Assignment 1

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1 Introduction

EEG stands for electroencephalogram and in the first week of our project we learnt the basics of EEG,its technical terms , how does EEG take data,different ways of showing the outputs and how to correctly interpret the displayed data and also some ways to play with the output for out convenience.

2 How does EEG record it's data?

There are 4 parts of brain classified for positioning the electrodes of EEG machine

1. Nasion (front)
2. Inion (back)
3. Two Pre-Auricular Points (Near the 2 Ears)

Electrodes are inserted beginning from Nasion to Inion following the **10-20 principle** which allows electrodes to be placed in 20 percent increments but starting and ending with 10 from nasion and inion and same for the two pre-auricular points.

Identification of the electrodes position is done by giving a letter and number to each electrode. Letters signify the position of the electrode with respect to the centre and the number signify the side and the distance.Even digits are for right and odd for left.Higher the number the further away it is.

3 Principle of recording EEG data

EEG uses the **Differential Amplifier** principle for recording it's data which basically outputs the difference between two inputs. There are various ways of taking this inputs.Usually one of them is the electrode potential itself.

3.1 Different Ways of Display

1. Bipolar Montage : In this one input is the electrode potential and the other is next adjacent electrode.The next electrodes are taken in a specific order considering the patient is facing forward.

2. Anterior Posterior Montage: This is similar to bipolar montage but order is taken assuming patient is facing rightward.

3. Common Reference Montage: In this one electrode is compared with a common reference value or a particular electrode.

   - CZ referrence montage: In this the common referrence is taken as CZ electrode.
   - Common Average Referrence : In this the average of the head is taken as the referrence.
   - Laplacian Montage: In this we take the other input as the averge of the neighbouring electrodes for an electrode.

   In this we learnt of a term called "Referrence Contamination" in which if in the referrence itself we have some abnormal behaviour we may observe abnormal behaviour in other electrodes which are actually normal.

3.2 How to play with the Display

We have different options available in the top bar section of the EEG display by changing which we can modify our display according to our convenience.The options are:

1. **Low Frequency Filter**: By this options we have filter out the signals which have frequency lower than the required amount. Note that around frequencies of the required one the amplification is reduced but lower than that they are diminished.

2. **High Frequency Filter** : In this frequencies above the required amount are filtered out.

3. **Notch Filter**: In this frequencies above and below are retained but frequencies which are closer or in the neighbourhood of the required amount are filtered out and some's amplitude is decreased.

4. **Sensitivity**: This is used to compare frequencies with a referrence using distance.The ratio of the given frequency with the referrence will signify the amplitude (Height) of the signal.

5. **Timebase**: It decides how much amount of data is to be shown in a frame wrt to time.

4 Some Common EEG Patterns

1. **Blink Eye**: We seen how does the pattern for blinking of aye looks using the polarity rules.
2. **Horizontal Moving of Eye**
3. **Normal Awake**: We sawin detail about how does the EEG pattern for normal wakefullness look like.

   In this we see the following things:

   (a) Low frequency filter is set to 1Hz.

   (b) High Frequency filter is set to 70 Hz.

   (c) Notch Filter is set to off.This is **important** to not miss any data.

   (d) Sensitivity depends on age. Generally 7uV for adutls.

   (e) timebase should be higher like around 30mm/sec.

   We saw how a cycle looks starting from opening our eyes to closing it , before and after which we should observe alpha rythm.

   Characteristic of alpha rythm:

   - Frequency is 11 Hz approx.
   - Amplitude is between 40-50 uV.
   - It shows normal symmetry.Note right has higher voltage but difference should not be above 50 percent.