



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF REAL-TIME BASED SMART
ASSISTANCE INTERFACES AUDIO RECEIVER FOR
BLIND PEOPLE BY USING OBJECT RECOGNITION
METHODS**

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

by

HASVINII A/P BASKARAN

B071610806

951010-14-6534

**FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING
TECHNOLOGY**

2019

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: DEVELOPMENT OF REAL-TIME BASED SMART ASSISTANCE
INTERFACES AUDIO RECEIVER FOR BLIND PEOPLE BY USING OBJECT
RECOGNITION METHODS

Sesi Pengajian: 2019

Saya **Hasvinii A/p Baskaran** mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (X)

SULIT* Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972.

TERHAD* Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan.

TIDAK TERHAD

Yang benar,

Disahkan oleh penyelia:

.....

Hasvini A/p Baskaran

.....

Dr Jamil Abedalrahim Jamil Alsayaydeh

Alamat Tetap:

Cop Rasmi Penyelia

F1846 Jalan Sation,

48100, Batu Arang,

Selangor.

Tarikh:

Tarikh:

*Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini

DECLARATION

I hereby, declared this report entitled DEVELOPMENT OF REAL-TIME BASED SMART ASSISTANCE INTERFACES AUDIO RECEIVER FOR BLIND PEOPLE BY USING OBJECT RECOGNITION METHODS is the results of my own research except as cited in references.

Signature:

Author : Hasvinii A/p Baskaran

Date:

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 Engineering Technology Computer (Computer System) with Honours. The member of the supervisory is as follow:

Signature:

Supervisor : Dr Jamil Abedalrahim Jamil Alsayaydeh

Signature:

Co-supervisor: Dr Adam Wong Yoon Khang

ABSTRACT

This project entitled development of Real-Time Based Smart Assistance Interfaces Audio Receiver for Blind People by using Object Recognition Method. Object recognition method is computer vision technique for identifying objects in images. Therefore, the main purpose of this system build is to put an end to blindness by constructing automated hardware with microcontroller that can confirm a visually impaired people to detect things or persons in front of them instantly and narrate what is in front of them through audio. This project contains Raspberry Pi that receives data from camera and processes on it. In addition, blind people will listen to voice narration through audio receiver. The major objective of this project to provide blind pedestrians a cost effective smart assistance to explore and feel the world independently. The second objective is to provide a portable device that is easy to utilize. The third objective let user to recognize object without touching and it will narrate the object in front of them. The camera module fixed in raspberry Pi will capture image and processor processes on it. After image, processing the narration will be send through audio receiver. This project will be very useful and assist a blind people to explore the environment by avoiding obstacles.

DEDICATION

To my beloved parents, thanks for the help, concern and understanding while I am in developing this project.

ACKNOWLEDGEMENTS

I would like to thank my supervisor, Dr Jamil Abedalrahim Jamil Alsayaydeh for his guiding during my final year project period so that I will be able to do through the Projek Sarjana II subject successfully. I also would like to thank my co-supervisor for his concern and care about my project during my final year project period. Besides that, I would like to give my appreciation to my final year project panels, Dr. Fara Ashikin Binti Ali and Madam Dayanasari Binti Abdul Hadi for giving their time to observe my presentation and evaluate my work. I want to thank them because giving a recommendation and advices in this project.

In addition, I would like to thank to my beloved parents. My father Baskaran Nadeson and my mother, Kanta Perumal for their understanding and giving support during my hardship. Thanks also to them for their patience to understand me.

Lastly, I would like to thank my beloved friends at Universiti Teknikal Malaysia Melaka who giving me support, advices, and help me when I need them throughout my project.

TABLE OF CONTENTS

	PAGE
TABLE OF CONTENTS	ix
LIST OF TABLES	xiii
LIST OF FIGURES	xiv
CHAPTER 1 INTRODUCTION	1
1.1 Introduction	1
1.2 Project Background	2
1.3 Problem Statement	3
1.4 Objective	5
1.5 Scope	6
1.6 Project Significance	6
1.7 Expected Output	7
1.8 Conclusion	7
1.9 Project Organization	7
CHAPTER 2 LITERATURE REVIEW	8
2.1 Introduction	8
2.2 Vision and Blindness	8
2.3 Visually impaired	9

2.4	Facts and Finding	10
2.4.1	Eyecane and Eyemusic	10
2.4.2	Blitab	11
2.4.3	Brainport V100	12
2.5	Comparison Between Existing system and updated system developed	13
2.6	Domain	14
2.6.1	Raspberry Pi Camera Module	14
2.6.2	Microcontroller	18
	2.6.2.1 Arduino Uno	19
	2.6.2.2 Raspberry Pi 3	20
2.7	Conclusion	21
CHAPTER 3	METHODOLOGY	22
3.1	Introduction	22
3.2	Planning	24
3.2.1	Collect Important Data	25
3.2.2	Software and Hardware requirement	26
	3.2.2.1 Software requirement	26
	3.2.2.2 Hardware requirement	27
3.3	Implementation	27
3.3.1	Implement the project	28

3.3.1.1	OpenCv	28
3.3.1.2	Implementing Hardware	28
3.3.2	Testing	29
3.3.2.1	Raspberry Pi 3 Model B+	30
3.3.2.2	Pi camera module	30
3.3.2.3	Flowchart of PSM II	31
3.3.2.4	Flowchart of the system	34
3.4	Conclusion	35
CHAPTER 4	36	
4.1	Introduction	36
4.2	Implementation and Testing	36
4.3	Testing phase	37
4.3.1	Step of configuring Pi camera	37
4.4	Implementation phase	40
4.5	Project result and analysis	47
4.6	Conclusion	51
CHAPTER 5	52	
5.1	Introduction	52
5.2	Observation of the project	52

5.3	Recommendation	53
5.4	Summary	53
APPENDIX	54	
REFERENCES	58	

LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.5.1	The difference between the existed systems had been listed out in the table.	13
Table 4.5.1	Average precision for all classes	50

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.6.1	Hardware specification	16
Figure 2.6.2	Software features	17
Figure 2.6.3	Picture of Raspberry Pi Camera Module	17
Figure 2.6.4	Picture of Arduino Uno	19
Figure 2.6.5	Picture of Raspberry Pi 3 model B	20
Figure 3.1.1	Steps of Methodology	24
Figure 3.2.1	shows the label of OpenCV	26
Figure 3.2.2	shows label of Python 3.0	27
Figure 3.3.1	Block Diagram for the project	29
Figure 4.3.1	command to enter into default option changer.	37
Figure 4.3.2	selecting the interfacing options to configure camera	37
Figure 4.3.3	selecting camera option	38
Figure 4.3.4	select yes to enable camera	38
Figure 4.3.5	confirm enabling camera	39
Figure 4.3.6	command to enter to capture a still	39
Figure 4.3.7	image that captured by command above and saved as image.jpg	39

Figure 4.4.1 the line of command creating launcher	40
Figure 4.4.2 the line of importing necessary packages	41
Figure 4.4.3 the argument parse	41
Figure 4.4.4 initialization of performance	42
Figure 4.4.5 initialize video stream	42
Figure 4.4.6 loop frame	43
Figure 4.4.7 loop the detection	44
Figure 4.4.8 write text file	45
Figure 4.4.9 frame display	45
Figure 4.4.10 FPS information display	45
Figure 4.4.11 shows object detected in frame and confidence percentage value of detected objects with label of classes	46
Figure 4.4.12 show that after video stream started the object will detected and the label classes will printed with detection confidence percentage value	46
Figure 4.4.13 voice narration	47
Figure 4.5.1 Iou calculation	48

CHAPTER 1

INTRODUCTION

1.1 Introduction

Physical movement is a challenge for blind pedestrians. Visual disability is a standout amongst the most extreme obstacles that may affect a person. Designing a gadget to help blind pedestrians is not something new. Various technologies have used to help the visually impaired and as innovations increasingly propelled, thoughts come up to make some intriguing answers for help the visually impaired. In any case designing a device to unravel this disability able to deal it reason yet is that the aid becomes a so-called luxurious item would not be most developing nations.

As indicated by the World Health Organization (WHO), universally it is evaluated that around 1.3 billion individuals live with some type of vision debilitation. Roughly, 80% of all vision debilitation all-inclusive is viewed as avoidable. Additionally, WHO appraises that most visually impaired youngsters would require, for self-improvement, visual recovery intercessions. Nevertheless, it more often than not accompanies enormous hospital expenses and with 90% of the outwardly debilitated people on the planet living in low pay settings, visual restoration is not the best alternative for all.

For full psychological improvement and better independence without these costly bills, blind pedestrians need a type of manual for assistance with their daily activities. This guide might be as a walking stick, a guide dog, or even a human individual right hand. Someone else may not generally be accessible and not constantly favoured for a visually impaired individual that is searching for freedom.

The smart assistance audio guidance to user can assist them to know what is in front of them and help them visualise the environment around them. Camera in processor will capture image, the image will be processes, and a voice narration will be send through audio receiver.

The main motive to improve this project to solve the problem faced by blind pedestrians to explore the real world independently. In addition, to enable the blind pedestrian to explore and use current technology.

1.2 Project Background

The title of this project is Development of Real-Time Based Smart Assistance Interfaces Audio Receiver for Blind People with Audio Guidance by using Object Recognition Method. This is a system that used to assist blind people with voice narration which processed by the raspberry pi processor. The portable electronic device is reasonable to give voice narration informing what them is in front. An important objective is to provide a portable device that is simple to use and a low cost affordable smart assistance to blind people. Another goal is to extend the computerized electronic travel aid for the blind

people by rising into the real-time object recognition technology. This blind guidance system is solid and financially perceptive.

Real-time based smart assistance interfaces audio receiver for blind people with voice narration by using object recognition methods is develop to provide blind pedestrians a cost effective smart assistance to explore and feel the world independently. Audio guidance help them to know what is happening around them and it help them to visualise the surroundings. By using real-time, the system will recognize the object in real-time with fast interference. This chapter will give an overview about the background study of the project. Apart from that, the objective of the project, problem statement, and scope have been discussed.

1.3 Problem Statement

Visually impaired people have issues with walking and avoiding obstacles in their daily activities. Generally, this people use guide sticks to detect barrier and obstacles in front of blind people. In this way, visually impaired people cannot actually recognize what kinds of obstacles are in front of them and should just rely upon guide sticks and encounters to walk securely and in the ideal way. Moreover, when in unfamiliar situations, blind people frequently require help and guidance in the form of volunteers or guardian to guide and explain the surrounding environment to them. Blind persons cannot completely rely upon a guide stick to get comfortable with their environment.

However, by implementing this development of real-time based smart assistance interfaces audio receiver for blind people by using object recognition methods project

can assist the blind people to avoid obstacles in front of them by using object recognition methods by sending voice narration that will be send to audio receiver headset. A camera module interfaced with raspberry pi fixed in bag strap of the blind pedestrians. Camera will capture front environment and the data will transferred to processor to process the image. Object recognition methods will used in this project. Once the image processed the context, information voice narration will be send to the user through audio receiver.

In this project, object recognition method used for image processing interfaced and Raspberry Pi used to process video and detect the object in it. Object recognition method, enables image processing changed and gTTS will create voice narration and make the device more useful and convenient with affordable price.

1.4 Objective

There are three objectives are carried out from this project to make it successful.

The objectives are:

- i. To provide blind pedestrians a cost effective smart assistance to explore and feel the world independently.
- ii. To provide a portable device which is easy to utilize
- iii. To let user to recognize object without touching and narrate the front surrounding they are in.

1.5 Scope

This project's scope is to build an embedded system that will function properly based on the objectives and problem statement faced in this project. The scope of this project is to provide blind pedestrians a cost effective smart assistance to explore and feel the world independently. Real-time object recognition chosen for the development because it allow recognizing and detecting multiple object within a video frame and identifying the object in it. Apart from that, the project will use a Raspberry Pi to connect with camera. Raspberry Pi also acts a platform in this project because it is simple to develop. Raspberry Pi, is a simple use gadget and easy to be programmed because the programming used is open source. To dominate computerized component for interactive physical system building and explore the Internet of Things (IoT) Raspberry Pi come up with a set of GPIO (General purpose input/output) pins .It also function as a proper desktop computer to build smart device.

1.6 Project Significance

This project is only for those blind and visually impaired who need guidance to move in the real world and get to narrate the front environment to know what is in front of them. Blind pedestrians, encouraged to have this project in their daily life to explore and feel the world independently. In addition, it also cost effective and can owned by everyone. It also can guide blind pedestrians without a guardian with them all the time

1.7 Expected Output

This project can help blind pedestrians by guiding them with voice narration that has generated from the image processing. The camera module interfaced with system will fixed in bag strap of the blind pedestrians. Camera will capture front environment and the data will transferred to processor to process the image. Object recognition methods will used in this project. Once the image processed the information through voice narration will be send to the user through audio receiver. Raspberry Pi can control the whole system in this project. Further research will conducted to make this project function better.

1.8 Conclusion

In conclusion, this project is about development Real-Time Based Smart Assistance Interfaces Audio Receiver for Blind People with voice narration by using Object Recognition Method created to assist blind pedestrians by using smart device and help them to feel the real world independently. The development of this project is based on objectives and problem statement before is used to be fulfil. This project will designed to solve the problem faced by blind pedestrians and are able to upgrade the innovation technology.

1.9 Project Organization

This part is simply briefing about the next chapter that will conducted in this project report. The next chapter is literature review. Literature review will shows about the further studies and research related to the project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This part will discuss regarding the literature review for the research that have done to gain as much as could be expected about the information comparable with this project. Each information for this part taken from the journals, academic article, books, and internet assets identified with the research topic. Concerning the studies of this project, information with respect to Raspberry Pi and camera module will be summarised in this topic and will be described in phrase of functionality, conditions, and characteristics of all the component used in this project. It used to further studies on the existing project of smart assistance for blind people.

2.2 Vision and Blindness

According to the research of Global data on blindness (Thylefors *et al.*, 1995) human vision is a significant gift for a person, but tragic loss of vision is getting the chance to be detectably ordinary these days. Visual deficiency may happen due to an infection, sickness, harm or various conditions that limits vision and due to this; they have to face lot of challenges in their daily activities.

Generally, visual deficiency affects a man's ability to self-explore outside surely understood environment and even walking around a busy street. It affects a man's ability and capacity to perform many employment obligations and practices outside of a

workplace, for instance, in academic and sport wise. A huge part of these social troubles limits a visually impaired person's ability to meet individuals, and this restrictive adds to low confidence of them.

In any case, innovation for the incapacitated has made different advances over the present years. The things they have been doing to help debilitated people to have the ability to stay with the advances that have been proceeding on the planet is proceeding enjoyably. This enables the handicapped to do fundamental things that we have thought to be an easily accessible errand.

2.3 Visually impaired

Based on the article of the visually impaired patient (Rosenberg and Sperazza, 2008) visual impairment, recognized as vision handicap or vision mishap, is a reduced ability to see to a degree that causes issues not fixable by standard methods, for instance, glasses. Moreover, put together the people who have a lessened vision since they do not approach glasses or contact lenses. Visual debilitation routinely described as a best-balanced visual sharpness of more deplorable than either 20/40 or 20/60. The term visual impairment used for completion or practically all out vision. Visual crippling may cause people difficulties with normal consistently works out, for instance, driving, examining, blending, and walking.

According to the article of (Abner G, Mario SP and Myhill C et al., 2002) the most broadly perceived explanations behind visual impediment globally are uncorrected refractive bumbles (43%), cascades (33%), and glaucoma (2%). Refractive slip-ups fuse near-sighted, far found, presbyopia, and astigmatism. Cataracts are the most notable