproof product that able to give the customer some peace of mind that the product has a chance of still working even when riding in rainy condition.

- There's always room for improvement, and build an application with a lot of options to control connectivity between helmet Bluetooth kits and phone. A Bluetooth control panel was sorely lacking a useful feature that offered an opportunity to create an even better phone application.

- Listen to user feedback and improving the project based on that feedback of the survey before starting the project, probably the driving force to the success.

- Choosing the right colour can help the product stand out to ensure differentiation from entrenched competitors and consumers' impressions of a brand.

CONCLUSION

A plan will not happen by itself. The process of preparing a carefully designed project is quite tricky because of the various obstacles and problems. Additionally, improving students existing skills while spends quality time learning new things. The supervisor is someone responsible for monitoring progress and chasing up overdue activities of the project.

This report has documented the development, features, method and use of the ASL Helmet as a complete communications system that can be utilized and benefited to everyone. The design challenges of the new learning framework which is based on The Fourth Industrial Revolution as the production by integrating the Internet of Things are summarized in the paper

Specifically, ASL Helmet introduces a new helmet Bluetooth kits development composed of Bluetooth receiver and a set of headphone to provide wireless communication on two wheels a bit easier. The product adopts the design of the well-developed module that's ready to go right out of the box. Eventually, create new opportunities to market and sell the products to interested customers.

REFERENCE

[1] Kimura, T. (2010). (12) Patent Application Publication (10) Pub. No.: US 2010/0226505 A1. 1(19).

[2] Ng, P. E. F. (1990). United States Patent (19) U . S. Patent. 19.

[3] Application, F., & Data, P. (2008). (12) United States Patent. 2(12).

[4] The device, A. (2007). (12) Patent Application Publication (10) Pub. No.: US 2007/0177741 A1. 1(19).

[5] Rong, X. U. X. (2010). (12) Patent Application Publication (10) Pub. No.: US 2010/0069002 A1. 1(19).

[6] Khaja, M., Aatif, A., & Manoj, A. (2017). Smart Helmet Based On IoT Technology. 5(Vii), 409–413.

[7] BE - LINK: Bluetooth Surround Sound for your Helmet. (2016, December 22). Retrieved from https://www.kickstarter.com/projects/be-bop-earbuds/be-link-bluetooth-surround-sound-for-your-helmet?ref=discovery&term=helmet

[8] Kamu, T. B., & Alasan Kenapa Kamu Harus Menggunakan Headset Gaming. (2017, November 20). Apa Itu Noise Cancellation dan Bagaimana Cara Kerjanya? Retrieved from https://getective.com/noise-cancellation-dan-bagaimana-cara-kerjanya/

[9] The 12 Best Bluetooth Motorcycle Helmets. (2019, July 31). Retrieved from https://improb.com/best-bluetooth-motorcycle-helmets/

[10] Roomi, M. (1970, January 01). 4 Advantages and Disadvantages of Bluetooth: Drawbacksand Benefits of Bluetooth. Retrieved December 29, 2020, from https://www.hitechwhizz.com/2020/03/4-advantages-and-disadvantages-drawbacks-benefits-of-bluetooth.html

[11] Definition of audio jack. (n.d.). Retrieved December 29, 2020, from https://www.pcmag.com/encyclopedia/term/audio-jack

[12] Earl, B. (n.d.). Adafruit Guide To Excellent Soldering. Retrieved December 29, 2020, from https://learn.adafruit.com/adafruit-guide-excellent-soldering/common-problems

[13] Lee, L. (2019, March 02). What Is ARCAP Alloy? Retrieved December 29, 2020, from https://sciencing.com/arcap-alloy-7692052.html

[14] Roomi, M. (1970, January 01). 4 Advantages and Disadvantages of Bluetooth: Drawback and Benefits of Bluetooth. Retrieved December 29, 2020, from https://www.hitechwhizz.com/2020/03/4-advantages-and-disadvantagesdrawbacksbenefits

[15] What is Soldering – The Fundamental Guide. (n.d.). Retrieved December 29, 2020, from https://makerslegacy.com/what-is-soldering/

[16] What is Welding? - Definition, Processes and Types of Welds. (n.d.). Retrieved December 29, 2020, from https://www.twi-global.com/technical-knowledge/faqs/what-is-welding

APPENDIX