Abstract

A Brain Computer Interface (BCI) is a computer-based system that acquires EEG signals, filters out noise, classifies brain activity, and utilizes these signals to perform tasks. The advancement in BCI technology has spurred the development of applications not only for hospital patients, but also for healthy and everyday users. Thus, the purpose of this project was to determine if a BCI can be used effectively. The researcher’s hypothesis was if a computer algorithm is constructed to decode and execute commands from generated EEG signals stemming from various brain activities (right eye wink, left eye wink, both eyes blink, right eye close, left eye close, both eyes close, teeth clenching, and mouth open), then a BCI application can be developed using variety of brain waves generated from different electrode positions. This is because unique electrical frequencies can be linked to different actions and stages of consciousness. The researcher first separately measured EEG signals for the eight facial movements then each of these facial movements were classified by EEG signal amplitude, frequency, and electrode position. The differentiated facial movements; both eyes blinking, both eyes close, and teeth clenching, were integrated into an algorithm that predicted specific brain activity. The researcher then determined the accuracy of the algorithm by sequentially performing the three facial movements over a five-minute interval. In conclusion, the hypothesis was supported as the three facial movements were successfully incorporated into the application. With advancements in user-friendly EEG signal acquisition devices and real-time algorithms, the development of BCIs could benefit the user community in medicine, neuroergonomics and smart environment, neuromarketing and advertisement, education, games and entertainment, security and authentication.