



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DEVELOPMENT OF EMOTION DJ SYSTEM FOR**

**ENTERTAINMENT**

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

by

**NOR SYAFIQAH BT ZAIDON**

**B071510516**

**961031017618**

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING  
TECHNOLOGY

2019

**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

Tajuk: DEVELOPMENT OF EMOTION DJ SYSTEM FOR ENTERTAINMENT

Sesi Pengajian: 2019

Saya **NOR SYAFIQAH BT ZAIDON** 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:

.....  
NOR SYAFIQAH BT ZAIDON

.....  
AHMAD FAUZAN BIN KADMIN

Alamat Tetap:

Cop Rasmi Penyelia

No. 589, Parit Amal, Jln Abd Rahman,

84000, Muar,

Johor.

Tarikh: 18 DISEMBER 2018

Tarikh: 18 DISEMBER 2018

\*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 EMOTION DJ SYSTEM FOR ENTERTAINMENT is the results of my own research except as cited in references.

Signature: .....

Author : NOR SYAFIQAH BT ZAIDON

Date:

## **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 Mechanical Engineering Technology (Automotive) with Honours. The member of the supervisory is as follow:

Signature: .....

Supervisor : AHMAD FAUZAN BIN KADMIN

## **ABSTRAK**

Projek ini membentangkan perkembangan Emosi Disc Jockey (DJ) System for Entertainment. Fungsi sistem DJ adalah untuk memainkan jenis genre muzik berdasarkan mood semasa pengguna. Selain daripada itu, isyarat EEG berfungsi untuk menangkap isyarat elektrik dari kulit kepala otak. Oleh itu, alat pemutar MindFlex adalah peranti utama yang menukar aktiviti elektrik otak kepada isyarat EEG. Isyarat EEG diproses dalam perisian MATLAB untuk menghadapi peringkat Brain Computer Interface (BCI). Kemudian, data akan digunakan untuk menunjukkan ekspresi menggambarkan emosi dalam editor susun atur GUI. Komponen perkakasan yang menyumbang dalam projek ini ialah Mikrokontroller Arduino yang digunakan sebagai penghantaran dan penerimaan tempat untuk menyambung modul Bluetooth HC-05

## **ABSTRACT**

This project present the development of Emotion of Disc Jockey (DJ) System for Entertainment. The objective of this project is to develop an integration system of emotion that can utilize in entertainment system and to analyze the emotion recognition performance. To achieve the objective, DJ system is used to analyse the emotion by playing the kind of music genres based on the current mood of user's. Other than that, the EEG signal functioning to capture the electrical signal from the scalp of the brain.waves Therefore, MindFlex headset is a primary device that convert the electrical activities of the brain to EEG signal. The EEG signal is processing in the MATLAB software to face the stages of Brain Computer Interface (BCI). Then, the data will used to demonstrate the visualize expression of emotion in GUI layout editor. The hardware component contributed in this project is Microcontroller Arduino that used as a transmission and receiving place to connect the HC-05 Bluetooth module. Finally, the development of this new technology can entertained people besides it will detect the current emotion of people in real time.

## **DEDICATION**

I would like to give dedication to my parents, siblings that give moral support and encourage to me during completing this project and report. The special dedication is to my friends that always possibly help anything when I am in trouble doing my project. Finally, I would like to dedicate to my Ahmad Fauzan Bin Kadmin that develop this idea to do this project and gives a lot of guidance until this project is successfully done. Thank you so much to all of you.



## **ACKNOWLEDGEMENTS**

I would like to express my very great appreciation to the Universiti Teknikal Melaka (UTEM) for giving the chances to me to complete my Bachelor of Electronic Engineering Technology (Teelcommunication) with Honours. Besides that, I would like to express thank you to my Faculty of Engineering Technology Electronic Electric (FTKEE) to give me opportunity to write an honour thesis. The special appreciation to my advisor Ahmad Fauzan Bin Kadmin for the continuous help and guide me to go through this project until completely done.

## **TABLE OF CONTENTS**

	<b>PAGE</b>
<b>TABLE OF CONTENTS</b>	<b>x</b>
<b>LIST OF TABLES</b>	<b>xiii</b>
<b>LIST OF FIGURES</b>	<b>xiv</b>
<b>LIST OF APPENDICES</b>	<b>xvi</b>
<b>LIST OF SYMBOLS</b>	<b>xvii</b>
<b>LIST OF ABBREVIATIONS</b>	<b>xviii</b>
<b>CHAPTER 1      INTRODUCTION</b>	<b>1</b>
1.1      Background	1
1.2      Statement of the Purpose	2
1.3      Problem Statement	2
1.4      Scope	3
1.5      Project Methodology	4
1.6      Thesis Structure	4
<b>CHAPTER 2      LITERATURE REVIEW</b>	<b>6</b>
2.1      Emotional detection from EEG signal	6
2.1.1      Human emotion recognition based on music and EEG signal	9
2.1.2      Various technique in performing EEG signal	9

2.1.3	Alternating technique of music-induced emotions	13
2.2	Brain Computer Interface (BCI)	15
2.3	Brainwaves classification	19
2.4	Microcontroller board (Arduino UNO)	21
2.4.1	EEG interfacing with Matlab and DJ system	23
<b>CHAPTER 3</b>	<b>METHODOLOGY</b>	<b>25</b>
3.1	Project Characteristic	25
3.2	Architecture	27
3.2.1	Electroencephalograph (EEG)	28
3.2.2	EEG (International 10/20 System)	29
3.2.3	NeuroSky Mindflex Headset	30
3.2.4	Microcontroller Arduino	32
3.2.5	HC-05 Bluetooth Module	33
3.3	Methodological Procedures	34
3.3.1	EEG Device Setup	36
3.4	Predict Outcomes	37
3.4.1	Knowledge	38
3.4.2	Research	38
<b>CHAPTER 4</b>	<b>RESULTS AND DISCUSSION</b>	<b>39</b>
4.1	Brain Grapher using Processing Software	39
4.2	Serial Monitor on Arduino IDE	41

4.3	Emotion DJ System	43
4.3.1	Classification Data using Meditation and Attention	43
4.3.2	Producing Emotion DJ System	45
4.3.3	Data Visualization in LCD	47
4.4	Overall Analysis Graph in Microsoft Excel	49
4.5	Discussion	53
<b>CHAPTER 5 CONCLUSION AND RECOMMENDATION</b>		<b>56</b>
5.1	Conclusion	56
5.2	Recommendation and Future Work	57
<b>REFERENCES</b>		<b>58</b>
<b>APPENDIX</b>		<b>60</b>

## LIST OF TABLES

TABLE	TITLE	PAGE
2.1	Electrode letter identification	18
2.2	Classification brain waves	19
3.1	Classification range for the proposed system	26
3.2	Classification activity of brainwaves	28
3.3	Interconnection between Mindflex Headset and HC-05 Bluetooth Module	37
4.8	Analysis data within 10seconds in users scalp	45
4.9	Classification of song and emotional mood	46
4.15	The types of brainwaves based on the user mood	48
4.16	The analysis data in Microsoft Excel	49

## LIST OF FIGURES

<b>FIGURE</b>	<b>TITLE</b>	<b>PAGE</b>
2.1	The method on how it process	7
2.2	EEG acquisition	8
2.3	Block diagram for the system	12
2.4	The setup of EEG data acquisition that used in this experiment	15
2.5	(a) Side view 10-20 international system, (b) Front view 10-20 International System, (c) Electrodes placement on the head	17
2.6	BCI system	19
2.7	The brain waveform	21
2.8	Software connected with Emotiv EPOC Neroheadset and Arduino	22
2.9	The user with EEG-enabled music therapy website	23
2.10	Structure of audio music tracks played for subject	24
3.1	The overview project diagram	25
3.2	Five stages of BCI components	27
3.3	Electroencephalograph (EEG)	28
3.4	International 10/20 System	30
3.5	NeuroSky MindFlex EEG headset device design	32
3.6	Arduino software IDE connected with HC-05	33
3.7	The visualize of the HC-05 Bluetooth Module	33
3.8	Flowchart of the system	35

3.9	Floechart of the overall project	36
4.1	The data received from Arduino to the Processing Software	39
4.2	Real-time brainwaves in Processing Software	40
4.3	Packet received and the connection quality	41
4.4	Coding for display brain data	42
4.5	Data received through Mindflex Mindset	42
4.6:	Average formula is used to categorize data	43
4.7	The data received from EEG signal in 10 sec	44
4.10	Import processing.sound library to the coding	46
4.11	Happy temotional state of the users	47
4.12	Stress emotional state of the users	47
4.13	Focus emotional state of the users	48
4.14	Rest emotional state of the user	48
4.17	The average of attention and meditation, mood against time	53

## LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix 1	Coding	60



## LIST OF SYMBOLS

Hz	-	Hertz
%	-	Percentage
GHz	-	Giga Hertz
$\mu$	-	Miu
V	-	Voltage
A	-	Ampere
>	-	Above
<	-	Below

## LIST OF ABBREVIATION

EEG	-	Electroencephalogram
IDE	-	Integrated development environment
DJ	-	Dics Jockey
BCI	-	Brain Computer Interface
EMG	-	Electromyogram
HRV	-	Heart rate variability
HPPT	-	Hypertext Transfer Protocol
API	-	Application Programming Interface
IC	-	Integrated Circuit
LED	-	Light Emitting Diode
MLP	-	Multilayer Perceptron
IAPS	-	International Affective Picture System
KDE	-	Kernel Density Estimation
AR	-	Auto Regression
FFT	-	Fast Fourier Transform
SVM	-	Support Vector Machine

# **CHAPTER 1**

## **INTRODUCTION**

This chapter will briefly discuss the overall project scope such as project background, statements, objectives, scope and methodology. This chapter is to figure out the overall description of the project can get through this chapter.

### **1.1 Background**

Nowadays, emotion recognition can be measured by the EEG device setup which is MindFlex Headset. Examine brain waves collected by an EEG can be utilize in understand in human psychosocial state such as stress, emotional exhaustion, angry, sad and happy.

Apart of that, music and emotions have an interconnection. Music can induced someone's feeling. Therefore, music will use as a method to entertain people who listen to the music or respectively. In this project, emotion will recognize first by MindFlex Headset that have implement with EEG signal and BCI. The function of microcontroller Arduino is to interface the HC-05 Bluetooth Module at the Mindflex Headset and Bluetooth module at Microcontroller Arduino. Bluetooth will acts as interface to transmit the signal from the EEG sensor to Microntroller Arduino. The data will load to the Arduino IDE software. Then, the Processing software will receive the signal data. The signal is processing in the Processing software and the data collected is used to analyze the behaviour of the kind emotion states by using Brain Grapher.

Additionally, EEG is a one way to track and measure the brain activity influenced by human brain. It occur between human brain and metal electrodes that have unique place on human scalp which is conductive media with an EEG bio amplifier. In fact, there are millions neurons activities can connected within the brain based on EEG signal. It reflects on the brain theory which is there are interconnection among brain cells and it will provide an electrical pulse.

Besides of that, EEG based BCI system is develop in this project by using Arduino UNO. Brain Computer Interface (BCI) is interconnection method that depends on the neural activity performed by the brain regardless of peripheral nerves and muscles. The application of BCI system is for social application to capture feelings and emotions of individual such as mental state detection, automatic music player and control depending upon person's emotion. The components involved in BCI are signal acquisition, pre-processing, feature extraction, pattern recognition and control system. Instead of that, by initialize the HC-05 Bluetooth module in Arduino UNO board. This device module will establish their connection with the Arduino UNO.

## **1.2 Statement of the Purpose**

The purpose of the project is to develop an integration system of emotion that can utilize in entertainment system and to analyze the emotion recognition performance.

## **1.3 Problem Statement**

Nowadays, a lot of music with the variety of genres will capture the attention person's that listening to it. Music also can be as a therapy for person's feeling. Besides that, human emotions is quite difficult to know by other people except the individually feeling. Therefore, the EEG device which is MindFlex Headset is introduced to measure the electrical signal in the brain. Hence, the problem of this can be solved by the development of emotion recognition of DJ system for entertainment. Disc Jockey's (DJ)

is the one of the method to listen music in a way need to use turntable DJ set to produce the music. Since, it quite difficult to set up and did not have the function of automatic detection music, the new development with the spectator that can detect emotion and trigger the music based on the current emotion with the technology of remote wireless to store the data collected.

#### **1.4 Scope**

The scope of this subject is develop the new project of emotion DJ system. At the beginning of this project, the MindFlex Headset is implement the features of EEG biosensor will scan the brain activity. Microcontroller applicable to accept data from the EEGSensor and transmit data to the web view platform. Arduino IDE is used to initialize the Arduino UNO board. The process of EEG based-BCI system is control by Arduino such as signal processing and feature extraction to extract the most suitable feature and triggered based on the suitable function. Finally, a reliable database will visualize to allow user to have a clear illustration on the interface.

#### **1.5 Project methodology**

This goal for this project is successful to develop the Emotion DJ system in real life based on the correct procedures and method taken. The function of methodology is to ensure the project is done within the specific time and smoothly, executes as the results are identified. The establishment of this project is to illustrate the idea and meaning of

this projects and their target why this project is taken. The method of this project include the flow chart of microcontroller setup and EEG device setup.

The overview project method to complete with a successful achievement is found in the project flowchart. Other than that, the system flowchart shows the work flow of the project from start to the end. The selection of hardware and software flowchart used in this project after doing analysis about all the microcontroller also shown in the flowchart. Also, it assembling the configuration of the hardware and software. The methodology is purposely to obtain the development of the project is successful with a systematically.

## **1.6 Thesis Structure**

### Chapter 1:

Introducing this chapter with the general explanation about the project. Other than, project background is provided to bring the detail about the development of DJ system. It also focused on the used on the project background, the detail in objectives, the problem statement, project scope, and methodology of the project.

### Chapter 2:

The discussion on the background of the project. The reliable research paper is used to demonstrate the literature review. The alternating technique used from the recent project is discussed. The observation is done in this chapter by making a research from the previously available project to apply in the project.

### Chapter 3:

The step taken and procedure on how to complete the project. Also, it includes the schedule and detailed reports of studies and accordance with objective achievement. The flow of the project is clearly will explain through project characteristic and flowchart.

### Chapter 4:

In this chapter, the overall data is present in the result while discuss about the general procedure, error, theoretical statement in the discussion part. All the simulation recorded data, and data analysis is discussed and attach in detail. The hypothesis, discussion, and conclusion of this project are included in this chapter. Those parts are based on comparison and elaboration according to the outlined objectives.

### Chapter 5:

It contains about the summary for overall analysis and recommendation that can implement towards this project. Moreover than that, the summary will analyze is it the objective is established or not from this project. Therefore, if objective is not establish, the reasonable reason must have to discuss in summary.