

Problemas con el procesamiento de FBB y como no morir en el intento

bulk conversion

Voy a escribir un procedimiento nuevo para la conversion de DCM a NiftI aprovechando que tengo nuevos procedimientos y software para todo.

Primero,

```
[osotolongo@detritus facehbi]$ ls /nas/clinic/facehbi
FACEHBI-F001B  FACEHBI-F018B  FACEHBI-F036B  FACEHBI-F055B  FACEHBI-F072B
FACEHBI-F088B  FACEHBI-F105B  FACEHBI-F122B  FACEHBI-F139B  FACEHBI-F155B
FACEHBI-F171B  FACEHBI-F191B  FACEHBI-F208B
FACEHBI-F002B  FACEHBI-F019B  FACEHBI-F037B  FACEHBI-F056B  FACEHBI-F073B
FACEHBI-F089B  FACEHBI-F106B  FACEHBI-F123B  FACEHBI-F140B  FACEHBI-F156B
FACEHBI-F173B  FACEHBI-F192B  FACEHBI-F209B
FACEHBI-F003B  FACEHBI-F020B  FACEHBI-F038B  FACEHBI-F057B  FACEHBI-F074B
FACEHBI-F090B  FACEHBI-F107B  FACEHBI-F124B  FACEHBI-F141B  FACEHBI-F157B
FACEHBI-F174B  FACEHBI-F193B  FACEHBI-F210B
FACEHBI-F004B  FACEHBI-F021B  FACEHBI-F039B  FACEHBI-F058B  FACEHBI-F075B
FACEHBI-F091B  FACEHBI-F108B  FACEHBI-F125B  FACEHBI-F142B  FACEHBI-F158B
FACEHBI-F175B  FACEHBI-F194B  FACEHBI-F211B
FACEHBI-F005B  FACEHBI-F022B  FACEHBI-F040B  FACEHBI-F059B  FACEHBI-F076B
FACEHBI-F092B  FACEHBI-F109B  FACEHBI-F126B  FACEHBI-F143B  FACEHBI-F159B
FACEHBI-F177B  FACEHBI-F195B  FACEHBI-F212B
FACEHBI-F006B  FACEHBI-F023B  FACEHBI-F041B  FACEHBI-F060B  FACEHBI-F077B
FACEHBI-F093B  FACEHBI-F110B  FACEHBI-F127B  FACEHBI-F144B  FACEHBI-F160B
FACEHBI-F178B  FACEHBI-F196B  FACEHBI-F213B
FACEHBI-F007B  FACEHBI-F024B  FACEHBI-F042B  FACEHBI-F061B  FACEHBI-F078B
FACEHBI-F094B  FACEHBI-F111B  FACEHBI-F128B  FACEHBI-F145B  FACEHBI-F161B
FACEHBI-F179B  FACEHBI-F197B  FACEHBI-F214B
FACEHBI-F008B  FACEHBI-F025B  FACEHBI-F043B  FACEHBI-F062B  FACEHBI-F079B
FACEHBI-F095B  FACEHBI-F112B  FACEHBI-F129B  FACEHBI-F146B  FACEHBI-F162B
FACEHBI-F181B  FACEHBI-F198B  FACEHBI-F215B
FACEHBI-F009B  FACEHBI-F026B  FACEHBI-F044B  FACEHBI-F063B  FACEHBI-F080B
FACEHBI-F096B  FACEHBI-F113B  FACEHBI-F130B  FACEHBI-F147B  FACEHBI-F163B
FACEHBI-F182B  FACEHBI-F199B
FACEHBI-F010B  FACEHBI-F027B  FACEHBI-F047B  FACEHBI-F064B  FACEHBI-F081B
FACEHBI-F097B  FACEHBI-F115B  FACEHBI-F131B  FACEHBI-F148B  FACEHBI-F164B
FACEHBI-F183B  FACEHBI-F200B
FACEHBI-F011B  FACEHBI-F028B  FACEHBI-F048B  FACEHBI-F065B  FACEHBI-F082B
FACEHBI-F098B  FACEHBI-F116B  FACEHBI-F132B  FACEHBI-F149B  FACEHBI-F165B
FACEHBI-F184B  FACEHBI-F201B
FACEHBI-F012B  FACEHBI-F029B  FACEHBI-F049B  FACEHBI-F066B  FACEHBI-F083B
FACEHBI-F099B  FACEHBI-F117B  FACEHBI-F133B  FACEHBI-F150B  FACEHBI-F166B
FACEHBI-F185B  FACEHBI-F202B
FACEHBI-F013B  FACEHBI-F030B  FACEHBI-F050B  FACEHBI-F068B  FACEHBI-F084B
```

```

FACEHBI-F101B FACEHBI-F118B FACEHBI-F134B FACEHBI-F151B FACEHBI-F167B
FACEHBI-F186B FACEHBI-F203B
FACEHBI-F014B FACEHBI-F031B FACEHBI-F052B FACEHBI-F069B FACEHBI-F085B
FACEHBI-F102B FACEHBI-F119B FACEHBI-F135B FACEHBI-F152B FACEHBI-F168B
FACEHBI-F188B FACEHBI-F204B
FACEHBI-F015B FACEHBI-F033B FACEHBI-F053B FACEHBI-F070B FACEHBI-F086B
FACEHBI-F103B FACEHBI-F120B FACEHBI-F136B FACEHBI-F153B FACEHBI-F169B
FACEHBI-F189B FACEHBI-F205B
FACEHBI-F017B FACEHBI-F035B FACEHBI-F054B FACEHBI-F071B FACEHBI-F087B
FACEHBI-F104B FACEHBI-F121B FACEHBI-F137B FACEHBI-F154B FACEHBI-F170B
FACEHBI-F190B FACEHBI-F207B

```

```

[osotolongo@detritus facehbi]$ dcm2niix -o tmp -z y
/nas/clinic/facehbi/FACEHBI-F001B/DICOM/
Chris Rorden's dcm2niix version v1.0.20180622 (JP2:OpenJPEG) (JP-LS:CharLS)
GCC5.5.0 (64-bit Linux)
Found 620 DICOM file(s)
Convert 109 DICOM as tmp/DICOM_FACEHBI_Florbetaben_20min_20141211120511_5
(400x400x109x1)
compress: "/usr/local/mricron/pigz_mricron" -n -f -6
"tmp/DICOM_FACEHBI_Florbetaben_20min_20141211120511_5.nii"
Convert 75 DICOM as tmp/DICOM_FACEHBI_20141211120511_3 (512x512x75x1)
compress: "/usr/local/mricron/pigz_mricron" -n -f -6
"tmp/DICOM_FACEHBI_20141211120511_3.nii"
Convert 436 DICOM as tmp/DICOM_FACEHBI_Florbetaben_4x5min_20141211120511_4
(400x400x109x4)
compress: "/usr/local/mricron/pigz_mricron" -n -f -6
"tmp/DICOM_FACEHBI_Florbetaben_4x5min_20141211120511_4.nii"
Conversion required 105.374635 seconds (6.340000 for core code).

```

```

[osotolongo@detritus facehbi]$ ls tmp
DICOM_FACEHBI_20141211120511_3.json
DICOM_FACEHBI_Florbetaben_20min_20141211120511_5.json
DICOM_FACEHBI_Florbetaben_4x5min_20141211120511_4.json
DICOM_FACEHBI_20141211120511_3.nii.gz
DICOM_FACEHBI_Florbetaben_20min_20141211120511_5.nii.gz
DICOM_FACEHBI_Florbetaben_4x5min_20141211120511_4.nii.gz

```

```

[osotolongo@detritus facehbi]$ for x in tmp/*.nii.gz; do fsinfo ${x}; done
data_type      INT16
dim1           512
dim2           512
dim3           75
dim4           1
datatype      4
pixdim1       0.585938
pixdim2       0.585938
pixdim3       3.000000
pixdim4       0.000000
cal_max       0.0000
cal_min       0.0000
file_type     NIFTI-1+
filename      tmp/DICOM_FACEHBI_Florbetaben_20min_20141211120511_5.nii.gz
data_type     FLOAT32

```

```

dim1      400
dim2      400
dim3      109
dim4      1
datatype  16
pixdim1   1.018210
pixdim2   1.018210
pixdim3   2.027008
pixdim4   0.000000
cal_max   0.0000
cal_min   0.0000
file_type NIFTI-1+
filename   tmp/DICOM_FACEHBI_Florbetaben_4x5min_20141211120511_4.nii.gz
data_type FLOAT32
dim1      400
dim2      400
dim3      109
dim4      4
datatype  16
pixdim1   1.018210
pixdim2   1.018210
pixdim3   2.027008
pixdim4   1.000000
cal_max   0.0000
cal_min   0.0000
file_type NIFTI-1+

```

y me hago un scriptcillo para convertir los DCM, escoger el adecuado usando *fslinfo* y hacer un *fslsplit* en el directorio final,

[update_fbb.pl](#)

```

#!/usr/bin/perl

use strict;
use warnings;
use NEURO qw(load_study);
use Data::Dump qw(dump);
use File::Find::Rule;

my $study = "facehbi";
my %std = load_study($study);
my $src_dir = "/nas/clinic/facehbi";
my $output_dir = $std{'PET-FBB'};
my @other_exts = ("nii.gz", "json");

opendir(my $dh, $src_dir) || die "Can't opendir $src_dir: $!";
my @adqs = grep {/^[A-Za-z]/} readdir($dh);
closedir $dh;

foreach my $adq (sort @adqs) {

```

```

(my $subject = $daq) =~ s/.*-F(.*)B$/0$1/;
my $order = 'dcm2niix -z y -o '$std{'DATA'}.'/tmp/
'.'$src_dir.'/'.'$daq.'/DICOM';
print "$order\n";
system($order);
my @conv_files = find(file => 'name' => "*.nii.gz", in =>
$std{'DATA'}.'/tmp/');
foreach my $nii_file (@conv_files){
    $order = 'fslinfo '$nii_file;
    my %xinfo;
    foreach (qx/$order/){
        my ( $key, $value ) = /(\S+)\s+(\S+)\s*.*;/;
        $xinfo{$key} = $value;
    }
    if($xinfo{"dim4"}>1){
        print "Choosing and moving files\n";
        $order = 'fslsplit '$nii_file.'
'.'$output_dir.'/smc'.'$subject.'s -t';
        print "$order\n";
        system($order);
    }
}
print "Cleaning house\n";
$order = "rm $std{'DATA'}/tmp/*";
system($order);
}

```

Lo lanzo desde el directorio del proyecto,

```
[osotolongo@detritus facehbi]$ ./update_fbb.pl
```

y ya esta, los fbb me quedan ordenados correctamente.

de DICOM a NiFTI



Necesitamos convertir los DICOM de FBB a formato NiFTI-1 para trabajar con FSL. El servidor DICOM corta el numero de slices por directorio a 500 por lo que inicialmente hubo muchisimos problemas de conversion y procesamiento.

Luego hay que buscar por todas las subcarpetas del DICOM las imagenes 4x5min que estan desordenadas. Para convertir uno de los sujetos ha de hacerse algo asi,

```

$ for x in `find /nas/raw_images/facehbi/fbb/FACEHBI-F001B/DICOM/ -type f`;
do if [[ `dckey -k "SeriesDescription" $x 2>&1 | grep "4x5min" ` ]]; then cp
$x /nas/facehbi/tmp_2nifti/; fi; done; y=$(ls /nas/facehbi/tmp_2nifti/ |
head -n 1); dcm2nii -o /nas/facehbi/tmp/ /nas/facehbi/tmp_2nifti/$y;

```

que da una salida muy ruidosa, pero funciona. Para hacerlos todos de una tacada habria que iterar esto por todos los sujetos.

```
for s in `ls -d /nas/clinic/* | grep FACEHBI | grep "B$"`; do sbj=$(echo $s | sed 's/.*-F(.*\)B$/\1/'); for x in `find ${s}/DICOM/ -type f`; do if [[ `dckey -k "SeriesDescription" $x 2>&1 | grep "4x5min"` ]]; then cp $x /nas/facehbi/tmp_2nifti/; fi; done; y=$(ls /nas/facehbi/tmp_2nifti/ | head -n 1); dcm2nii -o /nas/facehbi/tmp/ /nas/facehbi/tmp_2nifti/$y; conv=$(ls /nas/facehbi/tmp/ | head -n 1); fslsplit /nas/facehbi/tmp/${conv} /nas/facehbi/fbb_first/smc0${sbj}s -t; rm -rf /nas/facehbi/tmp/*; rm -rf /nas/facehbi/tmp_2nifti/*; done
```

si queremos aprovechar un archivo yet.txt ([ver aqui](#))

```
$ for sbj in `awk -F";" '{print $1}' yet.txt | sed 's/0//;`; do s="/nas/clinic/FACEHBI-F${sbj}B"; for x in `find ${s}/DICOM/ -type f`; do if [[ `dckey -k "SeriesDescription" $x 2>&1 | grep "4x5min"` ]]; then cp $x /nas/facehbi/tmp_2nifti/; fi; done; y=$(ls /nas/facehbi/tmp_2nifti/ | head -n 1); dcm2nii -o /nas/facehbi/tmp/ /nas/facehbi/tmp_2nifti/$y; conv=$(ls /nas/facehbi/tmp/ | head -n 1); fslsplit /nas/facehbi/tmp/${conv} /nas/facehbi/fbb/smc0${sbj}s -t; rm -rf /nas/facehbi/tmp/*; rm -rf /nas/facehbi/tmp_2nifti/*; done
```

Correccion de movimiento

Ahora tenemos 4 archivos representando la integracion de 5 min y hay que corregistrarlos al espacio de usuario. Lo primero es traer el archivo de freesurfer y luego corregistrar cada uno de los fbb al user space. despues se ha de unirlos temporalmente y hacer un mcflirt.

lo primero seria traerse la mri del directorio de freesurfer

[get_fs_subj](#)

[get_fs_subj.sh](#)

```
#!/bin/sh
study=$1
shift

id=$1
shift

dir=$1
shift

debug=0

#First get the freesurfer processed MRIs
${FREESURFER_HOME}/bin/mri_vol2vol --mov
```

```

${SUBJECTS_DIR}/${study}_${id}/mri/nu.mgz --targ
${SUBJECTS_DIR}/${study}_${id}/mri/rawavg.mgz --regheader --o
${dir}/${id}_tmp_nu_in_rawavg.mgz
${FREESURFER_HOME}/bin/mri_convert --in_type mgz --out_type nii
${dir}/${id}_tmp_nu_in_rawavg.mgz ${dir}/${id}_tmp.nii.gz
${FSLDIR}/bin/fslreorient2std ${dir}/${id}_tmp ${dir}/${id}_struc
${FREESURFER_HOME}/bin/mri_vol2vol --mov
${SUBJECTS_DIR}/${study}_${id}/mri/brain.mgz --targ
${SUBJECTS_DIR}/${study}_${id}/mri/rawavg.mgz --regheader --o
${dir}/${id}_tmp_brain_in_rawavg.mgz
${FREESURFER_HOME}/bin/mri_convert --in_type mgz --out_type nii
${dir}/${id}_tmp_brain_in_rawavg.mgz ${dir}/${id}_tmp_brain.nii.gz
${FSLDIR}/bin/fslreorient2std ${dir}/${id}_tmp_brain ${dir}/${id}_brain

if [ $debug = 0 ] ; then
    rm ${dir}/${id}_tmp*
fi

```

y luego registrar cada imagen al espacio del sujeto. Hay 4 variantes para esto.

1.- Intentando registrar cada imagen independientemente.

[fbf_reg](#)

[fbftemp_reg.sh](#)

```

#!/bin/sh

study=$1
shift

id=$1
shift

tdir=$1
shift

wdir=$1
shift

debug=1

#get the uncorrected PETs and register to user space MRI
for i in {0..3}; do
    tf=`printf "${id}s%04d" $i`
    ${FSLDIR}/bin/imcp ${tdir}/${tf} ${tdir}/${id}_tmp
    ${FSLDIR}/bin/flirt -ref ${wdir}/${id}_struc -in
    ${tdir}/${id}_tmp -omat ${tdir}/${tf}_pet2struc.mat -out

```

```

${tdir}/${tf}_reg
done
a=`for i in {0..3}; do printf " ${tdir}/${id}s%04d_reg " $i; done`
${FSLDIR}/bin/fslmerge -t ${wdir}/${id}_tmp_mvc $a
${FSLDIR}/bin/mcflirt -in ${wdir}/${id}_tmp_mvc -out
${wdir}/${id}_tmp_corr
${PIPEDIR}/bin/4dmean.pl ${wdir}/${id}_tmp_corr
${FSLDIR}/bin/flirt -ref ${wdir}/${id}_struc -in ${wdir}/${id}_mean -
omat ${wdir}/${id}_fbb2struc.mat -out ${wdir}/${id}_fbb

if [ $debug = 0 ] ; then
    rm ${tdir}/${id}_tmp*
    rm ${wdir}/${id}_tmp*
fi

```

2.- Usando la informacion de un registro para el resto (-useg)

fbb_regc

fbbtemp_regc.sh

```

#!/bin/sh

study=$1
shift

id=$1
shift

tdir=$1
shift

wdir=$1
shift

sok=$1
shift

debug=1

#Now get the uncorrected PETs and register to user space MRI
bsc=`printf "${id}s%04d" $sok`
${FSLDIR}/bin/imcp ${tdir}/${bsc} ${tdir}/${id}_tmp
${FSLDIR}/bin/flirt -ref ${wdir}/${id}_struc -in ${tdir}/${id}_tmp -
omat ${tdir}/${bsc}_pet2struc.mat -out ${tdir}/${bsc}_reg
for i in {0..3}; do
    if [ "$i" != "$sok" ]; then
        tf=`printf "${id}s%04d" $i`

```

```

        ${FSLDIR}/bin/imcp ${tdir}/${tf} ${tdir}/${id}_tmp
        ${FSLDIR}/bin/flirt -ref ${wdir}/${id}_struc -in
${tdir}/${id}_tmp -init ${tdir}/${bsc}_pet2struc.mat -omat
${tdir}/${tf}_pet2struc.mat -out ${tdir}/${tf}_reg
        fi
done
a=`for i in {0..3}; do printf " ${tdir}/${id}s%04d_reg " $i; done`
${FSLDIR}/bin/fslmerge -t ${wdir}/${id}_tmp_mvc $a
${FSLDIR}/bin/mcflirt -in ${wdir}/${id}_tmp_mvc -out
${wdir}/${id}_tmp_corr
${PIPEDIR}/bin/4dmean.pl ${wdir}/${id}_tmp_corr
${FSLDIR}/bin/flirt -ref ${wdir}/${id}_struc -in ${wdir}/${id}_mean -
omat ${wdir}/${id}_fbf2struc.mat -out ${wdir}/${id}_fbf

if [ $debug = 0 ] ; then
    rm ${tdir}/${id}_tmp*
    rm ${wdir}/${id}_tmp*
fi

```

3.- Usando la informacion solo del cerebro extraido para hacer el corregistro (-useb)

[fbf_regb](#)

[fbftemp_regb.sh](#)

```

#!/bin/sh

study=$1
shift

id=$1
shift

tdir=$1
shift

wdir=$1
shift

sok=$1
shift

debug=1

#Now get the uncorrected PETs and register to user space MRI
bsc=`printf "${id}s%04d" $sok`
${FSLDIR}/bin/imcp ${tdir}/${bsc} ${tdir}/${id}_tmp
${FSLDIR}/bin/flirt -ref ${wdir}/${id}_brain -in ${tdir}/${id}_tmp -

```



```

omat ${tdir}/${bsc}_pet2struc.mat -out ${tdir}/${bsc}_reg
for i in {0..3}; do
    if [ "$i" != "$sok" ]; then
        tf=`printf "${id}s%04d" $i`
        ${FSLDIR}/bin/imcp ${tdir}/${tf} ${tdir}/${id}_tmp
        ${FSLDIR}/bin/flirt -ref ${wdir}/${id}_brain -in
${tdir}/${id}_tmp -init ${tdir}/${bsc}_pet2struc.mat -omat
${tdir}/${tf}_pet2struc.mat -out ${tdir}/${tf}_reg
        fi
    done
a=`for i in {0..3}; do printf " ${tdir}/${id}s%04d_reg " $i; done`
${FSLDIR}/bin/fslmerge -t ${wdir}/${id}_tmp_mvc $a
${FSLDIR}/bin/mcflirt -in ${wdir}/${id}_tmp_mvc -out
${wdir}/${id}_tmp_corr
${PIPEDIR}/bin/4dmean.pl ${wdir}/${id}_tmp_corr
${FSLDIR}/bin/flirt -ref ${wdir}/${id}_struc -in ${wdir}/${id}_mean -
omat ${wdir}/${id}_fbb2struc.mat -out ${wdir}/${id}_fbb

if [ $debug = 0 ] ; then
    rm ${tdir}/${id}_tmp*
    rm ${wdir}/${id}_tmp*
fi

```

4.- el mas complicado, usando una mascara. Este metodo se probó con el [corregistro de PiBs](#) y usa un umbral de intensidad (-usem)

[fbb_regm](#)

[fbbtemp_regm.sh](#)

```

#!/bin/sh

study=$1
shift

id=$1
shift

tdir=$1
shift

wdir=$1
shift

#sok=$1
#shift

treshold=$1

```

```

shift

debug=1

#Now get the uncorrected PETs and register to user space MRI
bsc=`printf "${id}s%04d" $sok`
${FSLDIR}/bin/fslreorient2std ${tdir}/${bsc} ${tdir}/${bsc}_tmp
if [ $treshold = 0 ] ; then
    ${FSLDIR}/bin/fslmaths ${tdir}/${bsc}_tmp -thr ${treshold} -bin
    ${tdir}/${bsc}_tmp_fbb_mask
else
    ${FSLDIR}/bin/fslmaths ${tdir}/${bsc}_tmp -thrP ${treshold} -
bin ${tdir}/${bsc}_tmp_fbb_mask
fi
${FSLDIR}/bin/flirt -ref ${wdir}/${id}_struc -in
${tdir}/${bsc}_tmp_fbb_mask -omat ${tdir}/${bsc}_tmp_fbb -dof 9
${FSLDIR}/bin/flirt -ref ${wdir}/${id}_struc -in ${tdir}/${bsc} -
applyxfm -init ${tdir}/${bsc}_tmp_fbb -out ${tdir}/${bsc}_reg -omat
${tdir}/${bsc}_pet2struc.mat

for i in {0..3}; do
    if [ "$i" != "$sok" ]; then
        tf=`printf "${id}s%04d" $i`
        ${FSLDIR}/bin/fslreorient2std ${tdir}/${tf}
        ${tdir}/${id}_tmp
        if [ $treshold = 0 ] ; then
            ${FSLDIR}/bin/fslmaths ${tdir}/${id}_tmp -thr
            ${treshold} -bin ${tdir}/${tf}_tmp_fbb_mask
        else
            ${FSLDIR}/bin/fslmaths ${tdir}/${id}_tmp -thrP
            ${treshold} -bin ${tdir}/${tf}_tmp_fbb_mask
        fi
        ${FSLDIR}/bin/flirt -ref ${wdir}/${id}_struc -in
        ${tdir}/${tf}_tmp_fbb_mask -omat ${tdir}/${tf}_tmp_fbb -init
        ${tdir}/${bsc}_pet2struc.mat -dof 9
        ${FSLDIR}/bin/flirt -ref ${wdir}/${id}_struc -in
        ${tdir}/${tf} -applyxfm -init ${tdir}/${tf}_tmp_fbb -out
        ${tdir}/${tf}_reg
    fi
done
a=`for i in {0..3}; do printf " ${tdir}/${id}s%04d_reg " $i; done`
${FSLDIR}/bin/fslmerge -t ${wdir}/${id}_tmp_mvc $a
${FSLDIR}/bin/mcflirt -in ${wdir}/${id}_tmp_mvc -out
${wdir}/${id}_tmp_corr
${PIPEDIR}/bin/4dmean.pl ${wdir}/${id}_tmp_corr
${FSLDIR}/bin/flirt -ref ${wdir}/${id}_struc -in ${wdir}/${id}_mean -
omat ${wdir}/${id}_fbb2struc.mat -out ${wdir}/${id}_fbb

if [ $debug = 0 ] ; then
    rm ${tdir}/${id}_tmp*
    rm ${wdir}/${id}_tmp*

```

```
fi
```

Esto lo he intentado agrupar en el script *fbf_correct.pl*,

[fbf_correct.pl \(chunk\)](#)

```
my $study;
my $cfile;
my $wbrain = 0;
my $wguide = 0;
my $wmask = 0;
my $sok = 0;

@ARGV = ("-h") unless @ARGV;
while (@ARGV and $ARGV[0] =~ /^-/) {
    $_ = shift;
    last if /^--$/;
    if (/^-e/) { $study = shift; chomp($study);}
    if (/^-cut/) { $cfile = shift; chomp($cfile);}
    if (/^-useg/) { $sok = shift; $wguide = 1;}
    if (/^-useb/) { $sok = shift; $wbrain = 1;}
    if (/^-usem/) { $sok = shift; $wmask = 1;}
    if (/^-h/) { print_help $ENV{'PIPEDIR'}.'/doc/fbf_reg.hlp'; exit;}
}
```

y despues,

```
foreach my $subject (@ok_pets){
    $pm->start and next;
    my $order;
    if($wmask){
        $order = "fbftemp_regm.sh ".$study."
".$pets{$subject}.$subject." ".$petnc_dir." ".$w_dir." ".$sok;
    }elsif($wguide){
        $order = "fbftemp_regc.sh ".$study."
".$pets{$subject}.$subject." ".$petnc_dir." ".$w_dir." ".$sok;
    }elsif($wbrain){
        $order = "fbftemp_regb.sh ".$study."
".$pets{$subject}.$subject." ".$petnc_dir." ".$w_dir." ".$sok;
    }else{
        $order = "fbftemp_reg.sh ".$study."
".$pets{$subject}.$subject." ".$petnc_dir." ".$w_dir;
    }
    print "$order\n";
    system($order);
    $pm->finish;
}
$pm->wait_all_children;
```

Resumiendo

si todo va bien basta con hacer:

```
$ fbb_correct.pl -e facehbi
$ parallel_fbb_rois_metrics.pl facehbi
```

Postprocessing (carrot)

```
$ cd /home/osotolongo/Documents/ACE/facehbi
$ R CMD BATCH selected_mri.r
$ sed 's//g' facehbi_mri_selected.csv | awk -F"," '{if($1!="Subject")
printf("%04d;%s;%s;%s;%s;%s;%s\n",$1,$2,$3,$4,$5,$6,$7); else
printf("%s;%s;%s;%s;%s;%s;%s\n",$1,$2,$3,$4,$5,$6,$7)}' >
facehbi_mri_selected_reformatted.csv
$ join -t";" -j 1 facehbi_fbb_fs_suvr_predef.csv
facehbi_mri_selected_reformatted.csv > facehbi_fbb_mri.csv
$ join -t";" -j 1 facehbi_fbb_mri.csv facehbi_dti.csv >
facehbi_fbb_mri_dti.csv
$ awk 'NR<2{print $0;next}{print $0| "sort -k1"}' demographics.csv | sed
's/, /;/g' > facehbi_demographics.csv
$ join -t";" -j 1 facehbi_demographics.csv facehbi_fbb_mri_dti.csv >
facehbi_data.csv
$ sed 's// /g' facehbi_data.csv > facehbi_data.dat
```

Note this: `extract_data | awk 'NR<3{print $0;next}{print $0| "sort -r"}'` 😊

```
$ head -n 1 facehbi_data.csv | sed 's//\n/g' | cat -n
 1 Subject
 2 Gender
 3 Education
 4 Age
 5 FBB
 6 HV
 7 aHV
 8 CMT
 9 aCMT
10 WMH
11 nWMH
12 Unclassified_FA_Mean
13 Unclassified_FA_STD
14 Unclassified_MD_Mean
15 Unclassified_MD_STD
16 Middle cerebellar peduncle_FA_Mean
17 Middle cerebellar peduncle_FA_STD
18 Middle cerebellar peduncle_MD_Mean
19 Middle cerebellar peduncle_MD_STD
20 Medial lemniscus L_FA_Mean
```

```
21 Medial lemniscus L_FA_STD
22 Medial lemniscus L_MD_Mean
23 Medial lemniscus L_MD_STD
24 Inferior cerebellar peduncle R _FA_Mean
25 Inferior cerebellar peduncle R _FA_STD
26 Inferior cerebellar peduncle R _MD_Mean
27 Inferior cerebellar peduncle R _MD_STD
28 Inferior cerebellar peduncle L_FA_Mean
29 Inferior cerebellar peduncle L_FA_STD
30 Inferior cerebellar peduncle L_MD_Mean
31 Inferior cerebellar peduncle L_MD_STD
32 Superior cerebellar peduncle R_FA_Mean
33 Superior cerebellar peduncle R_FA_STD
34 Superior cerebellar peduncle R_MD_Mean
35 Superior cerebellar peduncle R_MD_STD
36 Superior cerebellar peduncle L_FA_Mean
37 Superior cerebellar peduncle L_FA_STD
38 Superior cerebellar peduncle L_MD_Mean
39 Superior cerebellar peduncle L_MD_STD
40 Cerebral peduncle R_FA_Mean
41 Cerebral peduncle R_FA_STD
42 Cerebral peduncle R_MD_Mean
43 Cerebral peduncle R_MD_STD
44 Cerebral peduncle L_FA_Mean
45 Cerebral peduncle L_FA_STD
46 Cerebral peduncle L_MD_Mean
47 Cerebral peduncle L_MD_STD
48 Anterior limb of internal capsule R_FA_Mean
49 Anterior limb of internal capsule R_FA_STD
50 Anterior limb of internal capsule R_MD_Mean
51 Anterior limb of internal capsule R_MD_STD
52 Anterior limb of internal capsule L_FA_Mean
53 Anterior limb of internal capsule L_FA_STD
54 Anterior limb of internal capsule L_MD_Mean
55 Anterior limb of internal capsule L_MD_STD
56 Posterior limb of internal capsule R_FA_Mean
57 Posterior limb of internal capsule R_FA_STD
58 Posterior limb of internal capsule R_MD_Mean
59 Posterior limb of internal capsule R_MD_STD
60 Pontine crossing tract (a part of MCP)_FA_Mean
61 Pontine crossing tract (a part of MCP)_FA_STD
62 Pontine crossing tract (a part of MCP)_MD_Mean
63 Pontine crossing tract (a part of MCP)_MD_STD
64 Posterior limb of internal capsule L_FA_Mean
65 Posterior limb of internal capsule L_FA_STD
66 Posterior limb of internal capsule L_MD_Mean
67 Posterior limb of internal capsule L_MD_STD
68 Retrolenticular part of internal capsule R_FA_Mean
69 Retrolenticular part of internal capsule R_FA_STD
70 Retrolenticular part of internal capsule R_MD_Mean
71 Retrolenticular part of internal capsule R_MD_STD
```

72 Retrolenticular part of internal capsule L_FA_Mean
73 Retrolenticular part of internal capsule L_FA_STD
74 Retrolenticular part of internal capsule L_MD_Mean
75 Retrolenticular part of internal capsule L_MD_STD
76 Anterior corona radiata R_FA_Mean
77 Anterior corona radiata R_FA_STD
78 Anterior corona radiata R_MD_Mean
79 Anterior corona radiata R_MD_STD
80 Anterior corona radiata L_FA_Mean
81 Anterior corona radiata L_FA_STD
82 Anterior corona radiata L_MD_Mean
83 Anterior corona radiata L_MD_STD
84 Superior corona radiata R_FA_Mean
85 Superior corona radiata R_FA_STD
86 Superior corona radiata R_MD_Mean
87 Superior corona radiata R_MD_STD
88 Superior corona radiata L_FA_Mean
89 Superior corona radiata L_FA_STD
90 Superior corona radiata L_MD_Mean
91 Superior corona radiata L_MD_STD
92 Posterior corona radiata R_FA_Mean
93 Posterior corona radiata R_FA_STD
94 Posterior corona radiata R_MD_Mean
95 Posterior corona radiata R_MD_STD
96 Posterior corona radiata L_FA_Mean
97 Posterior corona radiata L_FA_STD
98 Posterior corona radiata L_MD_Mean
99 Posterior corona radiata L_MD_STD
100 Posterior thalamic radiation (include optic radiation) R_FA_Mean
101 Posterior thalamic radiation (include optic radiation) R_FA_STD
102 Posterior thalamic radiation (include optic radiation) R_MD_Mean
103 Posterior thalamic radiation (include optic radiation) R_MD_STD
104 Genu of corpus callosum_FA_Mean
105 Genu of corpus callosum_FA_STD
106 Genu of corpus callosum_MD_Mean
107 Genu of corpus callosum_MD_STD
108 Posterior thalamic radiation (include optic radiation) L_FA_Mean
109 Posterior thalamic radiation (include optic radiation) L_FA_STD
110 Posterior thalamic radiation (include optic radiation) L_MD_Mean
111 Posterior thalamic radiation (include optic radiation) L_MD_STD
112 Sagittal stratum (include inferior longitudinal fasciculus and inferior fronto-occipital fasciculus) R_FA_Mean
113 Sagittal stratum (include inferior longitudinal fasciculus and inferior fronto-occipital fasciculus) R_FA_STD
114 Sagittal stratum (include inferior longitudinal fasciculus and inferior fronto-occipital fasciculus) R_MD_Mean
115 Sagittal stratum (include inferior longitudinal fasciculus and inferior fronto-occipital fasciculus) R_MD_STD
116 Sagittal stratum (include inferior longitudinal fasciculus and inferior fronto-occipital fasciculus) L_FA_Mean
117 Sagittal stratum (include inferior longitudinal fasciculus and

```

inferior fronto-occipital fasciculus) L_FA_STD
  118 Sagittal stratum (include inferior longitudinal fasciculus and
inferior fronto-occipital fasciculus) L_MD_Mean
  119 Sagittal stratum (include inferior longitudinal fasciculus and
inferior fronto-occipital fasciculus) L_MD_STD
  120 External capsule R_FA_Mean
  121 External capsule R_FA_STD
  122 External capsule R_MD_Mean
  123 External capsule R_MD_STD
  124 External capsule L_FA_Mean
  125 External capsule L_FA_STD
  126 External capsule L_MD_Mean
  127 External capsule L_MD_STD
  128 Cingulum (cingulate gyrus) R_FA_Mean
  129 Cingulum (cingulate gyrus) R_FA_STD
  130 Cingulum (cingulate gyrus) R_MD_Mean
  131 Cingulum (cingulate gyrus) R_MD_STD
  132 Cingulum (cingulate gyrus) L_FA_Mean
  133 Cingulum (cingulate gyrus) L_FA_STD
  134 Cingulum (cingulate gyrus) L_MD_Mean
  135 Cingulum (cingulate gyrus) L_MD_STD
  136 Cingulum (hippocampus) R_FA_Mean
  137 Cingulum (hippocampus) R_FA_STD
  138 Cingulum (hippocampus) R_MD_Mean
  139 Cingulum (hippocampus) R_MD_STD
  140 Cingulum (hippocampus) L_FA_Mean
  141 Cingulum (hippocampus) L_FA_STD
  142 Cingulum (hippocampus) L_MD_Mean
  143 Cingulum (hippocampus) L_MD_STD
  144 Fornix (cres) / Stria terminalis (can not be resolved with current
resolution) R_FA_Mean
  145 Fornix (cres) / Stria terminalis (can not be resolved with current
resolution) R_FA_STD
  146 Fornix (cres) / Stria terminalis (can not be resolved with current
resolution) R_MD_Mean
  147 Fornix (cres) / Stria terminalis (can not be resolved with current
resolution) R_MD_STD
  148 Body of corpus callosum_FA_Mean
  149 Body of corpus callosum_FA_STD
  150 Body of corpus callosum_MD_Mean
  151 Body of corpus callosum_MD_STD
  152 Fornix (cres) / Stria terminalis (can not be resolved with current
resolution) L_FA_Mean
  153 Fornix (cres) / Stria terminalis (can not be resolved with current
resolution) L_FA_STD
  154 Fornix (cres) / Stria terminalis (can not be resolved with current
resolution) L_MD_Mean
  155 Fornix (cres) / Stria terminalis (can not be resolved with current
resolution) L_MD_STD
  156 Superior longitudinal fasciculus R_FA_Mean
  157 Superior longitudinal fasciculus R_FA_STD

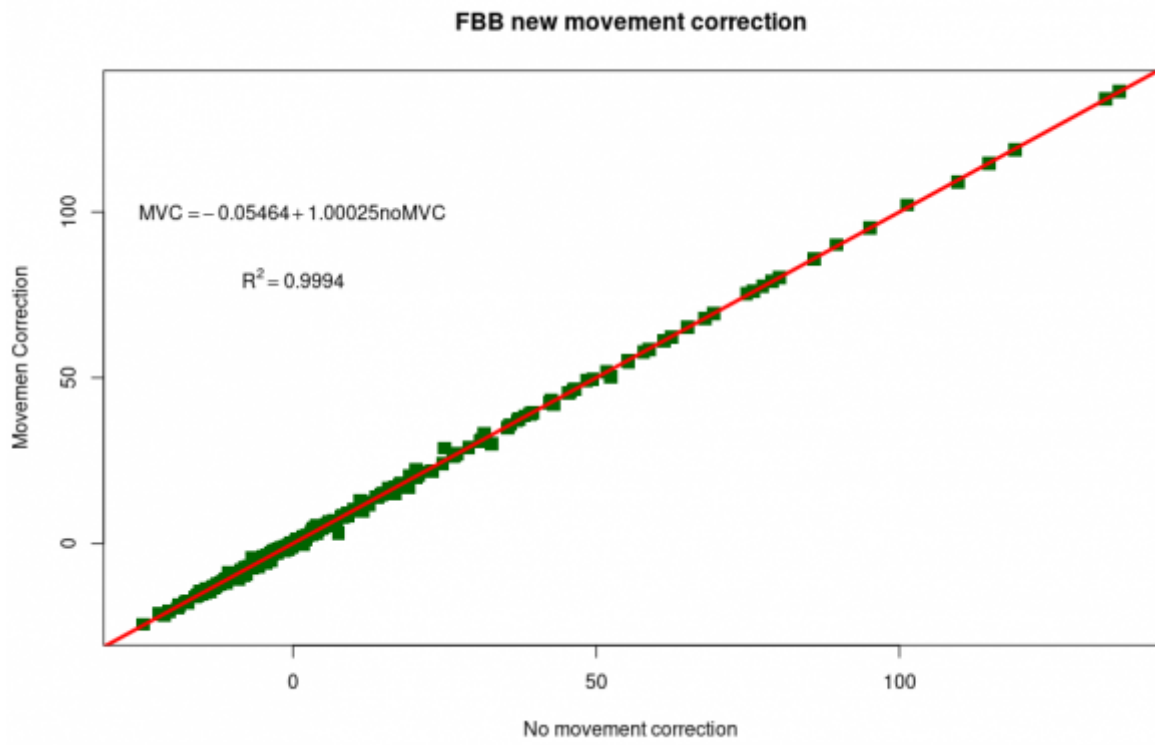
```

158 Superior longitudinal fasciculus R_MD_Mean
159 Superior longitudinal fasciculus R_MD_STD
160 Superior longitudinal fasciculus L_FA_Mean
161 Superior longitudinal fasciculus L_FA_STD
162 Superior longitudinal fasciculus L_MD_Mean
163 Superior longitudinal fasciculus L_MD_STD
164 Superior fronto-occipital fasciculus (could be a part of anterior internal capsule) R_FA_Mean
165 Superior fronto-occipital fasciculus (could be a part of anterior internal capsule) R_FA_STD
166 Superior fronto-occipital fasciculus (could be a part of anterior internal capsule) R_MD_Mean
167 Superior fronto-occipital fasciculus (could be a part of anterior internal capsule) R_MD_STD
168 Superior fronto-occipital fasciculus (could be a part of anterior internal capsule) L_FA_Mean
169 Superior fronto-occipital fasciculus (could be a part of anterior internal capsule) L_FA_STD
170 Superior fronto-occipital fasciculus (could be a part of anterior internal capsule) L_MD_Mean
171 Superior fronto-occipital fasciculus (could be a part of anterior internal capsule) L_MD_STD
172 Uncinate fasciculus R_FA_Mean
173 Uncinate fasciculus R_FA_STD
174 Uncinate fasciculus R_MD_Mean
175 Uncinate fasciculus R_MD_STD
176 Uncinate fasciculus L_FA_Mean
177 Uncinate fasciculus L_FA_STD
178 Uncinate fasciculus L_MD_Mean
179 Uncinate fasciculus L_MD_STD
180 Tapetum R_FA_Mean
181 Tapetum R_FA_STD
182 Tapetum R_MD_Mean
183 Tapetum R_MD_STD
184 Tapetum L_FA_Mean
185 Tapetum L_FA_STD
186 Tapetum L_MD_Mean
187 Tapetum L_MD_STD
188 Splenium of corpus callosum_FA_Mean
189 Splenium of corpus callosum_FA_STD
190 Splenium of corpus callosum_MD_Mean
191 Splenium of corpus callosum_MD_STD
192 Fornix (column and body of fornix)_FA_Mean
193 Fornix (column and body of fornix)_FA_STD
194 Fornix (column and body of fornix)_MD_Mean
195 Fornix (column and body of fornix)_MD_STD
196 Corticospinal tract R_FA_Mean
197 Corticospinal tract R_FA_STD
198 Corticospinal tract R_MD_Mean
199 Corticospinal tract R_MD_STD
200 Corticospinal tract L_FA_Mean

201 Corticospinal tract L_FA_STD
202 Corticospinal tract L_MD_Mean
203 Corticospinal tract L_MD_STD
204 Medial lemniscus R_FA_Mean
205 Medial lemniscus R_FA_STD
206 Medial lemniscus R_MD_Mean
207 Medial lemniscus R_MD_STD
208 Anterior thalamic radiation L_FA_Mean
209 Anterior thalamic radiation L_FA_STD
210 Anterior thalamic radiation L_MD_Mean
211 Anterior thalamic radiation L_MD_STD
212 Forceps minor_FA_Mean
213 Forceps minor_FA_STD
214 Forceps minor_MD_Mean
215 Forceps minor_MD_STD
216 Inferior fronto-occipital fasciculus L_FA_Mean
217 Inferior fronto-occipital fasciculus L_FA_STD
218 Inferior fronto-occipital fasciculus L_MD_Mean
219 Inferior fronto-occipital fasciculus L_MD_STD
220 Inferior fronto-occipital fasciculus R_FA_Mean
221 Inferior fronto-occipital fasciculus R_FA_STD
222 Inferior fronto-occipital fasciculus R_MD_Mean
223 Inferior fronto-occipital fasciculus R_MD_STD
224 Inferior longitudinal fasciculus L_FA_Mean
225 Inferior longitudinal fasciculus L_FA_STD
226 Inferior longitudinal fasciculus L_MD_Mean
227 Inferior longitudinal fasciculus L_MD_STD
228 Inferior longitudinal fasciculus R_FA_Mean
229 Inferior longitudinal fasciculus R_FA_STD
230 Inferior longitudinal fasciculus R_MD_Mean
231 Inferior longitudinal fasciculus R_MD_STD
232 Superior longitudinal fasciculus L_FA_Mean
233 Superior longitudinal fasciculus L_FA_STD
234 Superior longitudinal fasciculus L_MD_Mean
235 Superior longitudinal fasciculus L_MD_STD
236 Superior longitudinal fasciculus R_FA_Mean
237 Superior longitudinal fasciculus R_FA_STD
238 Superior longitudinal fasciculus R_MD_Mean
239 Superior longitudinal fasciculus R_MD_STD
240 Uncinate fasciculus L_FA_Mean
241 Uncinate fasciculus L_FA_STD
242 Uncinate fasciculus L_MD_Mean
243 Uncinate fasciculus L_MD_STD
244 Uncinate fasciculus R_FA_Mean
245 Uncinate fasciculus R_FA_STD
246 Uncinate fasciculus R_MD_Mean
247 Uncinate fasciculus R_MD_STD
248 Superior longitudinal fasciculus (temporal part) L_FA_Mean
249 Superior longitudinal fasciculus (temporal part) L_FA_STD
250 Superior longitudinal fasciculus (temporal part) L_MD_Mean
251 Superior longitudinal fasciculus (temporal part) L_MD_STD

252 Anterior thalamic radiation R_FA_Mean
253 Anterior thalamic radiation R_FA_STD
254 Anterior thalamic radiation R_MD_Mean
255 Anterior thalamic radiation R_MD_STD
256 Superior longitudinal fasciculus (temporal part) R_FA_Mean
257 Superior longitudinal fasciculus (temporal part) R_FA_STD
258 Superior longitudinal fasciculus (temporal part) R_MD_Mean
259 Superior longitudinal fasciculus (temporal part) R_MD_STD
260 Corticospinal tract L_FA_Mean
261 Corticospinal tract L_FA_STD
262 Corticospinal tract L_MD_Mean
263 Corticospinal tract L_MD_STD
264 Corticospinal tract R_FA_Mean
265 Corticospinal tract R_FA_STD
266 Corticospinal tract R_MD_Mean
267 Corticospinal tract R_MD_STD
268 Cingulum (cingulate gyrus) L_FA_Mean
269 Cingulum (cingulate gyrus) L_FA_STD
270 Cingulum (cingulate gyrus) L_MD_Mean
271 Cingulum (cingulate gyrus) L_MD_STD
272 Cingulum (cingulate gyrus) R_FA_Mean
273 Cingulum (cingulate gyrus) R_FA_STD
274 Cingulum (cingulate gyrus) R_MD_Mean
275 Cingulum (cingulate gyrus) R_MD_STD
276 Cingulum (hippocampus) L_FA_Mean
277 Cingulum (hippocampus) L_FA_STD
278 Cingulum (hippocampus) L_MD_Mean
279 Cingulum (hippocampus) L_MD_STD
280 Cingulum (hippocampus) R_FA_Mean
281 Cingulum (hippocampus) R_FA_STD
282 Cingulum (hippocampus) R_MD_Mean
283 Cingulum (hippocampus) R_MD_STD
284 Forceps major_FA_Mean
285 Forceps major_FA_STD
286 Forceps major_MD_Mean
287 Forceps major_MD_STD

Correccion de movimiento



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