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NIRS-SPM : Updates to Revision v. 4
December 16, 2011
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r1
NIRS-SPM has been updated with providing the frontal view of NIRS result image.
Request : Paola Petrucci, Politecnico di Milano, Italy.
2008-10-15

In obtaining the frontal view of NIRS result image, most of the routines are same.
Only the 'Result_NIRS' routine is different.
In the 'NIRS Results Viewer' window, highlight 'View of the brain'
and select the 'frontal checkbox'.
If most of the optodes are on the frontal lobe, the registration results and activation map will be more accurate.
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r2
NIRS-SPM has been updated for Linux and window compatibility.
Request and advice : Xu Cui, Stanford University, USA.
2008-10-15
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r3
In NIRS-fMRI alignment, NIRS-SPM has been updated for reading the real coordinates of optode and reference positions saved in a text file format (.txt) or a Microsoft Excel 97-2003 file format (.xls).
Request : Xu Cui, Stanford University, USA.
2008-10-21
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r4
NIRS-SPM has been updated for converting the Hitach's ETG4000 data to oxy and deoxy-Hb concentrations.
The source code and sample data have been provided by Xu Cui, Stanford University, USA.
2008-10-21
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r5
In the group analysis routine of frontal NIRS data, the program bug was fixed.
Advice : Ramona Cabiddu, Politecnico di Milano, Italy.
2008-11-17
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r6
For spatial registration of stand-alone NIRS data, NIRS-SPM has been updated for allowing for the manual MNI coordinates of each channel.
Request : Simone Cutini, Padova, Italy
          Xu Cui, Stanford University, USA
2008-11-26

In the main window of NIRS-SPM, choose the 'Stand-alone' checkbox and then, select the 'Spatial Registration' button.

In case that the MNI coordinates of channels are saved as a text (.txt) or CSV (.csv) file format, select the 'Select the file to contain MNI coordinates of each channel'. Specifically, column indexes in the file are x, y, and z coordinates of MNI space, respectively. (Please refer to the sample text file –MNI_standalone.txt).

Specify the optode holder type – 1 set or 2 sets.

Select the 'View Ch.' button and then, select the 'Save Ch.' button.

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r7

NIRS-SPM has been updated for providing the several views of NIRS activation map

1) ventral, 2) dorsal, 3) lateral (right), 4) lateral (left), 5) frontal, 6) occipital view.

2008-11-26

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r8

In the fMRI analysis, several files in sample data set were missed out. The missed files have been supplied.

Request : Haijing Niu, China

2008-11-26

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r9

NIRS-SPM has been updated for allowing the several cap configurations:

1) Artinis's OXYMON MKIII, 4 x 4 (1set), 24 channels - OxymonMK3_4x4_24ch.txt

2) Hitachi's ETG 4000, 3 x 11 (1set), 52 channels - HitachiETG4000_3x11_52ch.txt

3) Hitachi's ETG 4000, 4 x 4 (2sets), 48 channels - HitachiETG4000_4x4_48ch.txt

4) Hitachi's ETG 4000, 3 x 5 (2sets), 44 channels - HitachiETG4000_3x5_44ch.txt

In the 'Indicator Locations' window, select the 'Ch. Configuration' button and then, specify the channel configuration file.

Request : Xu Cui, Stanford University, USA.

2008-11-26

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r10

There were system errors in 'Spatial Registration of NIRS Channel Location' routines. These bugs were fixed.

Request : Xu Cui, Stanford University, USA.

2008-12-02

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r11

There was a error in including the path of the files (e.g. render_single_subj.mat, T1.nii). These bugs were fixed.

Request : Xu Cui, Stanford University, USA.

Simone Cutini, Padova, Italy

2008-12-13

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r12

NIRS-SPM has been updated for reading the HbO/HbR concentration changes from the Imagent^{TM} (ISS, Champaign, Illinois) system.

The sample data have been provided by Simone Cutini, Padova, Italy.

2008-12-23

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r13

NIRS-SPM has been updated for allowing for the optical density changes or HbO/HbR concentration changes as for the manual input of HbO and HbR.

Request : Simone Cutini, Padova, Italy.

2008-12-23

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r14

NIRS-SPM has been updated that i) several predicted models can be overlaid with the NIRS time series, and ii) the vector of onsets and durations can be automatically read from Imagent^{TM} data in the 'NIRS_TimeSeries_Viewer' window.

Request : Simone Cutini, Padova, Italy.

2009-02-02

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r15

Minor bugs in rendering routine were fixed. 'render_MNI_coordinates.m', 'NIRS_Rendered_MNI_viewer.m' files were modified.

Request : Joshua M. Carlson, University of New York, USA.

2009-02-25

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r16

There was a bug in the viewer of group analysis results (NIRS_Results_Viewer.m). Reported bug were fixed.

Request : Xu Cui, Stanford University, USA.

2009-04-08

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r17

Allowing simultaneous entry of multiple condition names, onsets, and durations using *.mat file has been implemented. This option can be used to load all the required information in one-go.

Request : Thomas Zeffiro, Massachusetts General Hospital, USA.

2009-05-07

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r18

Allowing channel wise input of distance, DPF, and wavelength to increase flexibility has been implemented.

Request : Thomas Zeffiro, Massachusetts General Hospital, USA.

2009-05-07

R19

NIRS-SPM has been modified for converting the Hitach's ETG4000 (2-set patch, 4x4 and 3x5) to oxy and deoxy-Hb concentrations.

Request : Xu Cui, Stanford University, USA

2009-05-07

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r20

Spatial registration of standalone NIRS from direct optode coordinates has been implemented. In addition to the previous channelwise MNI input interface, the new version allows the input of optode MNI coordinates from which channel MNI coordinate can automatically calculated.

Request : Xu Cui, Stanford University, USA
2009-05-11
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r21

Wavelet-minimum description length (MDL) detrending algorithm (Jang et al., Journal of Biomedical Optics 2009) has been implemented. Wavelet-MDL method effectively removes unwanted global trends due to breathing, cardiac, vaso-motion, or other experimental errors.
2009-05-11

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v02-r1

There was a bug in reading 'Hitachi ETG-4000 system (2set) data. Reported bug was fixed
2009-06-12

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v02-r2

In estimation of temporal correlation using 'pre-whitening' method, there was a bug. Problem was fixed.
2009-07-13

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v02-r3

NIRS-SPM has been updated for converting the optical density changes which were measured by DYNOT-232 (NIRx Medical Technologies, LLC.) system to the HbO/HbR concentration changes.
The sample data have been provided by Christina Habermehl.
Request : Christina Habermehl, Klinik für Neurologie, Charité Berlin, Germany.
2009-09-24

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v02-r4

NIRS-SPM has been updated for reading the oxy-, deoxy-, and total-hemoglobin concentration changes from Spectratech OEG-16 system.
The sample data has been provided by Fumio Kawaguchi.
Request : Fumio Kawaguchi, Spectratech, Inc., Yokohama, Japan.
2009-09-24

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v02-r5

In the model specification, the function which automatically reads the vector of onsets and durations from Hitachi ETG-4000 data has been implemented.
Request : Sebastian Heinzel, University of Wuerzburg, Germany.
2009-09-24

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v02-r6

Temporal processing capabilities have been strengthened. Currently, temporal smoothing (i.e. hrf and Gaussian smoothing) and detrending (i.e. Wavelet-MDL and DCT-based detrending) are available. In 'NIRS_TimeSeries_Viewer' window, the processed time series can be plotted.
2009-10-05

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v02-r7

The ROI analysis which plots the average time series among the certain channels or certain time-range has been added.

Request: Xu Cui, Stanford University, USA
2009-10-05

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v02-r8

The baseline correction as the initial time point or time-range has been included.
2009-10-06

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v02-r9

The function of spatial registration of NIRS channels without MRI and anatomical labeling for certain NIRS channel have been included. The NFRI' fNIRS tools (Singh et al., 2005) for spatial registration have been available in NIRS-SPM.
2009-10-12
The source codes have been provided by Ippeita Dan, Sensory & Cognitive Food Science Lab. National Food Research Institute, Japan.

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v03-r1

In 'Spatial registration of standalone NIRS channels', there was a problem in adding the MNI coordinates from the SPM template. The bug was fixed.
The bug was reported by Hadi Hussaini.
2009-11-20

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v03-r2

NIRS-SPM has been updated for reading the oxy-, deoxy-, and total-hemoglobin concentration changes from Hitachi ETG-4000 system.
The sample data has been provided by Danko Georgiev.
Request: Danko Georgiev, Kanazawa University, Japan.
2009-11-20

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v03-r3

Wavelet-MDL detrending has been modified so that 'Statistical Toolbox' of MATLAB is not required.
2009-12-17

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v03-r4

The function which projects the channel position of head surface onto that of cortical surface has been updated. It will promise more accurate result of spatial registration.
2009-12-17

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v03-r5

The batch scripts for data conversion, specification of general linear model (GLM), estimation of GLM parameters, and activation map have been completed.
2009-12-17

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v03-r6

NIRS-SPM has been updated for reading the oxy-, deoxy-, and total-hemoglobin concentration changes from Shimadzu OMM. FOIRE-3000 system.
The source code and sample data have been provided by Akihiro Ishikawa, Shimadzu Corporation, Japan.
2009-12-18

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v03.1-r1

In the step of 'precoloring' method, a memory intensive process was sufficiently improved that 'out of memory' problem does not appear.

If the 'out of memory' problem still happens, please use the following options in the 'specification' step:

Detrending? Wavelet-MDL → Low-pass filter? Gaussian or hrf → Correct for serial correlation? None.

2010-03-10

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v03.1-r2

NIRS-SPM has been updated for reading oxy-, and deoxy-hemoglobin concentration changes from BIOPAC fNIR system.

Request: Steven J. Laken, Cephos Corp. USA

2010-04-14

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v03.1-r3

A batch function for data conversion, 'data_conversion_batch.m', has been updated for adding the 'Manual Input' mode for (1) converting optical density changes, and (2) reading oxy-hemoglobin and deoxy-hemoglobin changes.

Request: Gary Strangman, Massachusetts General Hospital, USA

2010-04-14

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v03.1-r4

There was a problem in the 'Specification' step of the deoxy-hemoglobin data which had been detrended using wavelet-MDL method in 'Time Series Analysis & Plot' step.

The bug was fixed.

Request: Amy Lin, VIPS, Italy

2010-05-28

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v03.1-r5

NIRS-SPM has been updated for reading hemoglobin concentration changes from CW5 system (TechEN Inc., Milford, MA). After converting the optical density changes measured by CW5 system to the hemoglobin concentration changes by using HomER software ((http://www.nmr.mgh.harvard.edu/PMI/resources/homer/home.htm, Huppert et al. (2009)), and exporting the results as .mat file format, NIRS-SPM can read it.

Request: Haijing Niu and Sabin Khadka, University of Texas at Arlington, USA

2010-06-14

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v03.1-r6

NIRS-SPM has been updated for converting the optical density changes as well as the hemoglobin concentration changes from Oxymon MKIII system (Artinis).

Request: Thomas Dannhauser, University College of London, UK.
2010-09-08

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v03.1-r7

Minor problems for reading the optical densities and hemoglobin concentration changes from Hitachi ETG-4000 data have been solved.
Request: Vladimir Ivkovic, University of Houston, USA
        Patrick Plenger, Pate Rehabilitation, USA
2010-09-08

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v03.1-r8

The input parameter '# of trials' of wavelet-MDL detrending was removed since it makes the users confused.
2010-09-14

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v03.1-r9

A problem exists in applying the modified Beer-Lambert law regarding the data conversion of DYNOT-232 (NIRx Medical Technologies, LCC) system.
The bug was fixed by Dr. Ursula Weisensee.
2010-09-14

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v03.2

The version 3.2 of NIRS-SPM has been updated including the following features:
1. Estimation of cerebral metabolic rate of oxygen ($CMRO_2$) and cerebral blood flow (CBF) without hypercapnia using simultaneous NIRS and fMRI measurements
2. Allowing the channel configurations which consist of more than two set of channels: graphical selection of set of channels is available.
3. Graphical user interface modification for 'Time Series Analysis' and 'Spatial Registration'
4. Minor bugs were fixed.

2010-09-30

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v03.2-r1

In the 'Spatial Registration' and 'Results NIRS' routines, we added a function which exports channel locations after registration and statistical results including the values of beta and t-statistics as a text file.
Request: Justin, Emory University, USA
2010-10-19

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v03.2-r2, r3

A few reports from users that wavelet-MDL detrending tends to overfit when the sampling rate or the length of time trace is large have been received. After analyzing the data and our code, we found that there is a bug in the code to deal with the time-series whose length is very different from a power of 2. The updated version of wavelet-detrending resolves this issue by resampling the original time-series to a nearest power of 2 length time series. We believe that the problem may not be observed anymore.
Request: Amy Lin, VIPS, Italy
2010-11-23

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v03.2-r4
Batch files were updated for being compatible with NIRS-SPM v.3.2. Also, in the 'Results NIRS' routine, we updated a function exporting the MNI coordinates of each channel, p-value and its corresponding z-threshold as a text file.
Request: Akihiro Ishikawa, Shimadzu Corporation, Japan
　　　　Irmgard Griessbach, Otto-von-Guericke-University Magdeburg, Germany
2010-12-24
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v03.2-r5
A program for spatial registration of stand-alone NIRS channels did not work with MATLAB version R2010b. The program bug was fixed.
Request: Akihiro Ishikawa, Shimadzu Corporation, Japan
2011-05-27
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v04
The version 4 of NIRS-SPM has been updated including the following features:
1. Employing the expected Euler characteristic approach based on Lipschitz-Killing curvature (LKC) for controlling the family-wise error rate in both individual and group level analysis.
   Now, it is available for inference of brain activation from interpolated F-statistics.
2. Modifying channel-residual covariance estimation by considering channel-wise least square residual correlation.
3. Acceleration of processing in the routine of NIRS_Results_Viewer.
4. Minor bugs were fixed.
2011-12-16

Our NIRS-SPM software will be renewed regularly after collecting the requests from users.