**Tutorial: Running ANTx on machines without graphic support “working without graphical user interfaces, GUIs”**

**This tutorial shows how to perform some basic steps without GUIs, for instance when running on an HPC-machine.**

**CONTENTS**

1) OPTIONAL: How to set the paths of ELASTIX in UNIX/LINUX-system:

2) OPTIONAL: Open interactive session on HPC-cluster and start Matlab

3) BASICS

ADD ANTx-PATHS

GO TO STUDY-FOLDER

UPDATE ANT-TOOLBOX

CREATE A PROJECT-FILE:

LOAD A PROJECT-FILE "proj.m"

CHECK WHETHER THE PROJECT-FILE IS LOADED

4) IMPORT BRUKER-DATA

5) VISUALIZE FILES AND FOLDERS

6) SELECTION OF ANIMALS

7) RENAME FILES

8) REGISTER “t2.nii” TO TEMPLATE (STANDARD SPACE, SS)

9) Extract the first 3d-volume from the 4D-vlume 'dti\_b100.nii'

10) COREGISTER 'dti\_b100\_1stIMG.nii' to ‘t2.nii’

11) TRANSFORM ANOTHER IMAGE TO STANDARD-SPACE

12) TRANSFORM ANOTHER IMAGE TO NATIVE-SPACE

13) CHECK REGISTRATION in STANDARD-SPACE - CREATE HTML-FILE

14) CHECK REGISTRATION in NATIVE-SPACE - CREATE HTML-FILE

**1) OPTIONAL: How to set the paths of ELASTIX in UNIX/LINUX-system:**

**MAKE ELASTIX RUNNING ON UNIX/LINUX-Systems**

========================================

**1)** **SET PATH OF ELASTIC IN .bashrc-FILE**

========================================

FOR INFORMATION:

see: elastix-manual (section 3.2)

see: https://usermanual.wiki/Document/elastix490manual.1389615963/html#pf17

**Linux: Add the following lines to your .bashrc file:**

------------------------------------------------------

**export PATH=folder/bin:$PATHexport**

**LD\_LIBRARY\_PATH=folder/lib:$LD\_LIBRARY\_PATH**

-----------

...where "folder" is the path to the linux-elastix-folder (which is within the antx2-folder):

EXAMPLE:

My linux-elastix-folder is "/sc-projects/sc-proj-agtiermrt/Daten-2/ressources/antx2/mritools/elastix/elastix\_linux64\_v4.7/". Thus, my bahrc-file it stmodified as follows:

#--------------------------[ELASTIX-PATH in bashrc]----------------------------------------

export PATH=/sc-projects/sc-proj-agtiermrt/Daten-2/ressources/antx2/mritools/elastix/elastix\_linux64\_v4.7/bin:$PATH

export LD\_LIBRARY\_PATH=/sc-projects/sc-proj-agtiermrt/Daten-2/ressources/antx2/mritools/elastix/elastix\_linux64\_v4.7/lib:$LD\_LIBRARY\_PATH

#------------------------------------------------------------------------------------------

========================================

**2)** **RELOAD .bashrc-FILE & TEST ELASTIX**

========================================

- save .bashrc-file, exit editor, than type the following to reload the .bashrc-file again:

**source .bashrc**

- check installation, by typing:

**elastix**

- if successful, a message is displayed:

Use "elastix --help" for information about elastix-usage.

**2) OPTIONAL: Open interactive session on HPC-cluster and start Matlab**

**OPEN INTERACTIVE JOB on HPC-CLUSTER (optional)**

srun --time 7-00 --mem=64G --ntasks=8 --pty bash -i

-Please check the parameters

**LOAD MATLAB-MODULE AND START MATLAB (optional)**

module load scientific/matlab/R2021b

matlab

-To access Matlab is for shure different on another machine!

**3) BASICS**

**FROM NOW ON type in the MATLAB CMD-WINDOW…**

**ADD ANTx-PATHS**

cd /sc-projects/sc-proj-agtiermrt/Daten-2/ressources/antx2/

antlink

**GO TO STUDY-FOLDER**

cd /sc-projects/sc-proj-agtiermrt/Daten-2/mri/projects/groeschel/

The study-folder is the folder where the registration of several animals of one study will be performed

**UPDATE ANT-TOOLBOX**

Just type updateantx(2) to update the toolbox. For more info type help updateantx

updateantx(2)

**CREATE A PROJECT-FILE:**

makeproject('projectname',fullfile(pwd,'proj.m'), 'voxsize',[.07 .07 .07],'wa\_refpath','/sc-projects/sc-proj-agtiermrt/Daten-2/ressources/anttemplates/mouse\_Allen2017HikishimaLR','wa\_species','mouse');

-here the project-file "proj.m" is created using a target voxelsize of 0.07x0.07x0.07 mm, the animal template is "mouse\_Allen2017HikishimaLR", with species 'mouse'

- a suitable template has to be downloaded from google-drive : <https://drive.google.com/drive/folders/1q5XOOVLvUYLqYsQJLqNRF7OK8fNwYhI9>

And should be unzipped and stored where it could be reached (do not store the downloaded template in the current project-folder!)

-This has to be done only once!

**LOAD A PROJECT-FILE "proj.m"**

loadconfig(fullfile(pwd,'proj.m'));

**CHECK WHETHER THE PROJECT-FILE IS LOADED**

global an;

an

now you should see some fileds stored in the global variable “an” (struct):

project: 'NEW PROJECT'

datpath: '/sc-projects/sc-proj-agtiermrt/Daten-2/mri/projects/groeschel/dat'

voxsize: [0.0700 0.0700 0.0700]

wa: [1x1 struct]

**4) IMPORT BRUKER-DATA**

First we just read the file-information of the Bruker-raw from the raw-data folder stored in the current study folder (fullfile(pwd,'raw')) and store it in the w-struct.

w=xbruker2nifti(fullfile(pwd,'raw'),0,[],[],'gui',0,'show',1); % first read all data and show it

The w.struct contains the a table “d” with header “hd” which is listed in the CMD-window when running this command. Now you can save & reload the struct and import some data later on (advantage: loading time is reduced). To show the table again, type:

w.showtable(w) ; %to show the table in CMD-window

If graphic is supported you could also see the table in an extra window via w.showtable2(w) ;

The raw-data contain two data-sets (2 animals)

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

BRUKER DATA

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

set SubjectId StudNo ExpNo PrcNo MRseq protocol sizeMB date file

1 20200925MG\_LAERMRT\_MGR000025 1 1 1 FLASH 01\_1\_Localizer\_CRP 0.393216 20-Oct-2020 15:07:20 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 10 1 SINGLEPULSE 02\_6\_freqAdj\_SINGLEPULSE 0.004096 20-Oct-2020 15:05:32 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 11 1 DtiEpi 02\_7\_DTI\_EPI\_seg\_b2500\_37dir 112.0666 20-Oct-2020 15:06:12 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 11 2 DtiEpi nan 129.7613 20-Oct-2020 15:06:59 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 13 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 15:07:11 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 16 1 STEAM 04\_3\_Localized\_shim\_MGB 0.004096 20-Oct-2020 15:03:38 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 17 1 STEAM 04\_3\_STEAM\_1H\_MGB 0.004096 20-Oct-2020 15:05:13 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 19 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 15:08:29 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 2 1 FLASH 01\_2\_Localizer\_multi\_slice 1.10592 20-Oct-2020 15:09:05 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 20 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 15:05:33 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 21 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 15:04:55 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 22 1 FieldMap B0Map-ADJ\_B0MAP 1.048576 20-Oct-2020 15:05:31 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 23 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 15:05:32 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 24 1 FLASH 01\_2\_Localizer\_multi\_slice 1.10592 20-Oct-2020 15:03:47 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 25 1 RARE 03\_T2\_TurboRARE\_CRP\_MapShim 2.94912 20-Oct-2020 15:08:28 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 26 1 FieldMap B0Map-ADJ\_B0MAP 1.048576 20-Oct-2020 15:03:51 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 27 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 15:04:48 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 28 1 STEAM 04\_2\_STEAM\_1H\_IC\_single 0.004096 20-Oct-2020 15:05:25 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 29 1 STEAM 04\_3\_Localized\_shim\_MGB 0.004096 20-Oct-2020 15:03:52 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 3 1 RARE 03\_T2\_TurboRARE\_CRP 6.5536 20-Oct-2020 15:05:38 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 31 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 15:05:39 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 33 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 15:08:23 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 35 1 STEAM 04\_2\_STEAM\_1H\_IC\_single 0.004096 20-Oct-2020 15:07:33 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 4 1 DtiEpi 02\_1\_DTI\_EPI\_seg\_b100\_6dir 20.64384 20-Oct-2020 15:08:11 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 4 2 DtiEpi nan 129.7613 20-Oct-2020 15:08:24 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 5 1 FieldMap B0Map-ADJ\_B0MAP 1.048576 20-Oct-2020 15:03:53 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 6 1 SINGLEPULSE 02\_2\_freqAdj\_SINGLEPULSE 0.004096 20-Oct-2020 15:05:00 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 7 1 DtiEpi 02\_3\_DTI\_EPI\_seg\_b900\_13dir 41.28768 20-Oct-2020 15:08:40 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 7 2 DtiEpi nan 129.7613 20-Oct-2020 15:09:00 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 8 1 SINGLEPULSE 02\_4\_freqAdj\_SINGLEPULSE 0.004096 20-Oct-2020 15:08:25 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 9 1 DtiEpi 02\_5\_DTI\_EPI\_seg\_b1600\_25dir 76.67712 20-Oct-2020 15:04:13 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

1 20200925MG\_LAERMRT\_MGR000025 1 9 2 DtiEpi nan 129.7613 20-Oct-2020 15:04:41 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 1 1 FLASH 01\_1\_Localizer\_CRP 0.393216 20-Oct-2020 14:57:50 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 10 1 DtiEpi 02\_7\_DTI\_EPI\_seg\_b2500\_37dir 112.0666 20-Oct-2020 14:56:04 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 10 2 DtiEpi nan 129.7613 20-Oct-2020 14:56:29 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 11 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 14:57:36 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 12 1 STEAM 04\_2\_STEAM\_1H\_IC\_single 0.004096 20-Oct-2020 14:54:36 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 13 1 STEAM 04\_3\_Localized\_shim\_MGB 0.004096 20-Oct-2020 14:57:43 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 14 1 STEAM 04\_3\_STEAM\_1H\_MGB 0.004096 20-Oct-2020 14:57:16 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 15 1 FieldMap B0Map-ADJ\_B0MAP 1.048576 20-Oct-2020 14:59:45 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 16 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 14:54:32 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 17 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 14:55:28 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 18 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 14:56:48 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 19 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 14:59:15 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 2 1 FLASH 01\_2\_Localizer\_multi\_slice 1.10592 20-Oct-2020 14:59:33 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 20 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 14:56:38 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 21 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 14:54:36 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 23 1 STEAM 04\_2\_Localized\_shim\_IC\_single 0.004096 20-Oct-2020 14:55:32 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 3 1 RARE 03\_T2\_TurboRARE\_CRP 6.5536 20-Oct-2020 14:57:06 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 4 1 DtiEpi 02\_1\_DTI\_EPI\_seg\_b100\_6dir 20.64384 20-Oct-2020 14:58:07 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 4 2 DtiEpi nan 129.7613 20-Oct-2020 14:58:30 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 5 1 SINGLEPULSE 02\_2\_freqAdj\_SINGLEPULSE 0.004096 20-Oct-2020 14:54:33 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 6 1 DtiEpi 02\_3\_DTI\_EPI\_seg\_b900\_13dir 41.28768 20-Oct-2020 14:54:49 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 6 2 DtiEpi nan 129.7613 20-Oct-2020 14:55:18 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 7 1 SINGLEPULSE 02\_4\_freqAdj\_SINGLEPULSE 0.004096 20-Oct-2020 14:59:22 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 8 1 DtiEpi 02\_5\_DTI\_EPI\_seg\_b1600\_25dir 76.67712 20-Oct-2020 14:58:47 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 8 2 DtiEpi nan 129.7613 20-Oct-2020 14:59:07 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

2 20200925MG\_LAERMRT\_MGR000027 1 9 1 SINGLEPULSE 02\_6\_freqAdj\_SINGLEPULSE 0.004096 20-Oct-2020 14:54:33 /sc-projects/sc-proj-agtiermrt/Daten-2/mri/proje

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

Here we want to import the Turborare-image and the DTI\_EPI\_seg\_b100\_6dir-image.

To visulaize the filtered table run the following command (note that the w-struct is used as 1st argument)

w2=xbruker2nifti(w,0,[],[],'gui',0,'show',1,'flt',{'pro','03\_T2\_TurboRARE\_CRP|EPI\_seg\_b100' } );

the table now looks as follows:

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

BRUKER DATA

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

set SubjectId StudNo ExpNo PrcNo MRseq protocol sizeMB date file

1 20200925MG\_LAERMRT\_MGR000025 1 3 1 RARE 03\_T2\_TurboRARE\_CRP 6.5536 20-Oct-2020 15:05:38 /sc-projects/sc-

1 20200925MG\_LAERMRT\_MGR000025 1 4 1 DtiEpi 02\_1\_DTI\_EPI\_seg\_b100\_6dir 20.64384 20-Oct-2020 15:08:11 /sc-projects/sc-

2 20200925MG\_LAERMRT\_MGR000027 1 3 1 RARE 03\_T2\_TurboRARE\_CRP 6.5536 20-Oct-2020 14:57:06 /sc-projects/sc-

2 20200925MG\_LAERMRT\_MGR000027 1 4 1 DtiEpi 02\_1\_DTI\_EPI\_seg\_b100\_6dir 20.64384 20-Oct-2020 14:58:07 /sc-projects/sc-

¯

Now let’s import these data, for this just set the ‘show’-parameter to 0

w2=xbruker2nifti(w,0,[],[],'gui',0,'show',0,'flt',{'pro','03\_T2\_TurboRARE\_CRP|EPI\_seg\_b100' } );

**5) VISUALIZE FILES AND FOLDERS**

-type dispfiles to see a file by folder matrix in the command-window (see dispfiles for further help)

dispfiles

the following is displayed in the CMD-window:

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

FILE x FOLDER

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

20200925MG\_LAERMRT\_MGR000025 20200925MG\_LAERMRT\_MGR000027 counts

============================ ============================ ======

02\_1\_DTI\_EPI\_seg\_b100\_6dir\_1.nii + + 2/2

03\_T2\_TurboRARE\_CRP\_1.nii + + 2/2

counts 2/2 2/2

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

Here we see that in the study’s dat-folder now contains two animal-folders (“20200925MG\_LAERMRT\_MGR000025” and “20200925MG\_LAERMRT\_MGR000027”) and each animal contain two files.

**6) SELECTION OF ANIMALS**

Before renaming files let’s first select the animals we want to process:

Here we select all animals:

mdirs=antcb(‘getallsubjects’)

mdirs contains the fullpaths of the selected animals:

{'/sc-projects/sc-proj-agtiermrt/Daten-2/mri/projects/groeschel/dat/20200925MG\_LAERMRT\_MGR000025'}

{'/sc-projects/sc-proj-agtiermrt/Daten-2/mri/projects/groeschel/dat/20200925MG\_LAERMRT\_MGR000027'}

Alternative selection of all animals:

mdirs =antcb('selectdirs',[1:2 ])

mdirs=antcb('selectdirs','all')

**7) RENAME FILES**

Lets rename '02\_1\_DTI\_EPI\_seg\_b100\_6dir\_1.nii' to 'dti\_b100.nii'

xrename(0,'02\_1\_DTI\_EPI\_seg\_b100\_6dir\_1.nii','dti\_b100.nii',':','dirs',mdirs);

and rename '03\_T2\_TurboRARE\_CRP\_1.nii' to t2.nii'

xrename(0,'03\_T2\_TurboRARE\_CRP\_1.nii','t2.nii',':','dirs',mdirs);

Here for safety reasons, we make a copy of the original file and rename the copied fiel (copying and renaming is defined via the colon-sign (:) as 4th input arg ). To really rename the file, keep the 4th arg empty.

Now, check the renaming via dispfiles:

dispfiles

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

FILE x FOLDER

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

20200925MG\_LAERMRT\_MGR000025 20200925MG\_LAERMRT\_MGR000027 counts

============================ ============================ ======

02\_1\_DTI\_EPI\_seg\_b100\_6dir\_1.nii + + 2/2

03\_T2\_TurboRARE\_CRP\_1.nii + + 2/2

dti\_b100.nii + + 2/2

t2.nii + + 2/2

counts 4/4 4/4

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

**8) REGISTER “t2.nii” TO TEMPLATE (STANDARD SPACE, SS)**

Registration of “t2.nii” to standard space (SS) is done in 4 steps ( [1] initialization, [2] rough rigid registration, [3] segmentation and [4] warping). You can perform these steps (‘task’) isolated but must applied in the order. Rough Registration ‘is done automatically (autoreg’, 1), here we use parallel processing across animals ('parfor',1); Please check the memory and number of cores for parfor-processing.

xwarp3('batch','task',[1:4 ],'autoreg',1,'parfor',1, 'mdirs',mdirs(:) );

-let’s check whether the “t2.nii” is now in standard-space (“x\_t2.nii”) and the template (“AVGT.nii”) and atlas (“ANO.nii”) is back-transformed to native-space (“ix\_ANO.nii” & “ix\_AVGT.nii”) via:

dispfiles('flt','^x.\*.nii|^ix.\*.nii');

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

FILE x FOLDER

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

20200925MG\_LAERMRT\_MGR000025 20200925MG\_LAERMRT\_MGR000027 counts

============================ ============================ ======

ix\_ANO.nii + + 2/2

ix\_AVGT.nii + + 2/2

x\_t2.nii + + 2/2

counts 3/3 3/3

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

**9) Extract the first 3d-volume from the 4D-vlume 'dti\_b100.nii'**

Use the following command to extract the 1st volume (4th input arg) of 'dti\_b100.nii' and save as 'dti\_b100\_1stIMG.nii' for all animals (mdirs):

xrename(0,'dti\_b100.nii' ,'dti\_b100\_1stIMG.nii' ,'1','dirs', mdirs );

and check existence of file via:

dispfiles('flt','^dt')

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

FILE x FOLDER

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

20200925MG\_LAERMRT\_MGR000025 20200925MG\_LAERMRT\_MGR000027 counts

============================ ============================ ======

dti\_b100.nii + + 2/2

dti\_b100\_1stIMG.nii + + 2/2

counts 2/2 2/2

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

**10) COREGISTER 'dti\_b100\_1stIMG.nii' to ‘t2.nii’**

Now lets coregister the file 'dti\_b100\_1stIMG.nii' to the ‘t2.nii’-image:

z=[];

z.TASK={ '[2]' };

z.targetImg1={ 't2.nii' }; ;% TARGET-IMAGE

z.sourceImg1={ 'dti\_b100\_1stIMG.nii' }; ;% SOURCE-IMAGE

z.sourceImgNum1=[1]; ;% IN CASE OF 4D-vol use 1st 3d-volume of SOURCE

z.applyImg1= '' ; % TRAFO IS NOT APPLIED TO OTHER Images here

z.cost\_fun='nmi';

z.sep=[7 2 1 0.5 0.1 0.05];

z.tol=[0.01 0.01 0.01 0.001 0.001 0.001];

z.fwhm=[4 4];

z.centerering=[0];

z.reslicing=[1]; ;% OUTPUT-IMAGE IS RESLICED TO MATCH WITH TARGET

z.interpOrder='auto';

z.prefix='r3'; ;% OUTPUT FILE-PREFIX

z.warping=[0]; %WARPING IS "OFF"

z.isparallel=1; ;% PARALLEL PROCESSING ENABLED

xcoreg(0,z, mdirs);

check existence of file:

dispfiles('flt','^r3')

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

FILE x FOLDER

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

20200925MG\_LAERMRT\_MGR000025 20200925MG\_LAERMRT\_MGR000027 counts

============================ ============================ ======

r3c\_dti\_b100\_1stIMG.nii + + 2/2

r3c\_t2.nii + + 2/2

counts 2/2 2/2

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

**11) TRANSFORM ANOTHER IMAGE TO STANDARD-SPACE**

Now, we want to transform the image “r3c\_dti\_b100\_1stIMG.nii” to standard-space (1st arg: 1) for all selected animals (mdirs), using b-spline interpolation (4th arg: 4), with local reorientation estimated from the rough rigid registration step (5th arg: ‘local’) and that the input-file is located in the animal folder (6th arg: struct('source','intern') ). This will create the file “x\_r3c\_dti\_b100\_1stIMG.nii”:

fis=doelastix(1, mdirs,{'r3c\_dti\_b100\_1stIMG.nii'},4,'local' ,struct('source','intern'));

check existence of the file “x\_r3c\_dti\_b100\_1stIMG.nii”:

dispfiles('flt','x\_.\*')

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

FILE x FOLDER

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

20200925MG\_LAERMRT\_MGR000025 20200925MG\_LAERMRT\_MGR000027 counts

============================ ============================ ======

ix\_ANO.nii + + 2/2

ix\_AVGT.nii + + 2/2

ix\_AVGThemi.nii + + 2/2

x\_r3c\_dti\_b100\_1stIMG.nii + + 2/2

x\_t2.nii + + 2/2

counts 5/5 5/5

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

**12) TRANSFORM ANOTHER IMAGE TO NATIVE-SPACE**

In the same way we could also bring the template’s hemispheric mask (‘AVGThemi.nii’) to native space (‘ix\_AVGThemi.nii’). For transformation to native space the 1st arg is -1, we use NN-interpolation to preserve numbers (4th arg: 0):

fis2=doelastix(-1, mdirs,{'AVGThemi.nii'},0,'local' ,struct('source','intern'));

check existence of the file ‘ix\_AVGThemi.nii’:

dispfiles('flt','ix\_.\*')

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

FILE x FOLDER

¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯¯

20200925MG\_LAERMRT\_MGR000025 20200925MG\_LAERMRT\_MGR000027 counts

============================ ============================ ======

ix\_ANO.nii + + 2/2

ix\_AVGT.nii + + 2/2

ix\_AVGThemi.nii + + 2/2

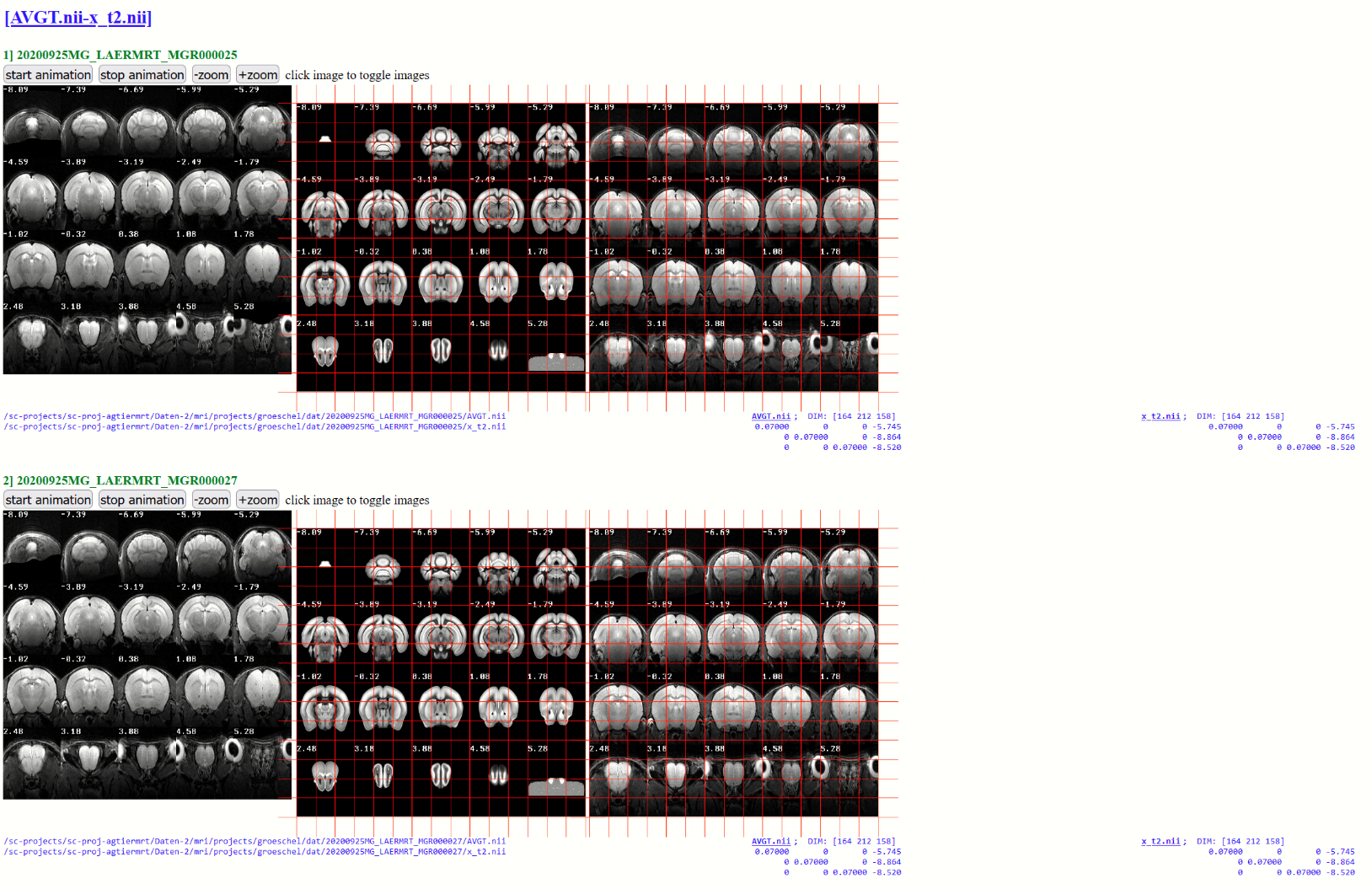
counts 3/3 3/3

**13) CHECK REGISTRATION in STANDARD-SPACE - CREATE HTML-FILE**

Next we create an HTML-file to visualize the overlay of the template “AVGT.nii” and “x\_t2.nii” (animal in standard-space). The 3rd arg defines the output-folder, the 4th input, defines the size of the images and the number of slices to visualize:

checkreghtml(mdirs,{'AVGT.nii','x\_t2.nii' },fullfile(pwd,'checks'),struct('size',300,'slices','n20'))

Now you can copy the checks-folder and visualize the registration with your Web-browser (1st image: animated gif, 2nd image: 'AVGT.nii', 3rd image: 'x\_t2.nii' )

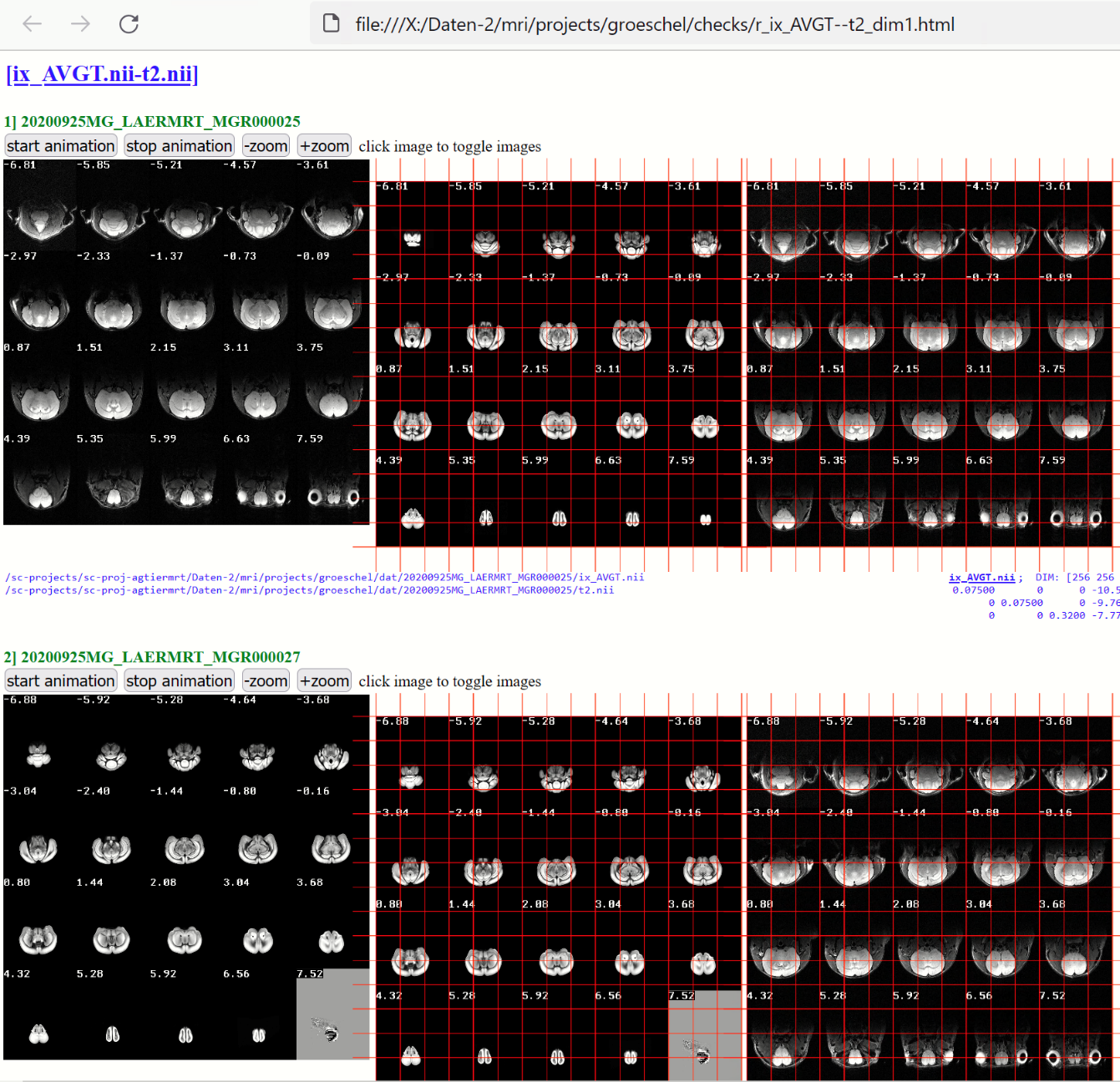


**14) CHECK REGISTRATION in NATIVE-SPACE - CREATE HTML-FILE**

In the same, we can create the overlay of “t2.nii” and “ix\_AVGT.nii” and save it as HTML-file.

Note, here the slicing is done from the 1st-dimension (‘dim’: 1)

checkreghtml(mdirs,{'ix\_AVGT.nii','t2.nii' },fullfile(pwd,'checks'),struct('size',300,'slices','n20','dim',1))

****