

Simultaneous Acquisition of EEG and NIRS during Cognitive Tasks for an Open Access Dataset

This description is for use of data in vendor-specific format (EEG: BrainVision, NIRS: NIRx). Please download BBCI toolbox (https://github.com/bbci/bbci_public).

Example Dataset

Please download [example dataset](#) for data conversion exercise.

Data Organization

EEG data

EEG data are in each participant folder (e.g. VP001, VP002, etc.)

- *.vhdr: BrainVision header files
- *.vmrk: BrainVision marker files
- *.eeg: BrainVision data files

The file name does not match the dataset name. Please refer to the table below.

file name	Dataset name
nback	Dataset A (n-back task)
gonogo	Dataset B (discrimination/selection response)
word	Dataset C (word generation)

Please refer to the link below for EEG data conversion.

https://github.com/JaeyoungShin/simultaneous_EEG-NIRS/blob/master/BrainVision/EEG_conversion.m

In **cnt**:

cnt.clab does not match the clab shown in the paper. Please refer to the table below.

Table 1. Comparison of channels labels (clab)

original	paper	original	paper	original	paper
FP1	Fp1	POz	POz	HEOG	HEOG
AFF5	AFF5h	O1	O1	VEOG	VEOG
AFz	AFz	FP2	Fp2		
F1	F1	AFF6	AFF6h		
FC5	FC5	F2	F2		
FC1	FC1	FC2	FC2		
T7	T7	FC6	FC6		
C3	C3	C4	C4		
Cz	Cz	T8	T8		
CP5	CP5	CP2	CP2		
CP1	CP1	CP6	CP6		
P7	P7	P4	P4		
P3	P3	P8	P8		
Pz	Pz	O2	O2		

In **mrk**:

For **mrk.className**, see the table below.

Table 2. Description of class name (className) for dataset A

className	description
n/d	unused
S 16	0-back target
S 48	2-back target
S 64	2-back non-target
S 80	3-back target
S 96	3-back non-target
S112	0-back session
S128	2-back session
S144	3-back session
actiCAP Data On	unused

Table 3. Description of class name (className) for dataset B

className	description
n/d	unused
S 16	symbol 'O'
S 32	symbol 'X'
S 48	session
actiCAP Data On	unused

Table 4. Description of class name (className) for dataset C

className	description
n/d	unused
S 16	word generation
S 32	baseline
S208	unused
actiCAP Data On	unused

In **hdr**:

hdr.clab does not match the clab shown in the paper. Please refer to Table 1.

NIRS data

NIRS data are in each session folder (e.g. '2016-06-14_001', '2016-06-14_002', etc.) in each participant folder (e.g. VP001, VP002, etc.).

prefix-yyyy-mm-dd_XXX.wl1: NIRx data files for wavelength 1 (760 nm).

prefix-yyyy-mm-dd_XXX.wl2: NIRx data files for wavelength 2 (850 nm).

***.hdr**: NIRx header files.

Other files (***.set**, ***.evt**, ***._config.txt**, ***.inf**, ***.tpl**): The files contain mostly information that is redundant with entries in the .hdr file. These files are generated to maintain compatibility with other NIRx products.

Please refer to the link below for NIRS data conversion.

https://github.com/JaeyoungShin/simultaneous_EEG-NIRS/blob/master/NIRx/NIRS_conversion.m

WARNING: Please replace 'proc_BeerLambert.m' in BBCI toolbox folder with [this](#) for performing MBLL correctly.

Each session NIRS data are stored in separate subfolder. Please refer to Table 5 below.

Table 5. Folder name for each session data. Note VP001 and VP002 data are in different order.

participant	folder name	task	session	participant	folder name	task	session
VP001	'2016-05-26_001'	dsr	session 1	VP005	'2016-05-30_010'	nback	session 1
	'2016-05-26_002'	dsr	session 2		'2016-05-30_011'	nback	session 2
	'2016-05-26_003'	dsr	session 3		'2016-05-30_012'	nback	session 3
	'2016-05-26_004'	wg	session 1		'2016-05-30_013'	wg	session 1
	'2016-05-26_005'	wg	session 2		'2016-05-30_014'	wg	session 2
	'2016-05-26_006'	wg	session 3		'2016-05-30_015'	wg	session 3
	'2016-05-26_007'	nback	session 1		'2016-05-30_016'	dsr	session 1
	'2016-05-26_008'	nback	session 2		'2016-05-30_017'	dsr	session 2
	'2016-05-26_009'	nback	session 3		'2016-05-30_018'	dsr	session 3
VP002	'2016-05-26_010'	dsr	session 1	VP006	'2016-05-31_001'	nback	session 1
	'2016-05-26_011'	dsr	session 2		'2016-05-31_002'	nback	session 2
	'2016-05-26_012'	dsr	session 3		'2016-05-31_003'	nback	session 3
	'2016-05-26_013'	wg	session 1		'2016-05-31_004'	wg	session 1
	'2016-05-26_014'	wg	session 2		'2016-05-31_005'	wg	session 2
	'2016-05-26_015'	wg	session 3		'2016-05-31_006'	wg	session 3
	'2016-05-26_016'	nback	session 1		'2016-05-31_007'	dsr	session 1
	'2016-05-26_017'	nback	session 2		'2016-05-31_008'	dsr	session 2
	'2016-05-26_018'	nback	session 3		'2016-05-31_009'	dsr	session 3
VP003	'2016-05-27_001'	nback	session 1	VP007	'2016-06-01_001'	nback	session 1
	'2016-05-27_002'	nback	session 2		'2016-06-01_002'	nback	session 2
	'2016-05-27_003'	nback	session 3		'2016-06-01_003'	nback	session 3
	'2016-05-27_004'	wg	session 1		'2016-06-01_004'	wg	session 1
	'2016-05-27_005'	wg	session 2		'2016-06-01_005'	wg	session 2
	'2016-05-27_006'	wg	session 3		'2016-06-01_006'	wg	session 3
	'2016-05-27_007'	dsr	session 1		'2016-06-01_007'	dsr	session 1
	'2016-05-27_008'	dsr	session 2		'2016-06-01_008'	dsr	session 2
	'2016-05-27_009'	dsr	session 3		'2016-06-01_009'	dsr	session 3
VP004	'2016-05-30_001'	nback	session 1	VP008	'2016-06-02_001'	nback	session 1
	'2016-05-30_002'	nback	session 2		'2016-06-02_002'	nback	session 2
	'2016-05-30_003'	nback	session 3		'2016-06-02_003'	nback	session 3
	'2016-05-30_004'	wg	session 1		'2016-06-02_004'	wg	session 1
	'2016-05-30_005'	wg	session 2		'2016-06-02_005'	wg	session 2
	'2016-05-30_006'	wg	session 3		'2016-06-02_006'	wg	session 3
	'2016-05-30_007'	dsr	session 1		'2016-06-02_007'	dsr	session 1
	'2016-05-30_008'	dsr	session 2		'2016-06-02_008'	dsr	session 2
	'2016-05-30_009'	dsr	session 3		'2016-06-02_009'	dsr	session 3

participant	folder name	task	session	participant	folder name	task	session
VP009	'2016-06-02_010'	nback	session 1	VP013	'2016-06-06_010'	nback	session 1
	'2016-06-02_011'	nback	session 2		'2016-06-06_011'	nback	session 2
	'2016-06-02_012'	nback	session 3		'2016-06-06_012'	nback	session 3
	'2016-06-02_013'	wg	session 1		'2016-06-06_013'	wg	session 1
	'2016-06-02_014'	wg	session 2		'2016-06-06_014'	wg	session 2
	'2016-06-02_015'	wg	session 3		'2016-06-06_015'	wg	session 3
	'2016-06-02_016'	dsr	session 1		'2016-06-06_016'	dsr	session 1
	'2016-06-02_017'	dsr	session 2		'2016-06-06_017'	dsr	session 2
	'2016-06-02_018'	dsr	session 3		'2016-06-06_018'	dsr	session 3
VP010	'2016-06-03_001'	nback	session 1	VP014	'2016-06-07_001'	nback	session 1
	'2016-06-03_002'	nback	session 2		'2016-06-07_002'	nback	session 2
	'2016-06-03_003'	nback	session 3		'2016-06-07_003'	nback	session 3
	'2016-06-03_004'	wg	session 1		'2016-06-07_004'	wg	session 1
	'2016-06-03_005'	wg	session 2		'2016-06-07_005'	wg	session 2
	'2016-06-03_006'	wg	session 3		'2016-06-07_006'	wg	session 3
	'2016-06-03_007'	dsr	session 1		'2016-06-07_007'	dsr	session 1
	'2016-06-03_008'	dsr	session 2		'2016-06-07_008'	dsr	session 2
	'2016-06-03_009'	dsr	session 3		'2016-06-07_009'	dsr	session 3
VP011	'2016-06-03_010'	nback	session 1	VP015	'2016-06-07_010'	nback	session 1
	'2016-06-03_011'	nback	session 2		'2016-06-07_011'	nback	session 2
	'2016-06-03_012'	nback	session 3		'2016-06-07_012'	nback	session 3
	'2016-06-03_013'	wg	session 1		'2016-06-07_013'	wg	session 1
	'2016-06-03_014'	wg	session 2		'2016-06-07_014'	wg	session 2
	'2016-06-03_015'	wg	session 3		'2016-06-07_015'	wg	session 3
	'2016-06-03_016'	dsr	session 1		'2016-06-07_016'	dsr	session 1
	'2016-06-03_017'	dsr	session 2		'2016-06-07_017'	dsr	session 2
	'2016-06-03_018'	dsr	session 3		'2016-06-07_018'	dsr	session 3
VP012	'2016-06-06_001'	nback	session 1	VP016	'2016-06-08_001'	nback	session 1
	'2016-06-06_002'	nback	session 2		'2016-06-08_002'	nback	session 2
	'2016-06-06_003'	nback	session 3		'2016-06-08_003'	nback	session 3
	'2016-06-06_004'	wg	session 1		'2016-06-08_004'	wg	session 1
	'2016-06-06_005'	wg	session 2		'2016-06-08_005'	wg	session 2
	'2016-06-06_006'	wg	session 3		'2016-06-08_006'	wg	session 3
	'2016-06-06_007'	dsr	session 1		'2016-06-08_007'	dsr	session 1
	'2016-06-06_008'	dsr	session 2		'2016-06-08_008'	dsr	session 2
	'2016-06-06_009'	dsr	session 3		'2016-06-08_009'	dsr	session 3

participant	folder name	task	session	participant	folder name	task	session
VP017	'2016-06-09_001'	nback	session 1	VP021	'2016-06-14_010'	nback	session 1
	'2016-06-09_002'	nback	session 2		'2016-06-14_011'	nback	session 2
	'2016-06-09_003'	nback	session 3		'2016-06-14_012'	nback	session 3
	'2016-06-09_004'	wg	session 1		'2016-06-14_013'	wg	session 1
	'2016-06-09_005'	wg	session 2		'2016-06-14_014'	wg	session 2
	'2016-06-09_006'	wg	session 3		'2016-06-14_015'	wg	session 3
	'2016-06-09_007'	dsr	session 1		'2016-06-14_016'	dsr	session 1
	'2016-06-09_008'	dsr	session 2		'2016-06-14_017'	dsr	session 2
	'2016-06-09_009'	dsr	session 3		'2016-06-14_018'	dsr	session 3
VP018	'2016-06-10_001'	nback	session 1	VP022	'2016-06-15_001'	nback	session 1
	'2016-06-10_002'	nback	session 2		'2016-06-15_002'	nback	session 2
	'2016-06-10_003'	nback	session 3		'2016-06-15_003'	nback	session 3
	'2016-06-10_004'	wg	session 1		'2016-06-15_004'	wg	session 1
	'2016-06-10_005'	wg	session 2		'2016-06-15_005'	wg	session 2
	'2016-06-10_006'	wg	session 3		'2016-06-15_006'	wg	session 3
	'2016-06-10_007'	dsr	session 1		'2016-06-15_007'	dsr	session 1
	'2016-06-10_008'	dsr	session 2		'2016-06-15_008'	dsr	session 2
	'2016-06-10_009'	dsr	session 3		'2016-06-15_009'	dsr	session 3
VP019	'2016-06-13_001'	nback	session 1	VP023	'2016-06-16_001'	nback	session 1
	'2016-06-13_002'	nback	session 2		'2016-06-16_002'	nback	session 2
	'2016-06-13_003'	nback	session 3		'2016-06-16_003'	nback	session 3
	'2016-06-13_004'	wg	session 1		'2016-06-16_004'	wg	session 1
	'2016-06-13_005'	wg	session 2		'2016-06-16_005'	wg	session 2
	'2016-06-13_006'	wg	session 3		'2016-06-16_006'	wg	session 3
	'2016-06-13_007'	dsr	session 1		'2016-06-16_007'	dsr	session 1
	'2016-06-13_008'	dsr	session 2		'2016-06-16_008'	dsr	session 2
	'2016-06-13_009'	dsr	session 3		'2016-06-16_009'	dsr	session 3
VP020	'2016-06-14_001'	nback	session 1	VP024	'2016-06-16_010'	nback	session 1
	'2016-06-14_002'	nback	session 2		'2016-06-16_011'	nback	session 2
	'2016-06-14_003'	nback	session 3		'2016-06-16_012'	nback	session 3
	'2016-06-14_004'	wg	session 1		'2016-06-16_013'	wg	session 1
	'2016-06-14_005'	wg	session 2		'2016-06-16_014'	wg	session 2
	'2016-06-14_006'	wg	session 3		'2016-06-16_015'	wg	session 3
	'2016-06-14_007'	dsr	session 1		'2016-06-16_016'	dsr	session 1
	'2016-06-14_008'	dsr	session 2		'2016-06-16_017'	dsr	session 2
	'2016-06-14_009'	dsr	session 3		'2016-06-16_018'	dsr	session 3

participant	folder name	task	session
VP025	'2016-06-17_010'	nback	session 1
	'2016-06-17_011'	nback	session 2
	'2016-06-17_012'	nback	session 3
	'2016-06-17_013'	wg	session 1
	'2016-06-17_014'	wg	session 2
	'2016-06-17_015'	wg	session 3
	'2016-06-17_016'	dsr	session 1
	'2016-06-17_017'	dsr	session 2
	'2016-06-17_018'	dsr	session 3
VP026 (example data)	'2016-07-11_001'	nback	session 1
	'2016-07-11_002'	nback	session 2
	'2016-07-11_003'	nback	session 3
	'2016-07-11_004'	wg	session 1
	'2016-07-11_005'	wg	session 2
	'2016-07-11_006'	wg	session 3
	'2016-07-11_007'	dsr	session 1
	'2016-07-11_008'	dsr	session 2
	'2016-07-11_009'	dsr	session 3

Note

You can also use EEGLAB toolbox for converting the rawdata.

Citation

We would be grateful if you cite following articles:

1. Shin, Jaeyoung et al. "Simultaneous Acquisition of EEG and NIRS during Cognitive Tasks for an Open Access Dataset." *Scientific Data*, submitted.
2. Shin, Jaeyoung, et al. "Open Access Dataset for EEG+ NIRS Single-Trial Classification." *IEEE Transactions on Neural Systems and Rehabilitation Engineering* 25(10), (2017).
3. Blankertz, Benjamin, et al. "The Berlin brain–computer interface: non-medical uses of BCI technology." *Frontiers in neuroscience* 4 (2010).