B071710736 BACHELOR OF COMPUTER ENG. TECH. (COMPUTER SYSTEMS) 2020 UTeM

DEVELOPMENT OF SAFETY CAR WINDOWS SYSTEM FOR EMERGENCY

IZZATY HAYANI BINTI ABDUL RAZAK

B071710736

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2020

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: DEVELOPMENT OF SAFETY CAR WINDOWS SYSTEM FOR EMERGENCY

Sesi Pengajian: 2020

Saya **IZZATY HAYANI BINTI ABDUL RAZAK** 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)

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

☐	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,

.....

IZZATY HAYANI BINTI ABDUL RAZAK

Alamat Tetap:

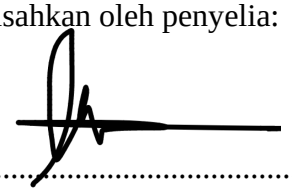
No 66A-B, Lorong Hj Mat Wahie,

Kg Padang Kunyit, 33300,

Gerik, Perak.

Tarikh: 12/2/2021

Disahkan oleh penyelia:



.....

TS. NIZA BINTI MOHD IDRIS

Cop Rasmi Penyelia

NIZA BINTI MOHD IDRIS
PENSYARAH
JABATAN TEKNOLOGI KEJURUTERAAN ELEKTRONIK DAN KOMPUTER
FAKULTI TEKNOLOGI KEJURUTERAAN ELEKTRIK DAN ELEKTRONIK
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Tarikh: 15/2/2021

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

*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 declare that this thesis entitled "Development of Safety Car Windows System For Emergency" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in the candidature of any other degree.

Signature :

Name : Izzaty Hayani Binti Abdul Razak

Date : 12/2/2021

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor of Computer Engineering Technology (Computer System) with Honours.

Signature :

Supervisor Name : Ts. Niza Binti Mohd Idris

Date : 15/2/2021

UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEDICATION

I would like to dedicate my completion work to those who are always giving me the strength and supported tirelessly to my beloved parents. They taught me to trust in Allah the Greatest and most merciful, believe in hard work, and afford that so much could do with this work. I believe in appreciating the little things in life. It would make us more grateful for what we have today. Life never meant to be easy. I have struggled and focused on achieving and doing my best to complete this work successfully. I would also like to thank my lecturers and my friends that have been my source of motivation to accomplish the task. Not forget to thank Universiti Teknikal Malaysia Melaka (UTeM) for giving me a chance to develop this project.

اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ABSTRACT

This project focuses on car windows used for children's safety in an emergency. Nowadays, many parents are working, and a load of commitment often causes careless parents. In this case, the rate of children cases being left in the car increase. There is also a situation where children are locked in cars. When that situation happens, people find it difficult to provide immediate assistance. This project aims to build a sound and vibration detection system using 'Arduino Uno'. In this system, car windows will automatically lower and produce a warning alarm when a sound or vibration wave is triggered by the child's crying and physical movement. The significance of using this system is it can alarm nearby people to help immediately when the child trap inside the car. The system responds to sound and vibration, such as crying or movement in the car. Furthermore, this system can be able to save the children's life.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ABSTRAK

Projek ini memfokuskan penggunaan tingkap kereta untuk keselamatan kanak-kanak apabila berlaku kecemasan. Trend zaman kini, ramai ibu bapa bekerja dan beban tugas menyebabkan kerapkali ibu bapa cuai. Rentetan ini, kadar kes kanak-kanak ditinggalkan di dalam kereta semakin meningkat. Kerap kali juga berlaku di mana kanak-kanak terkunci di dalam kereta. Apabila berlaku perkara-perkara ini, orang ramai sukar memberi bantuan dengan kadar segera. Projek ini bertujuan membina satu sistem pengesan bunyi dan getaran menggunakan 'Arduino Uno'. Dalam sistem ini, tingkap kereta akan turun secara automatik dan mengeluarkan bunyi penggera amaran apabila terdapat gelombang bunyi atau getaran yang terhasil dari tangisan dan pergerakan fizikal kanak-kanak. Kesan penggunaan sistem ini dapat membantu orang ramai memberikan bantuan dengan segera jika kanak-kanak yang ditinggalkan bersendirian memberi tindakbalas seperti menangis atau bergerak di dalam kereta. Secara tidak langsung, sistem ini dapat menyelamatkan nyawa kanak-kanak.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ACKNOWLEDGMENTS

First of all, honor and thanks to Allah, the Almighty. His countless blessings, all my effort works successfully to accomplish this project.

I would like to offer my sincere and most profound appreciation to my supervisor and lecturer, Ts. Puan Niza Binti Mohd Idris and Ts. Shamsul Fakhar Bin Abd Gani for their patience, guidance, support, and motivation to accomplish this project. Their advice provided and giving me opportunities to complete this Projek Sarjana Muda (PSM). Thanks to them as well for their afford and sincerity, it deeply inspired me.

I appreciate hugely to my beloved parents, Mr. Abdul Razak Bin Mat Wahie and Mrs. Noorul Dalilah Binti Harun. They always understand and support me whenever I worry about the hectic schedule while finishing this project. I would also like to thank my best friend, Mr. Muhammad Zikri Bin Asmani. With their help and strength, I could able to finish this project on my own research.

Thank you again to all the people involved directly or indirectly through this project. Their kindness and help give me the strength to be able to complete my project. My heartfelt thanks for all their support.

UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

TABLE OF CONTENTS

	PAGES
DECLARATION	
APPROVAL	
DEDICATION	
ABSTRACT	
ABSTRAK	
ACKNOWLEDGEMENTS	
TABLE OF CONTENTS	**i**
LIST OF TABLES	**iv**
LIST OF FIGURES	**v**
LIST OF SYMBOLS AND ABBREVIATIONS	**vii**
LIST OF APPENDICES	**viii**
LIST OF PUBLICATIONS	**ix**
CHAPTER 1: INTRODUCTION	**1**
1.0 Introduction	1
1.1 Background Study	1
1.2 Problem Statement	4
1.3 Significance of the Research	5
1.4 Objectives of Research	5
1.5 Scope of Research	6
1.6 Outline of Project	6
CHAPTER 2: LITERATURE REVIEW	**8**
2.0 Introduction	8
2.1 Car Window	8
2.1.1 Types of Power Window Regulator (Scissor Type)	9
2.1.2 Automatic Power Window	10
2.2 Vibration Sensor (SW-420)	10
2.3 Sound	13
2.3.1 Sound Sensor (Sound Module)	13
2.4 Arduino Board (Arduino Uno)	16

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.4.1 Hardware 17
2.4.2 Software 22
CHAPTER 3: RESEARCH METHODOLOGY 25
3.0 Introduction 25
3.1 Project Flow 26
3.2 Block Diagram 30
3.3 Implementation of the Circuit Diagram 31
3.4 Hardware Configurations 32
3.4.1 Scissor Type Car Window 32
3.4.2 8 Ohm Speaker 33
3.4.3 Sound Sensor Module 34
3.4.4 SW-420 Vibration Sensor 35
3.4.5 Arduino Uno 36
3.4.6 2-Channel 5V Optical Isolated Relay Module 37
3.5 Software Configurations 40
3.5.1 Arduino IDE 40
3.5.2 Proteus Software 41
3.6 Development of Project 45
3.7 Bill of Material 47
3.8 Summary 48
CHAPTER 4: RESULTS AND DISCUSSION 49
4.0 Introduction 49
4.1 Circuit Configuration for Push-Button as Power On Button 49
4.2 Car Window Regulator with Sound Sensor and Vibration Sensor 50
4.2.1 Intensity of Sound Sensor Based on Serial Plotter 52
4.2.2 Measurement Result of Vibration Sensor 56
4.3 Turn the Power Window Motor in Different Direction by Using 2-Channel Relay Module 59
4.4 Project Coding 61
4.5 Measurement Result of the Power Window Motor to Delay 65
4.6 Discussion 67
CHAPTER 5: CONCLUSION AND RECOMMENDATION 72

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

5.1 Introduction 72
5.2 Conclusion 72
5.3 Project Related Problems 73
5.4 Future Development and Recommended 73
5.6 Chapter Summary 74
REFERENCES 75
APPENDICES **77**

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.1	Specifications Arduino UNO	**18**
Table 2.2	Description of TCSP pin at Arduino UNO	**20**
Table 3.1	The specification of the sound module sensor	**35**
Table 3.2	Bill of Material for the Development Safety Car Windows System for Emergency project	**47**
Table 4.1	Range value Generated from the Vibration Sensor with Time	**57**
Table 4.2	Working Tool Logic Detection of vibration sensor	**58**
Table 4.3	Power Window Motor to Move Up/Down throughout Time Delay versus the Trial	**65**

UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاك
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF FIGURES

TABLE	TITLE	PAGE
Figure 1.1	A child may not be able to describe what hurts or bother them.	**2**
Figure 2.1	Power Window Control Module	**9**
Figure 2.2	SW-420 Vibration Sensor	**11**
Figure 2.3	SW-420 Sensor	**12**
Figure 2.4	The components and pins on a typical LM393 IC based Sound Sensor Module	**14**
Figure 2.5	LM393 Sound Detection Sensor	**15**
Figure 2.6	Arduino Uno Board	**17**
Figure 2.7	The development board labelled diagram	**20**
Figure 2.8	Arduino UNO board parts	**22**
Figure 2.9	The IDE software labelled diagram	**24**
Figure 3.1	Flow Chart of the entire process	**28**
Figure 3.2	Flow Chart of Development of Safety Car Windows System for Emergency works	**29**
Figure 3.3	Block diagram of the system control	**31**
Figure 3.4	Implementation of the circuit diagram	**31**
Figure 3.5	Car window regulator and motor	**32**
Figure 3.6	Integrated scissor type regulator	**33**
Figure 3.7	8 Ohm Speaker	**34**
Figure 3.8	Vibration sensor module pinout	**36**
Figure 3.9	2 Channel 5V Optical Isolated Relay Module	**37**
Figure 3.10	Operating principle of 2 Channel 5V Optical Isolated Relay Module	**38**
Figure 3.11	The 2 Channel Relay Module's pinout	**40**
Figure 3.12	Introduction to Arduino IDE	**41**
Figure 3.13	Proteus Design Suite 8.7	**42**
Figure 3.14	The simulation in the proteus software	**44**

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 3.15	The connection of Arduino, sound sensor, and vibration sensor's result of the prototype in PSM I	**46**
Figure 3.16	The power window motor of the prototype in PSM I	**46**
Figure 4.1	The Power On Button	**50**
Figure 4.2	The Power Window Regulator Motor's Prototype	**51**
Figure 4.3	The Sound Sensor and Vibration Sensor Under the Car Seat	**52**
Figure 4.4	No sound detection	**53**
Figure 4.5	Sound wave when human's cough	**53**
Figure 4.6	Sound wave when human's talking	**54**
Figure 4.7	Sound wave when playing a song	**54**
Figure 4.8	Sound wave when a baby is crying	**55**
Figure 4.9	Monitoring the vibration measurement value in Serial Monitor	**56**
Figure 4.10	Range value Generated from the Vibration Sensor	**58**
Figure 4.11	2-Channel Relay Module Connection	**60**
Figure 4.12	Initialize the Pinout's Variable	**62**
Figure 4.13	Declare the Input/Output's Components	**62**
Figure 4.14	The Button Program Code	**63**
Figure 4.15	How the Program Code Works Using the Vibration Sensor and Sound Sensor Input Detection	**64**
Figure 4.16	Time Delay monitoring data versus the Trial	**67**
Figure 4.17	Final Prototype Top View in PSM II	**69**
Figure 4.18	Final Prototype Front View in PSM II	**70**
Figure 4.19	Final Prototype Side View in PSM II	**70**
Figure 4.20	Final Prototype Back View in PSM II	**71**

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF SYMBOLS AND ABBREVIATIONS

DC	-	Direct Current
IDE	-	Integrated Development Environment
IC	-	Integrated Circuit
LED	-	Light-Emitting Diode
V	-	Voltage
BOM	-	Bill of Material
Etc.	-	As / So on

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF APPENDICES

Appendix 1: The Development of Safety Car Windows System for Emergency Coding **78**

Appendix 2: Gantt Chart Project Planning PSM I **83**

Appendix 3: Gantt Chart Project Planning PSM II **84**

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF PUBLICATIONS

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CHAPTER 1

INTRODUCTION

1.0 Introduction

The car window regulator is manual, allowing a person to control the regulator motion with a hand crank in some scenarios. Generally, a window controller is an electronic system that is activated by clicking a toggle switch or a button on the arm of the car next to the windshield. This chapter will introduce to the first electric control car window mechanism and how does it work. This part will present the project background study, problem statement, scope of research, and the project's objectives and outline.

1.1 Background Study

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

The system that raised and lowered the window glass with an average speed is known as a car window or power window. The electric motor, which works as the main function in the mechanism controlled the car window.

The primary electric control windows are presented around 1946 by Lincoln. These are driven by a small powered motor interior door. It also has come to be all-inclusive with the industry. Earlier to that date, within the few vehicles advertising this feature, the windows were driven by power through pressure or off the motor vacuum. Within the 1950s, electric control was too applied to the tailgate window in numerous station wagons.

This project presents the technology related to several issues that happened nowadays. These incidents occurred when the parents left their toddler in the parking cars with or without

opened the car windows. The windows are close, then the temperature inside the car rapidly increases even if there is an ordinary day when the car's engine is turned off. The child's thermoregulatory system cannot stabilize their body temperature. This condition may cause hyperthermia or heatstroke which can be a risk.

Recently, found out a nine-month-old girl was dead after being left by her biological father inside the car happened in east of Peninsular Malaysia. It is caused by heatstroke after been left inside the car with the engine off. The father who allegedly forgot about her child when he parked the car and went to work at Tun Razak Complex. The little girl that had found unconscious on the rear passenger seat inside the car when the father wanted to go out for lunch. The victim has been left in the car for several hours.

In Malaysia's same case, another two-year-old child girl died of heatstroke after being left in a car unattended. The mother realized that her toddler was unconscious in the car at the parking lot for four hours. The dangers of leaving a child in the car unattended with the door locked. Such an unwanted incident, even if it is just for a quick errand that takes a few minutes. The parents should never leave their toddlers alone in the car for even a few minutes. Figure 1.1 below illustrate that a child may not be able to tell what hurts or bother them when he/she faces a danger situation.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 1.1 A child may not be able to tell what hurts or bother them.

Animal Ethical Care (PETA) uploaded a video demonstrating how serious the heatstroke can be in 2015. In the video, Arizona Cardinals 'NFL player Tyrann Mathieu sat inside a car to see how long in blazing heat he would survive. It took just eight minutes for a professional athlete to barge his way out of the car, after the interior temperature soared to a frightening 48.9 degrees Celsius.

On the other sides, there was news reported a child locked the door and refused to open just because he wanted to play his mother's mobile phone inside the car. The mother was asking him to unlock the car door since she saw her child had locked himself inside. However, he neglected the pleas of his mother, fearing that his parents would stop him from playing on the mobile phone. This situation could happen even they know or not knowing to unlock the car door. It can cause the child could lack out of oxygen and can suffocate if the rescuer stuck in time to rescue them.

There are lots of cases of toddler's death inside the car cause of suffocating without air ventilation and heatstroke. As this problem is increasing toward the surrounding community, there is a system build to avoid this problem. Due to this project, the child's life is going to save as a quick action and alert from the other people in the surrounding area. In a busy schedule, the parents may forget to take the toddler who is kept in the back seat as they depend on the adult. When this system function as well, the action will be taken immediately. After the car is parked, an alarm warning in active mode.

In this project, the vibration and sound sensors used to detect any vibrate and sound to send the message to the car window as an output to generate. The vibration and sound sensing automatic car window have both sensors a motor operating circuit, a pair of motors and a drive mechanism for sliding type windows. Powered by 12V DC, transformer motors have enough

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

torque to move the windows as required. When the vibration and sound presence in the car, it signals the circuit to be active.

1.2 Problem Statement

Carelessness parents have been a serious problem facing in this country. Parent's carelessness left their toddler alone in the car without the adult assistant. Nowadays, people are too busy with their works and commitment. They forgot to check inside the car whether there is any left or noticed something weird inside before came out. When the car left in a few hours at the park in blazing heat may cause a high temperature inside the car.

If the toddle has been left inside the car in blazing heat can cause heatstroke. Heatstroke is a serious problem wherever in Malaysia that air temperature can rise to the thirties maximum high. That was much hotter can be inside the car if it had been park under the sun for a few hours. According to paediatric emergency experts as a child's body heats up much faster than an adult's body that leaves them more susceptible to the dangers associated with heatstroke. The child could die when theirs's body temperature hits 40 degrees Celsius, the internal organs shut down and at 41.6 degrees.

Besides, the car without air ventilation or window opened will lead to lack of oxygen. Less oxygen in the car due to suffocating without air ventilation. If the toddler trapped inside the car with no ventilation, it might cause difficult to breathe and may suffocate. This situation gives dangerous to the child even the car parked in the cold weather with a closed window. The air inside the car may contain less oxygen when the respiratory process of human is present.

Next, it also can prevent the car window from break if the responsible parties such as fireman or policeman came to rescue the child inside the car. So, they do not need to break the

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

door car or window to help the child. In this project, the prototype designed to solve these problems comfortably.

1.3 Significance of Research

A car window activates a warning alert that prevents the child from getting hurt or suffocate inside the car when other surrounding people come to giving help. This situation can help people to rescue the child without break any car windows. Besides, the vibration sensor can detect any vibration from the response of the child when the child is not comfortable inside the car. The sound sensor also can detect any sound from the child when they are starting to cry. Those happened will react to the car windows and alarm warning to generate the warning alert to people in the surrounding area.

For efficiency, the vibration and sound sensor might place nearby area the rear seat for precise alert detection from the sensors. Then, the data will collect, and this shows that the prototype may work efficiently.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

1.4 Objectives of Research

The objectives of this project are:

a) To design a car window system control using vibration and sound sensor.

b) To build the safety car window's prototype with an alarm system.

1.5 Scope of Research

The project scope for community needs and especially for parents or family. There are many cases in Malaysia where their parent's carelessness left their toddler in the car. The toddlers were mostly dead because of a lack of oxygen that causes suffocate in the car. The major components of the circuit project that must be a focus in this work are the car window mechanism and how the tool works. The sensors used in this project are the vibration and sound sensors to detect the presence of humans or objects inside the car. The Arduino IDE software used C++ language to command the Arduino board. The Arduino as a microcontroller and programming language used was suitable for students because its principles are much understandable.

1.6 Outline of Project

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

The several chapters involved in the development of this project have been appropriately put into five chapters to increase comprehensive and brief reading. In this project is sequentially organized as follows:

1. Chapter one of this work is basically introduced to the car window mechanism and the sensors used in this project. This chapter will represent the background study, problem statement, aim, and the scope of this project was discussed.
2. Chapter two based on the literature review of the car window mechanism, type of frame, and the components used in this project. In this chapter, all the literature relating to this work was surveyed.