Universiti Teknologi MARA

Electroencephalography-based Early Driver Fatigue Classification System

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ABSTRACT

Fatigue is one of the highly contributor to road accidents these days. It is defined as a condition that associates with psychological and physical exhaustion such as yawning, increase in the rate of eye blinks and also tired eyes. These circumstances have the tendency to make the drivers lost their control behind the wheel by losing their awareness on the road. This also increases reaction time and performance error during driving which may lead to severe road accidents. To overcome this problem, this research employs an electroencephalography (EEG) data (measures) in detecting an early driver fatigue symptoms. EEG is known to be one of the best measures for fatigue as it allows the fatigue level to be measured directly. In fact, EEG is also sensitive to any changes that occur inside the brain. Therefore, in this research, an Early Driver Fatigue Classification System is developed using Backpropagation Neural Network (BPNN) technique and EEG acts as the main data set. This system attempts to classify drivers' condition to determine whether they are awake or sleepy by using signal images. The accuracy of this classification system can be enhanced by using real time signal. Furthermore, to be implemented in real driving situation, a wireless and small device need to be designed to capture the real time signal data.

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CHAPTER 1

INTRODUCTION

This chapter explains about the overview and brief explanation of this project. It starts with the background study, followed by the problem statement, research questions, research objectives, research scope, research significance, and ends with the outline of the thesis.

1.1 Background Study

Transportation is very important nowadays. People move from one place to another place more frequent these days. As a result, there has been an increase of vehicles in recent years which lead to more occurrences of traffic accidents (Li et al., 2010).

One of the main factors that contribute to accidents is the driver fatigue. Driver fatigue is a severe condition where people tend to lose their concentration behind the wheels, takes time to respond and increased error rate that may lead to serious damage (Tran et al., 2010). Driver fatigue not only caused by spending too much time behind the wheel but also because of stress, lack of sleep and the time of day (Aworemi et al., 2010).

Most sleep related accidents occur in the early hours of the morning, specifically between 2.00 am to 6.00 am and in the mid-afternoon between 3.00 pm to 4.00 pm. As reported by Royal Society or the Prevention of Accidents Driver Fatigue and Road Accident (RoSPA) (2011), this is due to the circadian rhythm. Circadian rhythm refers to the body clock which is the natural pattern of physiological and behavioural processes that are occurred within a 24-hour period. These are the times where people are supposed to have rest and sleep or take a nap. However, the current hectic lifestyle these