Grove: an auxiliary device for sympathetic assessment via EDA measurement of neutral, stress, and anger emotions during simulated driving conditions

ABSTRCT

Cognition, emotion, and mood are one of the most researched topics in psychophysiological signal study. Heart rate, skin conductance, and skin temperature are popular measures of understanding autonomic nervous systems. These measures are tightly related to sympathetic and parasympathetic nervous system, which regulates human emotion. Stress and anger affect driving task and contribute to the high number of road crashes. This study utilised electrodermal activity (EDA) to differentiate stress and anger from the neutral emotion of drivers while performing a simulated driving task. Twenty healthy subjects participated and the experiment protocol was approved by Ethics Committee for Research Involving Human Subjects, Universiti Putra Malaysia. Mean power spectral density (PSD) of EDA signals were statistically compared between emotion groups with repeated-measures ANOVA and Bonferroni post hoc test. A significant difference ($p < 0.01$) was observed between neutral-anger and neutral-stress groups, whereas no significant difference ($p > 0.01$) was noted between stress-anger groups. Promising classification accuracy was achieved between emotion groups with support vector machine (SVM) classifier at ten-fold cross-validation.

Keyword: Anger; Cognition; Driving; EDA; Electrodermal activity; Emotion; SCR; Skin conductance response; Stress