# ABSTRACT

This undergraduate thesis has studied the design of EEG signal decoding system to identify imaginary hand movement of both left and right hand. This decoding system is considered necessary to help the Brain-Computer Interfacing (BCI) application in which to find means to bridge the gap between human mind and physical world, especially in terms of people with physical disability.

The study is done with EEG dataset taken from *Graz data set B: Institute for Human-Computer Interfaces, Graz University of Technology, Austria.*This dataset consisted of 9 subjects doing 5 sessions of imaginary left and right hand movement trials. Wavelet Packet Decomposition is used to extract the features of specific hand movement in the stream of EEG signal. Sliding *window* method is applied to simulate the online environment. Classification is done with Linear Discriminant Analysis. Evaluation criteria used in this study are accuracy, error rate, specific accuracy, kappa value, average processing time, maximum mutual information, SNR, specific SNR, and minimum misclassification taken from 10-fold cross validation.

The result of this study showed that the system achieved average overall accuracy from 9 subjects of 76,2% with average processing time of 4,179 second in *window* step size of 10. Average of maximum mutual information is 0,419, average of minimum misclassification rate is 0,215, average kappa value is 0,525, and average SNR is 0,934. The highest accuracy of the system is 96,8% and the highest mutual information is 0,889. The overall system can be used to produce separable features of EEG signal with different hand imaginary movement, but further study is required to make a finer and more general results.

**Keywords:** ***Electroencephalogram, Imaginary hand movement, Brain-Computer Interface, Wavelet packet decomposition, Sliding window, Linear Discriminant Analysis***