Offline LabVIEW-based EEG Signals Analysis to Detect Vehicle Driver Microsleep

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Abstract. Microsleep is often known as unintended loss of attention and alertness within short period of time briefly between a second up to 30 seconds. Microsleep might be dangerous to vehicle driver especially for long-distance driver due to unawareness and loss of focus towards surrounding environment. Thus, microsleep detection system based on Electroencephalogram (EEG) signals is proposed in this research to prevent the drivers to involve in the accidents. For investigation purpose, six samples are chosen to obtain their brain signals using NeuroSky Mindwave Mobile Headset and eegID mobile application in two different states which are relax state for 5 minutes and driving state for 1 hour. Besides, a Graphical User Interface (GUI) is constructed using LabVIEW to analyze the EEG signals. The captured EEG signals then, are undergone pre-processing to remove noises and undesired artifacts. Bandpass filter is then applied to brainwaves to split the signals into Alpha and Theta waves. The patterns of these waves are examined and analyzed using power spectrum technique to search for unique features that might relate to microsleep event. The kNN classifier is employed to classify the selected features in term of Standard Deviation (SD) and Spectral Centroid (SC). The best classification accuracy for SD and SC features are obtained at 82.83% and 77.65% respectively for 80:20 training-testing ratios. Besides, the analysis of EEG Alpha and Theta band using Short-Time Fourier Transform (STFT) technique able to localize the EEG signals to indicate the exact time of the microsleep occurrence. The alarm system and steering vibration motor are assembled and will be activated for any detection of microsleep event.

Keywords: Microsleep event, Vehicle Driver, EEG signals, LabVIEW, Short-Time Fourier Transform (STFT).

1 Introduction

1.1 Background

The major concern for all the road users especially vehicle drivers all over the world are safety. However, the percentage of car accident has been increased year by year where Malaysia having the highest car accidents fatality risk (per 100,000 population)

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