PROJECT ID: 729R

Early detection of emotion for autistic children by using Neurophysiological Signals

Billah Syed Mashkur (1723387)
billah.mashkur@live.iium.edu.my

KM Zubair (1722931)
zubair.k@live.iium.edu.my

Supervised by: Dr. Norzaliza Md Nor

ABSTRACT

The number of learning disabilities (LD) children has increased in Malaysia throughout the year. The assessment that is available for LD diagnosis is very limited since it involves experts to diagnose the disease. The assessment of LD by using neurophysiological signals has been found as scarce particularly in Malaysia. Thus, this research study has been engineered using EEG signals to early detect if the subjects are having learning disabilities like autism to use affective computing to do the identification of learning disability. The brain signal was collected from the subjects aged from 4 to 5 years using a 19 channel EEG machine called the DABO machine. Objective of this research is to focus on early detection of emotion for autistic children. In addition, the aim also demands to note the difference in emotion levels between the subject and the normal group. As far as the methodology of this research is concerned, we center around five distinct states to finish the experiment. These states are the collection of EEG data (raw Data), data pre-processing (filter noise), features extraction which will be analyzed using Mel Frequency Cepstral Coefficients or MFCC, classification which will be classified using multilayer perceptron or MLP and lastly the final result. Result shows that there is significant different emotion between normal subjects and subjects with LD. This will benefit the caregiver or parents and also researcher to identify the condition of the children through this early detection.

OBJECTIVES

- Focus on early detection if the subjects are having learning disabilities like autism.
- To use effective computing to do the identification of learning disabilities.
- Note the difference in emotion level between the subject and the normal group

METHODOLOGY

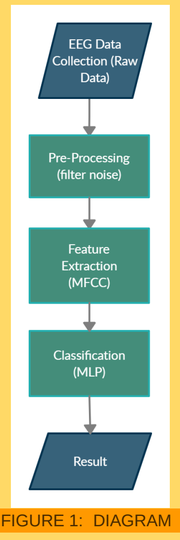

FIGURE 1: DIAGRAM

1 PREPROCESSING
Filter noise using split band function

2 FEATURE EXTRACTION
Mel Frequency Cepstral Coefficients (MFCC)

3 CLASSIFIER
Multilayer Perceptron (MLP)

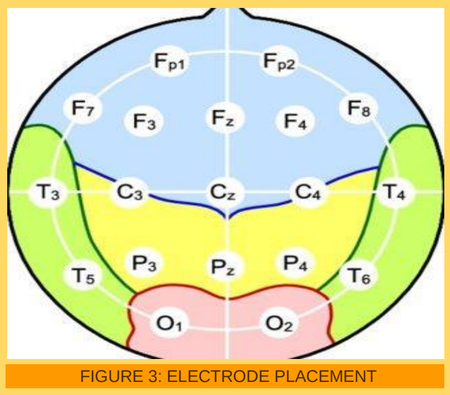

FIGURE 3: ELECTRODE PLACEMENT

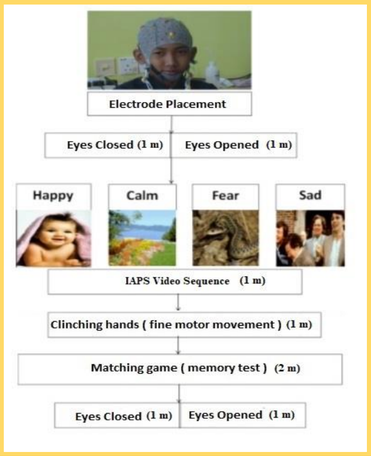

FIGURE 2: EXPERIMENTAL DESIGN

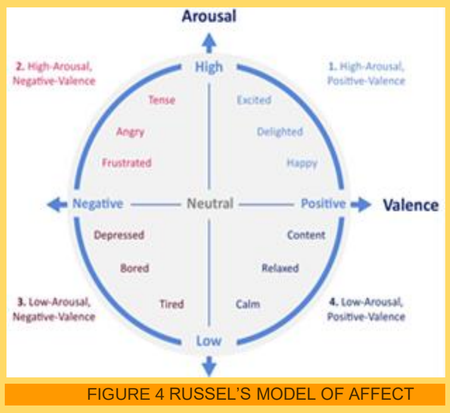

FIGURE 4 RUSSEL'S MODEL OF AFFECT

PUBLICATION

1] Zubair, K. M., Mashkur, B. S., & Nor, N. M. (2022). Early Detection On Autistic Children by Using EEG Signals. International Journal on Perceptive and Cognitive Computing, 8(1), 59–64. https://journals.iium.edu.my/kict/index.php/IJPCC/article/view/279

CONCLUSION

To conclude, it has been proved that an abnormal kid tends to have negative emotions which might develop autism. Negative attitudes, impoverishment, and pessimism can lead to chronic signs of autism that may disturb the body's hormone balance, deplete the brain chemicals needed to make it happy. Negative emotions prevent autistic children from thinking and acting in a sensible manner, as well as from viewing circumstances from their genuine viewpoint. When this occurs, people are more likely to perceive and remember only what they want to see and remember only what they want to recall.

RESULTS

Precursor Emotion Test

FIGURE 5: PRECURSOR EMOTION FOR AUTISTIC CHILDREN

FIGURE 6: PRECURSOR EMOTION FOR NORMAL CHILDREN

Memory Test

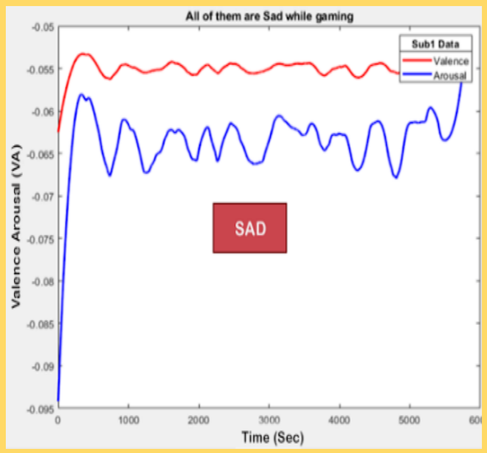

FIGURE 7: EMOTION FOR MATCHING GAME FOR AUTISTIC CHILDREN

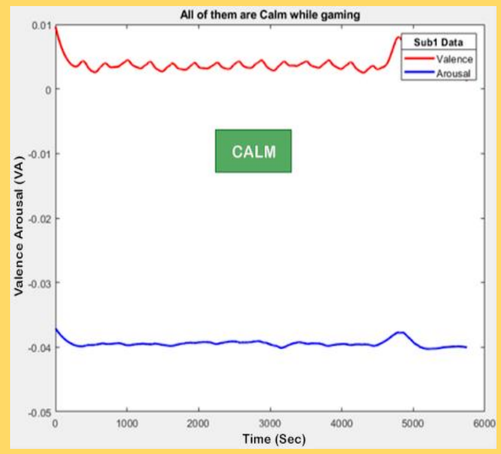

FIGURE 8: EMOTION FOR MATCHING GAME FOR NORMAL CHILDREN

Emotion Accuracy for all subjects

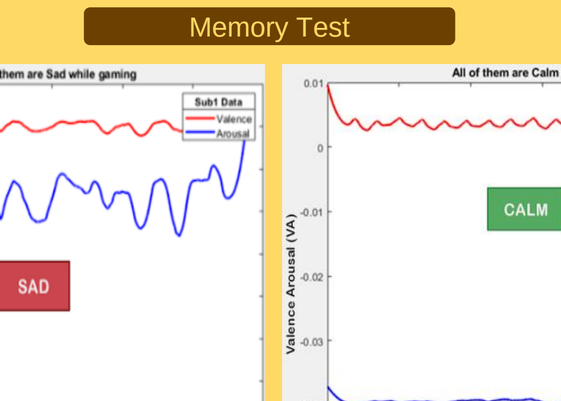

FIGURE 9: Accuracy of emotion based on MFCC

FUTURE WORKS

For future improvement, we would:

- Focus on another two learning disabilities:
  1. ADHD
  2. Dyslexia.
- Analyze more data for another 10 subjects.
- To compare between normal kids and Learning Disability kids.

REFERENCE

1] W. J. Bosl, H. Tager-Flusberg, and C. A. Nelson, "EEG analytics for early detection of autism spectrum disorder: A data-driven approach," Scientific Reports, vol. 8, no. 1, 2018.

2] J. LaRocco, M. D. Le, and D.-G. Paeng, "A systemic review of available low-cost EEG headsets used for drowsiness detection," Frontiers in Neuroinformatics, vol. 14, 2020.

3] H. Mukherjee, S. M. Obaidullah, K. C. Santosh, S. Phadikar, and K. Roy, "A lazy learning-based language identification from speech using MFCC-2 features," International Journal of Machine Learning and Cybernetics, vol. 11, no. 1, pp. 1–14, 2019.

4] H. Dabas, C. Sethi, C. Dua, M. Dalawat, and D. Sethia, "Emotion classification using EEG signals," Proceedings of the 2018 2nd International Conference on Computer Science and Artificial Intelligence - CSAI '18, 2018.

5] D. Abdolzadegan, M. H. Moattar, and M. Ghoshuni, "A robust method for early diagnosis of autism spectrum disorder from EEG signals based on feature selection and DBSCAN method," Biocybernetics and Biomedical Engineering, vol. 40, no. 1, pp. 482–493, 2020.

KICT FYP SHOWCASE
SEM 1 2021\2022
Bachelor of Computer Science

FYP 2 DCS