USER GUIDE

Subject-Independent ERP-based Brain-Computer Interface

Kha Vo
University of Technology Sydney, Australia

February 2018

1 How to reproduce the results shown in Table III?

1. Pick the correct $\tilde{\theta}_1$ and $\tilde{\theta}_2$ corresponding to the classification scheme and parameter a from Table II. For instance, scheme ENS-3 and $a = 0$ results in $\tilde{\theta}_1 = 1.50$ and $\tilde{\theta}_2 = 0.75$.

2. Input the selected scheme, parameters in the Input Parameters section in the *Main.m* file. To produce results for "Letters for AL" $= x$ (for $x > 0$) (as shown Table III), change variable *Adaptive_flag* to 1 and *max_adaptation* to x; otherwise *Adaptive_flag = 0* and *max_adaptation = 0* for $x = 0$.

3. Run the *Main.m* file.

2 Preprocessed Data

For usage convenience, we provide the preprocessed Akimpech data in *.mat* files, with each file corresponds to one spelling character. The files are store in folders named *TrainCharacters* and *TestCharacters*. The most important variables contained in these files are x, y, and *code*. Variable x has size 180×140, corresponding to 180 flashing trials with each trial spans for 140 preprocessed data samples. Variable y has size 180×1 corresponding to 180 labels of -1 and $+1$. Variable *code* contains 180 flashing codes corresponding to 12 rows/columns in the P300-Speller.

The files in *TrainCharacters* are extracted and preprocessed from the Session 1 of the original Akimpech dataset. Each subject has 16 fixed characters to spell. Each file is named "[SubjectName]_char[CharNumber]", where [CharNumber] spans from 1 to 16. The target string for each subject is "CALORCARINOSUSHI".

The files in *TestCharacters* are extracted and preprocessed from the Session 3 of the original Akimpech dataset. Each subject was free to spell a few strings. Each file is named "[SubjectName]R[StringNumber]_[CharNumber]". The target strings for each subject is provided in the original dataset's description.

3 Pre-built Classifiers

The 4 SVM classifiers (ENS-2, ENS-3, ENS-4, and ENS-6) are built and ready for use. Each of these classifiers are learned from 12 spelling characters of 2 to 6 different subjects detailed in Table I. The readers just need to change the classifier name and the appropriate dynamic stopping parameters in *Main.m*. Please read Section 1 for a simple guide to reproduce the results in the paper.

We are pleased to provide the codes and preprocessed test data for the reproducibility of our paper's result. If the readers would like to use any resource from our project for their research, we would like them to have a citation of our paper in your work.

Comments to Kha Vo, voanhkha@yahoo.com.