Error Related Potential dataset description

BCI course (EE 385V)

September 30, 2020

1 Introduction

We have designed an experimental protocol to write the user's intended word during brain-computer interaction. In this study, humans are asked to only assess whether an external autonomous agent performs properly. Subjects seat in front of a computer screen where a moving cursor (i.e., a green circle) and a target location (i.e., a red square) are displayed. The working area consists of 30 locations (5 x 6 grid space), and each grid has one character. At each time step (i.e., thereafter termed a trial) the cursor moves horizontally (right or left), vertically (up or down) or shrink its size to 40%.

2 Description for each run

The data is provided in gdf and matlab format. Data from each subject and run is provided in a separate file: subjectID_xx.gdf and subjectID_xx.mat.gdf GDF file contains EEG signals (16 channels) + software trigger. To loqd the file

```
[s,header]=sload('fileName.gdf');
```

- s(:, 1:16) -> eeg signals from Fz, FC3, FC1, FCz, FC2, FC4, C3, C1, Cz, C2, C4, CP3, CP1, CPz, CP2, CP4
- header.EVENT.TYP: action type : (101, UP), (102, DOWN), (103, LEFT), (104, RIGHT), (105, SHRINK), (999, End of RUN) and (other numbers, rest)
- header.EVENT.POS: timestamps of the aforementioned actions

Matlab file corresponding to each gdf file contains information about the location of the current states, goals, actions

- load('filename.mat') : load the matlab file
- runData.PM.currentState: current location of the cursor in the grid space. 1st row: y axis, 2nd row: x axis, [-1; -1] represents rest
- runData.PM.currentAction: (1, UP), (2, DOWN), (3, LEFT), (4, RIGHT), (5, SHRINK) and (-1, rest)
- runData.PM.currentGoals: location of the goals. [-1; -1] represents rest

3 Further notes:

We provide the scripts to load all the data in a concatenated form for each session and their corresponding trigger types and locations. Use the following function in the project directory,

```
[signals, event] = loadData(path);
```

Following is the input output pair of the function mentioned above

- `path` : Path to the folder you wanted to extract the data : i.e. `ErrPSpeller/Subject1/Offline`
- `signals`: Size ->`samples X Channels` : select the first 16 channels, neglect the last channel
- `event.type`: Size ->`1 X nTriggers` : Either 0 or 1, 0 correspond to no error, 1: erroneous trial
- `event.position`: Size ->`1 X nTriggers` : Time stamp of the corresponding trigger in the signals data
- `event.name`: Size ->`1 X nTriggers` : String name of the trigger either `correct_sw, error_sw`