دانشگاه صنعتی شریف

دانشکده مهندسی برق

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نیم‌سال دوم ۰۲–۰۱

تمرین EEG

تاریخ تحویل : ۱۲ اردیبهشت ۱۴۰۲

Dataset description:

Participants performed three identical sessions of 13 minutes each. 70% of stimuli were standard (500 Hz pure tone lasting 60 milliseconds), 15% were deviants (1000 Hz pure tone lasting 60 ms) and 15% were distractors (1000 Hz white noise lasting 60 ms). All sounds took 5 milliseconds to ramp up and 5 milliseconds to ramp down. Sounds were presented at a rate of 1 per second with a random gaussian jitter of standard deviation 25 ms. Participants were instructed to respond to oddball by pressing a key on a keypad that was resting on their lap.
Number of channels: 64
Sampling frequency: 256
Line noise = 50 Hz
Events:
"response": "Response of the subject",
"standard": "Standard at 500 hz for 60 ms".
"ignore": "Ignore − not a real event",
"oddball": "Oddball at 1000 hz for 60 ms".
"noise": "White noise for 60 ms".
"condition_5": "Ignore, computer glitch",
"noise_with_reponse": "White noise for 60 ms, followed by response (incorrect distractor)".
"oddball_with_reponse": "Oddball at 1000 hz for 60 ms, followed by response (correct target)".
"standard_with_reponse": "Standard at 500 hz for 60 ms, followed by response (incorrect)"

!! There are some extra electrodes on the cap, you can remove them before pre-processing the data.
!! The reference electrodes are not included in the data.

A. In this assignment, we want to see effect of the each step in EEG-Preprocessing in the final result. For the first part, follow the below instructions (Do it for each runs):

1. Import the data

2. Scroll through the data and remove artifacts and noisy channels by eye

3. Filter the data using a high pass-filter and also remove the line noise at 50 Hz

4. Reject Noisy data and channels using EEEGLAB extension and interpolate the removed channels.

5. Re-reference the channels to the common average.

6. Run ICA and remove artifactual components.

7. Extract Epochs using the times given in data description and using oddball events time and remove baseline.

8. Plot the ERPs of all channels and also find the channel with the largest P-300 amplitude.

B. Now swap the part 6 and 7 and do the same as part A.

C. Now skip the part 2 and do the same as part A and B.

D. Now skip the part 2 and 3 and do the same as part A and B.

E. Now do the same as Part A to D but re-reference the data to Channel Cz.

F. Now Plot the P-300 amplitudes and times in diffeerent parts and compare them. Is there any difference between different parts at all? Which method you think worked better on this data?