



Faculty of Electrical and Electronic Engineering Technology



**DEVELOPMENT OF ATTENTION NOTIFICATION SYSTEM USING
ARDUINO**

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Bachelor of Electronics Engineering Technology with Honours

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DEVELOPMENT OF ATTENTION NOTIFICATION SYSTEM USING ARDUINO

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A project report submitted
in partial fulfillment of the requirements for the degree of
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Faculty of Electrical and Electronic Engineering Technology

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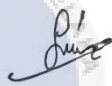
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I declare that this project report entitled “DEVELOPMENT OF ATTENTION NOTIFICATION SYSTEM USING ARDUINO” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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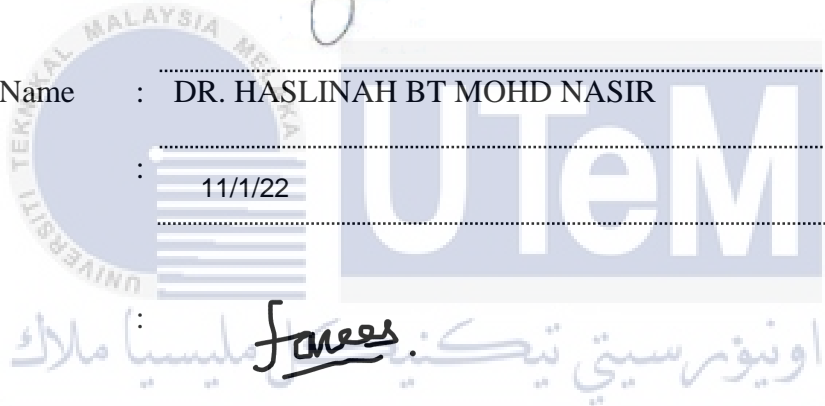
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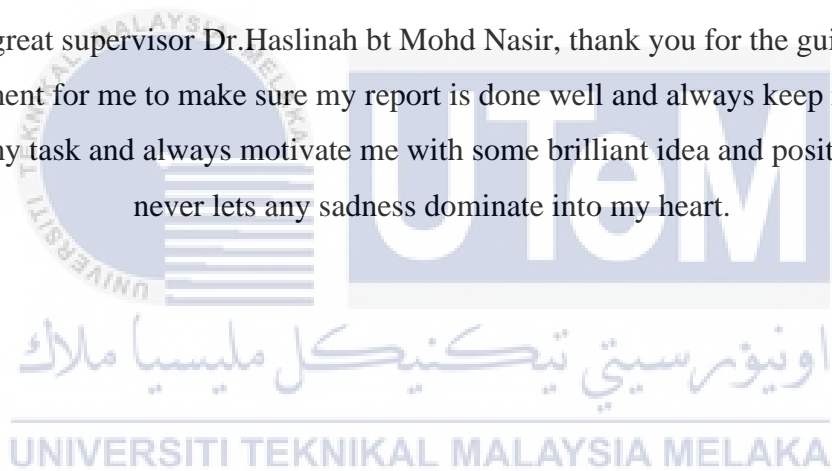


DEDICATION

To my beloved parent,
Hazman bin Dolah and Siti Zariah bt Zubir who always there with me and instilled in me the virtues of perseverance and relentlessly encouraged me to strive for excellent in completing this report.

To my siblings that always generates and giving idea for me to complete this report, I would like to say thank you for always support and help me with their full of love that make me feel motivated and always in high spirits to finish my report.

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ABSTRACT

Road accidents due to distracted condition cause the number of fatalities increasingly immensely in this era. Unexpectedly, many of these tragic crashes are induced by drivers' distraction, which enables the vehicles to lose control. Thus, this project proposes attention notification system using mobile application to reduce the road accidents. This project used Arduino UNO as the main controller to classify the attention level parameter from EEG signals which are low, medium and high state. System with wireless capabilities by detecting if the driver's attention is experiencing low state, a buzzer will trigger the driver. Driver can monitor their attention level during driving for each use wirelessly by displaying the information directly on applications in the smartphones via Wi-Fi and internet communications. With Wi-Fi and internet communication, the driver will response immediately as it also able generate a notifications and alarm from Blynk application. This system is successfully functional to notify the driver. The analysis shows that the greater the distance between attention notification hardware and the driver, the more time taken to recognized level attention of driver. However, the system is able to give reliable output to notify the driver whenever the attention decrease. As a result of this, the accident can be avoided and will help in saving the precious lives of drivers and co-passengers.

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ABSTRAK

Kemalangan jalan raya disebabkan gangguan menyebabkan jumlah kematian semakin banyak pada era ini. Tanpa diduga, banyak kemalangan tragis ini disebabkan oleh gangguan pemandu, yang membolehkan kenderaan hilang kawalan. Oleh itu, projek ini bertujuan untuk membangunkan sistem pemberitahuan perhatian menggunakan aplikasi mudah alih dan untuk menganalisis sistem sama ada ia dapat mengenali tahap perhatian pemandu dengan jayanya dengan menilai parameter EEG. Projek ini menggunakan Arduino UNO sebagai pengawal utama untuk mengklasifikasikan parameter tahap perhatian daripada isyarat EEG iaitu keadaan rendah, sederhana dan tinggi. Sistem dengan keupayaan tanpa wayar dapat mengesan jika perhatian pemandu mengalami keadaan rendah, buzzer akan memberi amaran kepada pemandu. Dengan alat ini, ia boleh memantau tahap perhatian pemandu semasa memandu untuk setiap penggunaan tanpa wayar dengan memaparkan maklumat secara terus pada aplikasi dalam telefon pintar melalui Wi-Fi dan komunikasi internet. Pada situasi ini, pemandu akan bertindakbalas dengan segera pada notifikasi dan alam daripada aplikasi blynk. Analisis menunjukkan bahawa semakin jauh jarak antara perkakasan perhatian notifikasi dan pemandu, semakin banyak masa yang diambil untuk perhatian tahap yang diiktiraf pemandu. Walau bagaimanapun, sistem ini mampu memberikan output yang boleh dipercayai untuk memberitahu pemandu apabila perhatian berkurangan. Akibatnya, kemalangan itu dapat dielakkan dan akan membantu menyelamatkan nyawa pemandu dan penumpang bersama.

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LIST OF SYMBOLS

μV	-	Microvolts
α	-	Alpha
β	-	Beta
Hz	-	Hertz
V	-	Volts
dB	-	Daubechies
ψ	-	Wavelet coefficients
τ	-	Tau



LIST OF ABBREVIATIONS

EEG	-	Electroencephalogram
CNN	-	Convolutional Neural Network
CWT	-	Continuous Wavelet Transform
SVM	-	Support Vector Machine
DWT	-	Discrete Wavelet Transform
RNN	-	Recurrent Neural Network
ANN	-	Artificial Neural Network
UTEM	-	University Technical Malaysia Melaka
MATLAB	-	Matrix Laboratory
GUI	-	Graphic User Interface



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CHAPTER 1

INTRODUCTION

1.1 Background

Attention classified as one of the basic part cognitive systems in human brain that processes behavioral and cognitive involved alerting, decision making and remembering. Driver distraction poses a significant risk because to the cognitive impact of shifting attention away from the present task. Distractions might be external, such as a ringing phone, or internal, such as mind wandering. [1]. This proved the fact that the causes for these unfortunate calamities were the attention deficit while driving.

Attention deficit during driving is a key contributing factor in many road fatalities [2]. In Malaysia, the number of road accident is increased during last ten years because there were approximately 27 million drivers on roads today [3]. Recently a naturalistic study concluded over 42% - 47% of all crashes and near crashes increased were caused by attention deficit compared with individuals without attention deficit [4]. Therefore, to avoid these tragic incidents, it is essential to develop an effective attention notification system that can monitors driver's attention while driving.

Electroencephalogram (EEG) is one of the technique commonly used in medical field that specially measures the electrical activities generated by firing of neurons along the scalp within the brain [5]. EEG is a cost effective, well-established, and accurate procedure used to diagnose brain-related such as attention deficit, autism and depression.

Attention electroencephalogram (EEG) dataset is obtained from the University of Technical Malaysia Melaka (UTEM). The student database of EEG dataset analysed completely by using Hybrid Mean Fuzzy (HMF) algorithm method. There are three levels of attentions with some limitations classification identified which are attentive state, onset of inattentive state and inattentive state [6].

1.2 Problem Statement

Attention deficit is a brain-related disorder involves cognitive systems that may cause distractions while driving. Driver need an attention notification system that capable of monitoring driver's level attention to keep driver safety on the road. Road accidents happened when driver's attention is distracted whether it is caused from external or internal distraction [7]. External distractions like as flashing billboards or a ringing phone may further increase one's collision risk, as can indulging in interior thoughts such as mind wandering. Distracted driving is a risk factor for traffic collisions since it involves the driver's attention. Road accidents among drowsy drivers are thought to be four to six times more likely than if the driver is fully alert [8]. The majority of popular driver monitors are primarily concerned with the driver's physical state, such as head movement, yawning or eye blink.

Essentially, EEG records are rarely observed because the oscillation is complex, pure, and plain. The EEG signal analysis requires the algorithm for accurate measurement; hence the interpretation is not carefully studied by the analytics. This proposed work investigates the flexibility of using arduino IDE as a pre-processor of an Hybrid Mean Fuzzy (HMF) based on EEG decomposed data. To solve the problem whether the data is detected or not, the data is developed by using Arduino IDE. From the parameter data adopted, the capability of the Hybrid Mean Fuzzy (HMF) attention state to classify whether driver in good or dangerous state based on their EEG parameters can be proven.

1.3 Project Objective

The main aim of this project are as follows:

- a) To develop attention notification system using mobile application.
- b) To analyze the performance of the system.

1.4 Scope of Project

This part explains about the scope of work for this project. The EEG dataset were taken from University of Technical Malaysia Melaka (UTEM). To identify student database attention deficits in an EEG signal, a Hybrid Mean Fuzzy method is applied. It is a synthesis of basic averaging (Mean) and fuzzy techniques for data analysis and classification. To accomplish the project's aim, a hardware implementation with a driver notification system was developed. The attention data are processed by a microcontroller unit in a prototype board called the Arduino UNO board. A wireless connection based on application is programmed in order to host and notify driver's level of attention through Attention Notification System while user can monitor driver's level attention on mobile application. In addition, ESP8266 Wi-Fi Shield Module is placed to detect driver's level attention and warn the driver if there is presence of low attention. It will initiate connection with the device by communicating through Android. Therefore, buzzer will be generated to trigger driver and results to turn on red LED.



Figure 1.1 Block Diagram for Attention Notification System

1.5 Report Organization

The introduction to Chapter 1 explains the project's overview, the issue statement, the project goals, the project's scope, the projected outcome, and the project's relevance. Chapter 2 contains a review of the literature and citations for any information pertinent to this project from any source. Additionally, the reference about equipment analysis was provided in that chapter. More detailed explanations on the project approach have been described in Chapter 3, methodology. For Chapter 4, the results and discussion explain about the project functionality. For Chapter 5 which would be the conclusion, future research recommendations and other implications are elaborated.



CHAPTER 2

LITERATURE REVIEW

2.1 Overview

This chapter discusses the review of prior research and issues related to this study. For the "Development of Attention Notification System Using Arduino," the literature review assists in determining the most appropriate strategy for classifying and differentiating data from three distinct categories of attention: attentive state, onset of inattentive state, and inattentive state.

2.2 Attention Condition

Being able to pay attention to the details is very important for a person to perform a task properly. Learning how to pay attention to these factors can help improve a person's driving performance. Driver inattention has continuously been identified as the most frequent particular cause contributing to road accidents. Recent naturalistic driving research have provided more evidence for this. Driver inattention was cited as a contributing factor in 78 percent of collisions and 65 percent of near-crashes evaluated in a recent 100-car study. Two naturalistic driving studies that examined driver distraction in commercial vehicle operations found similar outcomes [7].

Distraction is a more general word for inattention. A driver might be inattentive due to distraction, misplaced focus, or not being attentive enough. It has the impact of making a driver drowsy or unmotivated, resulting in a gap between the requirements for safe driving and the attention a driver devotes to driving. Giving insufficient attention to the task of driving is different from misdirecting it

and being distracted, even though driving performance worsens in both circumstances and the total risk of an accident rises [9].

2.3 Electroencephalogram (EEG)

Electroencephalography, or EEG, is a method used to monitor brain activity [10]. The electroencephalogram (EEG) is a technique for determining the electrical activity of the brain. Electrical impulses communicate between brain cells. An electroencephalogram (EEG) may be used to detect any possible complications that may occur during this technique. An electroencephalogram (EEG) is a machine that captures and analyses brainwave patterns. As seen in Figure 2.1, electrodes are tiny, flat metal discs that are connected to the scalp through cables. The electrodes monitor the brain's electrical activity and transmit the data to a recording device. An EEG recording shows wavy lines of peaks and troughs in the electrical impulses. These lines allow doctor to determine what kind of pattern it has. For example, abnormalities may be a sign of a deficit attention or some other brain condition.

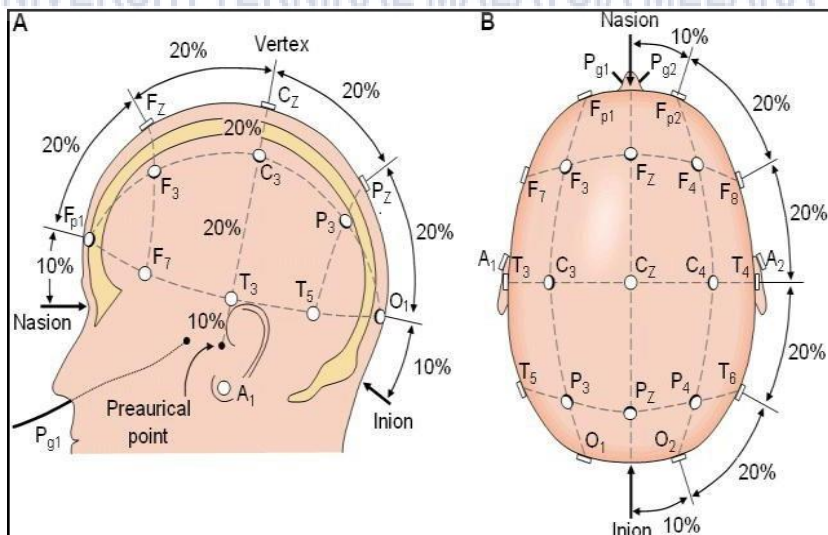
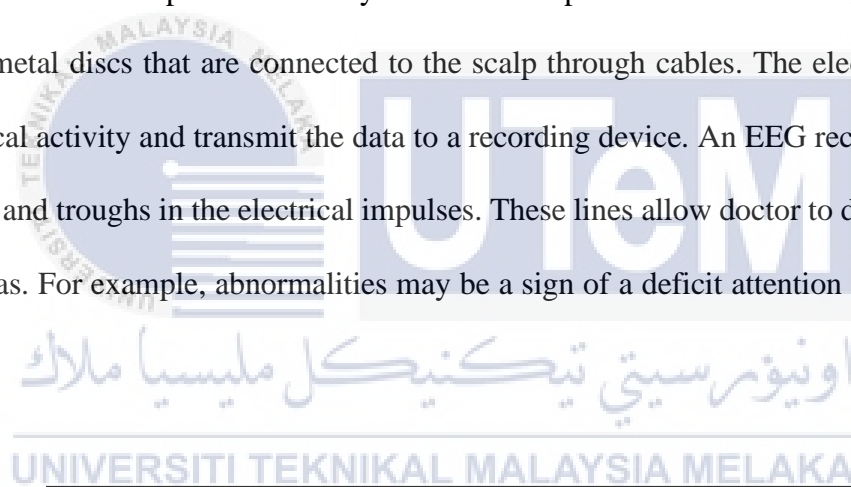


Figure 2.1 Electrodes settlement to measure EEG signals.