



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SAFE AIRPORT TROLLEY

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Power) with Honours.

by

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Power) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Di Lapangan Terbang, troli merupakan sesuatu alat yang digunakan untuk membawa bagasi penumpang dari sesuatu tempat ke sesuatu tempat. Troli pintar lapangan terbang ini dicipta dengan ciri-ciri keselamatan yang dapat membantu pengguna troli untuk mengelak sebarang pelanggaran di lapangan terbang. Penggunaan Arduino adalah untuk mengawal pergerakan troli. Projek ini terdiri daripada dua bahagian utama iaitu perkakasan dan perisian. Bahagian perkakasan adalah bahagian yang dilengkapi dengan litar arduino dan rangka troli. Manakala bahagian perisian untuk projek ini pula ialah dengan menggunakan perisian yang diprogramkan Arduino bersama sensor sebagai peranti keselamatan untuk troli ini. Selain itu, troli ini juga dilengkapi dengan butang suis sebagai peranti kemasukan kepada mikrokontroler untuk mengawal DC motor dan juga dilengkapi dengan roda getah untuk menggerakkan troli. Sensor adalah peranti yang digunakan untuk melindungi troli dan juga untuk mengelakkan daripada berlaku sebarang pelanggaran di lapangan terbang apabila pengguna kehilangan perhatian mereka semasa mengendalikan troli. Sensor juga digunakan sebagai peranti kemasukan kepada mikrokontroler untuk mengawal troli. Apabila sensor mengesan sebarang halangan berhampiran troli, troli secara automatik akan berhenti dari sebarang pergerakan. Dengan mencipta projek ini, troli dapat digunakan di lapangan terbang dengan lebih selamat dan memudahkan pengguna untuk membawa bagasi dan beg pakaian masing-masing yang lebih berat menggunakan bantuan motor yang akan menggerakkan troli. Rangka troli diperbuat menggunakan keluli tahan karat.

ABSTRACT

In airport, trolley is the must for transporting passenger luggage from one point to another. This safe airport trolley is being developed with safety features that can help to avoid collision. The use of Arduino is to control the movement of the trolley. This project consists with two main parts which is hardware and software. The hardware parts were developing the interface circuit between Arduino and the trolley. While the software parts for this project is using programmable software with the sensor as safety device for this trolley. Furthermore, this trolley also will be equipped with switch button as input device to the microcontroller to control the DC motor and rubber wheels to move the trolley. The sensor is a device to use to protect the trolley and to avoid any obstacle at the airport when users lose their attention in handling the trolley. The sensor is use as an input device for the microcontroller to control the trolley and if the sensor is detecting any obstacle near the trolley, the trolley will automatically stop any movement. By developing this project, the application or implementation of this Safe Airport Trolley can be use at airport to make the traveller convenience to push the trolley to carry their individual luggage and suitcase easier and when they bring heavy bags, the trolley motor will work to move the trolley easily. The trolley is made by stainless steel or aluminium alloy.

DEDICATION

I would like to the dedicate this project to almighty “Allah” who gave me capability, energy, strength, spirit and patience to complete this bachelor’s degree project. To my family especially my parents who always support, understanding and care about me. It a great pleasure to express my profound sense of gratitude to my supervisor for always give me an idea, advice, guidance, constant encouragement and all other supports throughout this project work and preparing this project report successfully. I am really benefited from his excellent supervision. I would like to thanks to all of our friends and those who always helped me and gave me mental support at different stage in different moment in my project.

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I am also wished to dedicate this project to my parent and my family who have given me strength and moral support until the end of this semester. Last but not least, I would like to thank to those individuals who have directly or indirectly involved and generously shared their knowledge and idea in order to complete this FYP report.

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LIST OF SYMBOLS

μF	-	Micro Farad
KG	-	Kilogram
s	-	Seconds
V	-	Voltage
cm	-	Centimetre
mA	-	Milli Ampere

LIST OF ABBREVIATIONS

IDE	-	Integrated Development Environment
DC	-	Direct Current
FYP	-	Final Year Project
LGPL	-	Lesser General Public License
GPL	-	General Public License
USB	-	Universal Serial Bus
LED	-	Light Emitting Diode

CHAPTER 1

INTRODUCTION

This chapter will explain the project's overview, goals, problem statement, and scope. Trolley is the device that will be used to transport the load or the material from one point to another. Baggage trolley or luggage trolley is a small vehicle for passengers to transport individual luggage around the terminal building. Sylvan Goldman invented the baggage cart by supermarket entrepreneur and shopping cart inventor. The carts are available at airports, train stations, large bus stations or luggage transportation hotels and may be free of charge. The trolleys are usually owned by the airport company. Airport trolley or Baggage carts are usually made from steel and equipped with three or four wheels. They are usually equipped with a brake for safety reasons. Usually, the handle has to be pushed down to move the cart. In the interests of safety, please don't let children ride on the trolleys.

1.1 Project Overview

Development of Safe Airport Trolley is a project which is based on using Arduino as microcontroller as a memory store to control the movement of the trolley. This project also completes with safety features. Safety feature means the trolley will be equipped with sensor to avoid the obstacle. The sensor will function as an anti-collision detector component. This project is intended to upgrade and modify the available airport trolley that use manual handling and with the manual braking system. Apart from this, microcontroller Arduino will be program and motor will be used to control the movement

of the trolley during long distance to the departure gate and the sensor as a device for braking system. The switch button will control the trolley movement forward, right and left. The trolley will be equipped with three wheels. This trolley will have three sensors that places on front and side of the trolley. The first sensor will detect any obstacle in-front of the trolley and if the sensor is detected any obstacle the trolley can't move forward but still can move to right or left. Another two sensor will use at side sensor and will function as same as first sensor situation when detected. By developing this project, it will increase the convenience level for the airport trolley users and the trolley will be more reliable, safe, easy to use, passenger satisfaction guarantees and even smooth the operation of daily airport operations.

1.2 Project Objectives

Airport trolley has been majorly produced by a few companies from China with more than 15 years' experience of producing an airport trolley. The trolley has been shipped or supplied for more than 90 international airports all over the world. The development of safe airport trolley is a project that has new technology feature to renew the existing trolley. The main goals of the project is:

- To design and implement the airport trolley complete with programmable device microcontroller system (Arduino) and motor to control the movement (forward, right, left and reverse).
- To design a trolley with safety feature anti-collision system that can detect and avoid the obstacle that may create any accident or harmful.

In order to achieve the objective of this project, there is several knowledges about the sensor, microcontroller circuit, motor and compatible software is needed to be determined.

1.3 Problem Statement

Nowadays, as we know, the number of people at airport is increasing and the numbers of trolley user will also be increasing because high of air transport demand. All the travellers will bring their baggage and heavy luggage to their destination. The probability of having any accident at the airport also will increase. Some time, they will feel inconvenience in bringing their things as it is tiring to push the trolley when the trolleys were fully loaded with heavy luggage. There are a few reported about the trolley hitting others traveller or trolley hitting another trolley as shown in Figure 1. The statistic number of accidents from 2015 to 2018 show that the number of accidents increasing year by year. The existing trolley at the airport must handle manually and has to be pushed down in order to move the trolley, however the handle will activate the break when the handle is releases. This thing will create difficulty to the traveller to move the trolley when they must always push down the handle to move the trolley. Besides that, they sometimes faced with the collision when they lose their attention in handling the trolley. Apart from that, this development of safe airport trolley will be built to make traveller feel easy and reduce collision at airport. By creating to this project, user will save their energy from pushing their trolley, but it will move by itself and can avoid any obstacle and the most important is safe from any accident.

Table 1.1: No of Accident From 2015 to 2018

Year	2015	2016	2017	2018
No of Accident	29	34	40	42

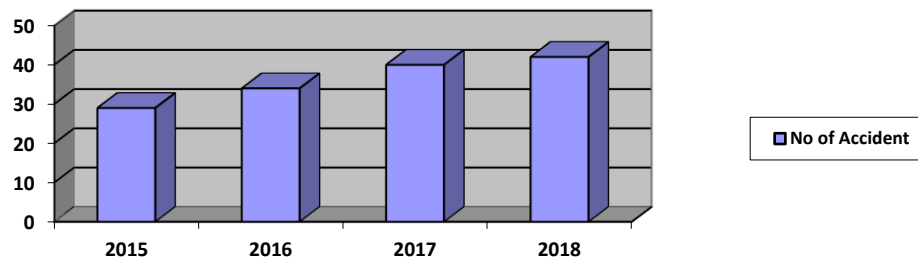


Figure 1.1: Statistic number of Accident at Airport

1.4 Project Scope

The scope of this project is to design a prototype model of safety airport trolley that capable to move forward, left, right and reverse and fully equipped the airport trolley with safety system that can detect and avoid obstacle by using sensor and programmable microcontroller. It consists of electronic circuit with Arduino, movement button switch and power window motor. The functional of Arduino in this project is to control power window motor as a device to control movement of the trolley and the sensor as a device to detect the obstacle in the trolley. This project will implement Arduino as main microcontroller as the main part or component to control the trolley.