



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT AND IMPLEMENTATION OF REAL
TIME MONITORING SMART SHOE FOR VISUALLY
IMPAIRED USING RASPBERRY PI**

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

By

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APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing 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 honor. The member of the supervisory is as follow:

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ABSTRAK

Projek ini bertajuk pembangunan dan pelaksanaan pemantauan kasut pintar masa nyata untuk cacat penglihatan dengan menggunakan Raspberry Pi. Matlamat utama sistem ini dibina adalah untuk membantu golongan kurang penglihatan dengan membina perkakasan automatik dengan mikrokontroler yang dapat mengesahkan orang cacat penglihatan untuk mengesan halangan atau benda di hadapan mereka serta-merta dan membimbing mereka. Kasut pintar ini mengesan dengan menggunakan sensor ultrasonik. Projek ini mengandungi Raspberry Pi yang menerima data dari kamera. Objektif utama projek ini adalah untuk memberikan jarak sesuatu objek dan menghantar maklumat yang relevan kepada orang buta. Objektif kedua menggantikan rotan berjalan konvensional. Kemudian, objektif ketiga dapat mengesan lokasi pengguna menggunakan navigasi. Kamera yang disambungkan ke Raspberry Pi akan membantu penjaga pengguna untuk memantau pengguna dengan menggunakan aplikasi yang dicipta.

ABSTRACT

Eyes play imperative role in our daily life and it is a most valuable part in human body. This world is visible to us because we are blessed with eyesight. But there are some people who is sightless. This inability makes them to be dependent on others for their daily activities and limits their movement from one to another place. Technology helps the blind people to communicate with the environment, the communication process and the dissemination of information has become very fast and on a wider scale to include all parts of the world which greatly affected to the human life, thus increasing the ways of entertainment and comfort and reduced suffering and hardship in many things. This project presents an idea dealing the problems that is faced by blind peoples through this smart shoes. The main purpose of this project is to develop a device for real time monitoring smart shoe for visually impaired person. It means the real time video streaming by the pi camera can be viewed by the guardian of the user from android application. Other than that, object detection will be made by the ultrasonic sensor in specified distance to help the user to move freely without depending on others. The buzzer used will alerts the user when there is obstacle detected by the ultrasonic sensor. Therefore, this project is planned to replace the existing project in advanced way. So, the smart shoe is developed, programmed and tested for the predicted result. The system use object detection method by using ultrasonic sensor. Thus, this project is mainly proposed to enhance the existing project using Arduino.

DEDICATION

To my beloved mother and father, my family, my supervisor and my fellow friends, thank you for the support and help given to me on completing this project.

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LIST OF SYMBOLS

%	Percentage
C/C++	Programming

LIST OF ABBREVIATIONS

GB	Gigabyte
KB	Kilobyte
MHz	Megahertz
GHz	Gigahertz
LAN	Local Area Network
BLE	Bluetooth Low Energy
PoE	Power Over Ethernet
HAT	Hardware attached onTop
SD	Secure Digital
WI-FI	Wireless Fidelity
USB	Universal Serial Bus
LED	Light Emitting Diode
PIR	Passive Infrared sensor
V2	Version 2
P	Pixel
V	Voltage
PWM	Pulse Width Modulation
TV	Television
HDMI	High Definition Media Interface
RAM	Random Access Memory
GPU	General Processing Unit
CPU	Central Processing Unit
mA	Milli-Amphere
GSM	Global System for Mobile
Mac OS	Macintosh Operating System
OOP	Object Oriented Programming
IDE	Integrated Development Environment

CHAPTER 1

INTRODUCTION

1.1 Background

Based on general statistics approximately 285 million people at all stages are visually impaired and it also states that out of 285 million only 39 million are categories under blind or loss of visual. The significant reasons for uncorrected refractive errors (43%) and cataract (33%); the major cause of blindness is cataract (51%)(Stevens *et al.*, 2013).

The main challenge that facing by a visually impaired individual is to move around places without any assistance. Yet, there are still a lot equipments used by the visually impaired person to move around such as they use a walking cane, an assisting dog, or even a personal helper. Always depending on others isn't a good solution for them.

In conjunction, a device is developed to be a guide for the users such as smart shoe for blind people with object detection sensor which will help them move free and guardian of the user can view the user from anywhere they want. The user will move individually through alert signals given such as vibrations, beeps and audio warnings.

1.2 Problem Statement

Most of the times visually impaired person having difficulties in moving around without any assistances such as Walking stick, Assisting Dog or with the help of people around them. Navigation difficulties for the sightless people is they can simply walk in their own house because they know the things position in their house(Rozaliet *al.*, 2017). But commercial places are different for them. They can't identify the place where they are standing.

Blindness will be a big challenges to an individual where they can't participate in few activities as others. Apart From That, blindness impacts a person's ability to perform many jobs, which can limit their career options(Brady *et al.*, 2013). This kind of factors may affect them by financially, and their self establishment.

1.3 Objectives

The objectives of this project are:

1. The aim of this project is to develop a device for real time monitoring smart shoe for visually impaired person.
2. To analyze the performance of the device using Raspberry PI.
3. To study the importance of the developed device to visual impaired person.

1.4 Work Scope

This smart shoe will be developed to be effective for visually impaired individuals. The smart shoe is make user easy to move. The accuracy of the obstacle detection will be helpful to users. The users will observe by the guardians in any place they want using IoT. The components used to create the complete system will be efficient.

In this project, I decided to study the efficiency of the device where I will be using Raspberry PI. To implement this project, first I need to investigate the important of this device to visually impaired person and then create a simple design that can be used by all stage of age people.

1.5 Organization

This project focuses on development and implementation real time monitoring smart shoe for visually impaired person using raspberry pi. This report consists of five chapters. First, a short introduction to the problem, objective and scope are given in chapter one. Then, follow by chapter two literature reviews on existing methods adopted and various technologies that implemented in previous project. In the mean times, the comparison regarding pros and cons will be discussed. Next, the components and methods description that planned to use will be explained in chapter three. Furthermore, a brief of overview flow of the project may show here. In the chapter four, the results including data tabulation and project analysis will be shown then discussed. Finally, conclusion and future recommendation will be explained in chapter five.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter will explain the literature review for the analysis that has accomplished in order to obtain the objectives of this project. All the data and information for this part are derived from the journals, academic articles, books, and web resources that are related finding of the topic and will be clearly cited. As for the studies of this project, information about Raspberry Pi, the sensor will be summarized in this topic and will be explained in terms of functionality, specification, characteristics, the advantages and disadvantages of all the components used in this project. It has been used to further studies on the existing project of the smart shoe.

2.1 Facts and Finding

2.1.1 Domain

Smart shoe is the protection mechanism that will be used by the user to prevent them from engaging nearby objects as its main intention is to protect the user from unsafe surroundings. Apart from protecting the user, the mechanism is connected to the monitoring system which can be monitored at any place by the guardian of the user. Therefore, this smart shoe was developed to reduce the risk of people getting serious injuries.

The aim of this project is to measure the object and send information to blind people. When users are walking towards an obstacle or an object, this smart shoe will detect the object and alert the user with a buzzer. The sensor will be used in this project to sense certain characteristics of its surroundings. It will be a real-time assistance via video streaming. The system has a Raspberry Pi, an ultrasonic sensor, a Pi camera, and a buzzer.

2.1.1.1 Raspberry Pi 3 b+ module

Raspberry Pi 3 b+ was chosen for this project. The Raspberry Pi 3 Model B+ is the new item in the Raspberry Pi 3 range. It has a 64-bit quad core processor running at 1.4GHz, dual-band 2.4GHz and 5GHz wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and PoE capability via an isolated PoE HAT (Components RS, 2016). This can be used easily just by interfacing a mouse, keyboard, display, power supply, micro SD card along with installing Linux Distribution in it and that makes a fully-fledged computer where the user can run (RASPBERRY PI 3 VS ARDUINO - LEARN THE 6 AMAZING DIFFERENCES, 2019) every one of the applications from word processors and spreadsheets to games. The new board in Raspberry Pi 3 Model B is capable of playing 1080p MP4 video at 60 frames per second (Raspberry Pi Foundation, 2016). It has built-in Wi-Fi and Bluetooth which supports the wireless internet out of the box. The Pi 3 board helps remote updates to Pi and it can also share images of the operating system between different computer machines like the booting process can be straight away done by using a USB-attached hard drive or pen drive and also by supporting booting from a network-attached file system.