A Home Automation System for Neuromuscular Disorder Patients Using Brain-Computer Interface

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The emergence of Brain Computer Interface (BCI) technology presents an interesting avenue for improving the lives of patients with neuromuscular disorders. BCI monitors brain signals from a user, extracts relevant features, and translates them into a desired action. The engineering goal is to develop a home automation system which is controlled only by brain activity to support people with neuromuscular disorders. A low-cost EEG device, Emotiv EPOC+ is used to record the EEG data for real-time application. The application will enable the user to select the home device control commands by using only the brain activity through P300 signals. The features extracted from the EEG are used to train the classifier, Linear Discriminant Analysis. The user can select home automation commands such as turning lights and music on simply by looking at a target command on the user interface. The trained classifier identifies the user's intended command. The selected command is then wirelessly sent to a Raspberry Pi using network communication. The Raspberry Pi translates the received command to control the respective home device. The system is currently able to control home devices like lights, music, television, and air-conditioner with over 95% accuracy. The proposed system would be helpful and easy-to-use for patients suffering from debilitating neurological disorders, allowing them to execute daily tasks with ease and improving their quality of life. The Emotiv headset is affordable compared to other devices and the setup time for the device is short and can be used by anyone without expertise.

Awards Won:

Second Award of $2,000

IEEE Foundation: All recipients of IEEE awards will receive a 4-year membership to IEEE

IEEE Foundation: Second Place Award of $600

Central Intelligence Agency: First Award: $1000 award