Enhancement of Hearing-Aid

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Abstract

As there is no coordination between the Central Nervous System and Impairments devices. So the aim is to build such a module that will provide the signal to hearing aid by taking the feedback from the brain. The feedback from the brain will be EEG(Electroencephalogram) signal. By finding the amount of disability in the ear, the module will automatically tune itself, and a person with disability will be able to hear properly. The output of the project will be the amount of tuning required for the module to tune itself and accuracy of the project. For this work, I have used a simple approach and Logistic regression.

Hearing-Aid

Hearing loss can have a big impact on our lives, from our work to our relationships and emotional well-being. Hearing aids can make a big difference, especially if you choose the right people and get help adjusting to them.

Electroencephalogram

The electroencephalogram (EEG) is a recording of the electrical activity of the brain from the scalp. The recorded waveforms reflect the cortical electrical activity.

Signal intensity: EEG activity is quite small, measured in microvolts.

Related Work

1. **Research Paper published by A.Nancy, Dr. M. Balamurugan and Vijaykumar SA Brain EEG Classification System For the Mild Cognitive ImpairmentAnalysis, in this work they have classified the persons whose brain is not workingproperly with the help of EEG signal of brain and used SVM to classify the persons.**

My Contribution

1. Collected data at IIIT Delhi with Emotive.
2. Removed noise with the help of Instrumentation Amplifier, 60 Hz Notch Filter, 31Hz Low Pass Filter, Gain Stage, and Clamper Circuit.
3. After removing the noise signal was broken into different bands(Beta(14-17hrtz), alpha(9-14hrtz), gamma(4-9) and delta(below 4hrtz)).

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4. Machine learning algorithm can only be applied on numerical value so signal was converted into voltage for this work I have used a python library pyEEG.
5. Written python code from scratch(Without using any machine learning approach) to get a gradient(cutoff) which helps to categorize the persons based on hearing loss and evaluated the amount of tuning required for proper hearing if person has hearing loss.

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6. **For improving the efficiency of the project I have used Logistic regression and recieved around 74% accuracy.**

Input and Output for the project

Input is stored in the csv file, project takes input from this file and seperates 75% for training and 25% for testing.

Output is accuracy using logistic regression, User has hearing loss or not and amount of tuning required for person having hearing loss.

Future Direction

- **EEG data can be used for testing of any illeness using the Machine learning algorithms.**
- **Using the EEG signal and Machine learning Algorithm information stored in Human brain can be evaluated.**
- **Using EEG signal and Machine learning algorithm, everything that is done physically can be implemented by just a simple instruction from brain.**

Thank You