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EEG Mechanism Interaction to Evaluate Vehicle's Driver Microsleep

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Abstract

Microsleep or more commonly known as momentary uncontrollable fall asleep in a very short period of time usually occurs between one second to fifteen seconds. In Malaysia, one of the factors that contribute to accidents is due to the microsleep factor when the driver is driving without them being aware. This factor also often occurs when driving in a tired state and traveling too long distance. Weather factors can also contribute to microsleep. Therefore, in this research, a system has been developed to detect frequency waves from the brain based on signals from electroencephalogram (EEG) electrodes to prevent drivers from experiencing microsleep and getting involved in accidents. To conduct this research, five subjects of different ages and gender were selected to collect their brainwave data using the NeuroSky Mindwave Mobile Headset device and the EegID Record application in two different situations, namely by driving the simulation in a challenging condition for 30 minutes and the second situation is by driving the simulation in a relaxed condition for 30 minutes. In addition, the use of MATLAB in this research is to pre-process the wave signal to remove unwanted noise interference. Then, a bandpass filter is used to classify and separate the signal into Theta, Alpha, and Beta waves. These three waves will be analyzed and studied based on the age and gender differences of the subjects. After the spectrum of the wave is drawn to trigger the alarm system and the steering vibration motor if microsleep is detected for some period of one to 3 seconds.

Keywords: Driving simulation; EEG; Microsleep detection system; Neurosky mindwave.