**mpm-for-rodents pre-orientations**

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**1) Easy way: Get pre-orientation from standard-space to T1/MT/PD-space**

**AIM: T1/PD/MT-images might be differently oriented compared to the standard-space** ('AVGT.nii'–image). Thus, we need a rough pre-orientation from standard space to T1/MT/PD-space. Here we obtain the pre-orientation manually via HTML-file.

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| 1) from mpm-GUI menu select  **'estimate pre-orientation T1/PD/MT to template(AVGT.nii) ..use HTML-version'** | **2) The cmd-window will display the following:** |
| 3) click on the hyperlink 'open' or open the check-folder and open "Reorient\_t1--AVGT.html" |  |
| 4) This will open the browser with different orientations of the 't1'-image (left) and target orientation of the structural image in standard space ('AVGT.nii) on the right side | |
| 5) we can see that the orientation with rotTable-Index **[11] (which is '3.1416 0 1.5708')** is a good pre-orientation | |
| 6) open the parameter settings of project-file by hitting the [gear] icon of the ANT-GUI    And change the variable **x.wa.orientType** as follows:  **x.wa.orientType =** [11];  or  **x.wa.orientType = '3.1416 0 1.5708'** | **7) reload ANT-projectfile**  Either manually via **[load loadproj]-**button **from ANT-GUI**  Or type:  **antcb('reload')** |

**2): EASY way: Get pre-orientation from t2w-space to T1/MT/PD-space**T1/PD/MT- **AIM: The turborare-image (t2w) might be differently oriented compared to T1/PD/MT-images.** Thus, we need a rough pre-orientation from t2w-space to T1/MT/PD-space. Here we obtain the pre-orientation manually via HTML-file.

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| 1) from mpm-GUI menu select  **'estimate pre-orientation t2w to T1/PD/MT . ..use HTML-version'** | **2) The cmd-window will display the following:** |
| 3) click on the hyperlink 'open' or open the check-folder and open "Reorient\_t1--AVGT.html" |  |
| 4) This will open the browser with different orientations of the 't2w'-image (left) and the target orientation of the 't1'-image on the right side | |
| 5) we can see that the orientation with **rotTable-Index [14]: which is '1.5708 0 1.5708'** is a good pre-orientation | |
| 6) open the [**mpm\_config.m**] -file in the mpm-folder  And change the variable **mpm.t2w\_preorient** as follows:  **mpm.t2w\_preorient=[1.5708 0 1.5708];**  \*use here three **numeric** values [rotX rotY rotZ] | **7) reload mpm-toolbox**  Either manually via **[load config-file]-**button **from mpm-GUI**  Or type:  **mpm('reload')** |

**Note: The below sections describe another approach for the pre-orientation/pre-alignment task. This approach is more laborious.**

**3) Alternative approach: Get pre-orientation from standard-space to T1/MT/PD-space**

The below figure shows that the T1/PD/MT-images are differently oriented compared to the standard-space ('AVGT.nii' from 'mouse\_Allen2017HikishimaLR'.

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| The 1st volume of  **'04\_2\_MPM\_3D\_0p15\_t1\_exvivo.nii'** | **'AVGT.nii' of**  **'mouse\_Allen2017HikishimaLR'** |

Thus, we need a rough pre-orientation from standard space to T1/MT/PD-space. Here we obtain the pre-orientation manually via GUI. It might be necessary to use another machine, because it's possible your HPC-cluster might not have graphical support.

**Note, these steps need to be done only once per study!**

**1) Necessary preliminary steps**

-Paths of ANTx and mpm-rodent are set in Matlab

-go to study-folder. Here I use another machine: cd F:\data8\_MPM\MPM\_agBrandt3

-open ANTx-GUI: ant

load projectfile: use button [loadproj] from ANTx-GUI ore type: antcb('load','proj.m')

select the 1st animal from the left animal-listbox from ANTx-GUI

open mpm\_rodent-GUI: mpm

load mpm\_config file: use button [load config-file]. When successful, the config-file is displayed in the black info-bar.

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| ANTx-GUI | Mpm\_rodent-GUI |

**1) get pre-orientation from standard-space to T1/MT/PD**

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| 1) From mpm-GUI select to MENU: Preproc/**estimate pre-orientation T1/PD/MT to template (AVGT.nii)** | 2) This will open a parameter-window. Make **no** changes, just hit [RUN] |
| 3) The new GUI (3-point-selection) will open. | 4) In the command-window the instruction is given:  **estimate pre-orientation: "04\_2\_MPM\_3D\_0p15\_t1\_exvivo.nii" to "F:\data8\_MPM\MPM\_agBrandt3\templates\AVGT.nii"**  **GET PREORIENTATION**  **1) change each image to CORONAL orientation [dim1],[dim2] or [dim3] button**  **2) set 3 landmarks in each volume**  **2.1) top(superior) of OLFACT. BULBUS**  **2.2) superior part of MIDLINE STRUCTURE**  **2.3) inferor part of MIDLINE STRUCTURE and onthe same plane as (2)**  **-ideally, the 3 points (a) anatomically match in both images**  **(b) must have a large large distance from each other**  **3) Select MRicron from pulldown and hit [check]-button to inspect the overlay.**  **-alternatively, just and hit [check]-button (without MRicron)**  **4) If the overlay is "ROUGHLY" OK, hit [CLOSE]-button.** |
| 5) First we set all images to coronal view by clicking on the[dim2] –button below each image | 6) Next, select the [**OB**]-radio and click onto the top/supperor part of the olfactory bulbus in each image. At the selected location a red dot will appear. You can reset the dot by clicking another location of the image. A rough setting is enough, don't be to precise |
| 7) Next, select the [**SUP**]-radio and click onto the superior part of a MIDLINE STRUCTURE in each image. At the selected location a green dot will appear. | 8) Next, select the [**INF**]-radio and click onto the inferior part of a MIDLINE STRUCTURE on the **same plane** as used in the  previous step. Do this for each image. At the selected location a blue dot will appear. |
| 9) Important: hit the [**check**]-button.  This will display the rotations and translations in the command line: here:  ROTATIONS: 3.1416 -1.2246e-16 1.5708  TRANSLATIONS: -18.2591 -0.107396 11.9797  This step also visualizes the orientation: | 10) You can also display the pre-orientation as overlay via MRicron. For this select [MRicron] from the pulldown-menu and hit the [**check**]-button. |
| 11) The pre-orientation looks ok. Hit the [**close**]-button from to close the window (3-point-selection-GUI) |  |
| 12) When done, the command line will display the following: | |
| 12) Here we want to change pre-orientation by setting the variable "orientType" to [**11**]  Alternatively, "orientType" can also set to **'3.142 -0 1.571'.**  For this, hit the hit the [gear]-icon from the ANTx-GUI to  open the parameter setting |  |
| In the parameter file change "orientType" to [11], as shown below.  Hit [OK]-button | |
| 13) reload ANT-project-file  Use type :  antcb('reload') or antcb('load','proj.m')  or manually load the proj-file via [loadproj]-button |  |
|  |  |

**4) Alternative approach: Get pre-orientation from t2w-space to T1/MT/PD-space**

The below figure shows that the T1/PD/MT-images are differently oriented compared to the t2w-image (**'03\_1\_T2\_TurboRARE.nii')**.

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| --- | --- |
| The 1st volume of  **'04\_2\_MPM\_3D\_0p15\_t1\_exvivo.nii'** | **The t2w-image '03\_1\_T2\_TurboRARE.nii' from the same animal** |

Thus, we need a rough **pre-orientation from t2w-space to T1/MT/PD-space**. Here we obtain the pre-orientation manually via GUI. It might be necessary to use another machine, because it's possible your HPC-cluster might not have graphical support.

**Note, these steps need to be done only once per study!**

**1) Necessary preliminary steps**

-Paths of ANTx and mpm-rodent are set in Matlab

-go to study-folder. Here I use another machine: cd F:\data8\_MPM\MPM\_agBrandt3

-open ANTx-GUI: ant

load projectfile: use button [loadproj] from ANTx-GUI ore type: antcb('load','proj.m')

select the 1st animal from the left animal-listbox from ANTx-GUI

open mpm\_rodent-GUI: mpm

load mpm\_config file: use button [load config-file]. When successful, the config-file is displayed in the black info-bar.

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| ANTx-GUI | Mpm\_rodent-GUI |

**1) get pre-orientation from t2w to T1/MT/PD**

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| --- | --- |
| 1) From mpm-GUI select to MENU: Preproc/**estimate pre-orientation T1/PD/MT to template (AVGT.nii)** | 2) This will open a parameter-window. Make **no** changes, just hit [RUN] |
| 3) The new GUI (3-point-selection) will open. | 4) In the command-window the instruction is given:  **estimate pre-orientation: "t2w.nii" to "t1.nii"**  **GET PREORIENTATION**  **1) change each image to CORONAL orientation [dim1],[dim2] or [dim3] button**  **2) set 3 landmarks in each volume**  **2.1) top(superior) of OLFACT. BULBUS**  **2.2) superior part of MIDLINE STRUCTURE**  **2.3) inferor part of MIDLINE STRUCTURE and onthe same plane as (2)**  **-ideally, the 3 points (a) anatomically match in both images**  **(b) must have a large large distance from each other**  **3) Select MRicron from pulldown and hit [check]-button to inspect the overlay.**  **-alternatively, just and hit [check]-button (without MRicron)**  **4) If the overlay is "ROUGHLY" OK, hit [CLOSE]-button.** |
| 5) First we set all images to coronal view by clicking on the [dim2] –button on the 2nd image. Note that the 1st image is already in coronar view | 6) Next, select the [**OB**]-radio and click onto the top/superior part of the olfactory bulbus in each image. At the selected location a red dot will appear. You can reset the dot by clicking another location of the image. A rough setting is enough, don't be to precise |
| 7) Next, select the [**SUP**]-radio and click onto the superior part of a MIDLINE STRUCTURE in each image. At the selected location a green dot will appear. | 8) Next, select the [**INF**]-radio and click onto the inferior part of a MIDLINE STRUCTURE on the **same plane** as used in the  previous step. Do this for each image. At the selected location a blue dot will appear. |
| 9) Important: hit the [**check**]-button.  This will display the rotations and translations in the command line: here:  ROTATIONS: 1.5708 -6.1232e-17 1.5708  TRANSLATIONS: 0.0828656 -18.15 17.7361  This step also visualizes the orientation: | 10) You can also display the pre-orientation as overlay via MRicron. For this select [MRicron] from the pulldown-menu and hit the [**check**]-button. |
| 11) The pre-orientation looks ok. Hit the [**close**]-button from to close the window (3-point-selection-GUI) |  |
| 12) When done, the command line will display the following: | |
| 12) Here we want to change pre-orientation of the t2w-image by editing the **[mpm\_config.m]-**file in the **mpm**-folder.  …open '**mpm\_config.m**'-file by clicking the hyperlink in the cmd-window |  |
| In the parameter file change "orientType" to [11], as shown below.  Hit [OK]-button | |
| 13) reload mpm  type :  mpm('reload')  or manually load the **[mpm\_config.m]-**file via [**load config-file**]-button from mpm-GUI |  |