

Realtime Motion tracking during fMRI Scans at CFMRI

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1. Overview

The realtime software is capable of tracking head motion during functional MRI scans. The motion parameters are displayed on the screen while the fMRI scan progresses, allowing researchers to make real-time assessment of subject's motion during the scan and decide if a rescan is necessary due to excessive motion.

The software was originally developed by Jerzy Bodurka at the Laureate Institute for Brain Research. It is written in perl and utilizes the afni realtime plugin and the Dimon command.

2. Start Realtime (on scanner console)

a. On the scanner console, open a command window. Position the window in the lower right corner of the screen so it does not obstruct any functional areas of the screen.

b. In the command window type: **RTctrl start**

Note: make sure that the command output says "Real time running".

c. Register a new patient and **Start Exam**. Follow the standard procedures to run the MRI scans.

Note: **Realtime** must be started before **Start Exam** for it to work.

Optional: Realtime creates a log file under `~sdc/RTafni/var/log`. You can monitor the running of the realtime by displaying the log file. Use the following command to display the log file:

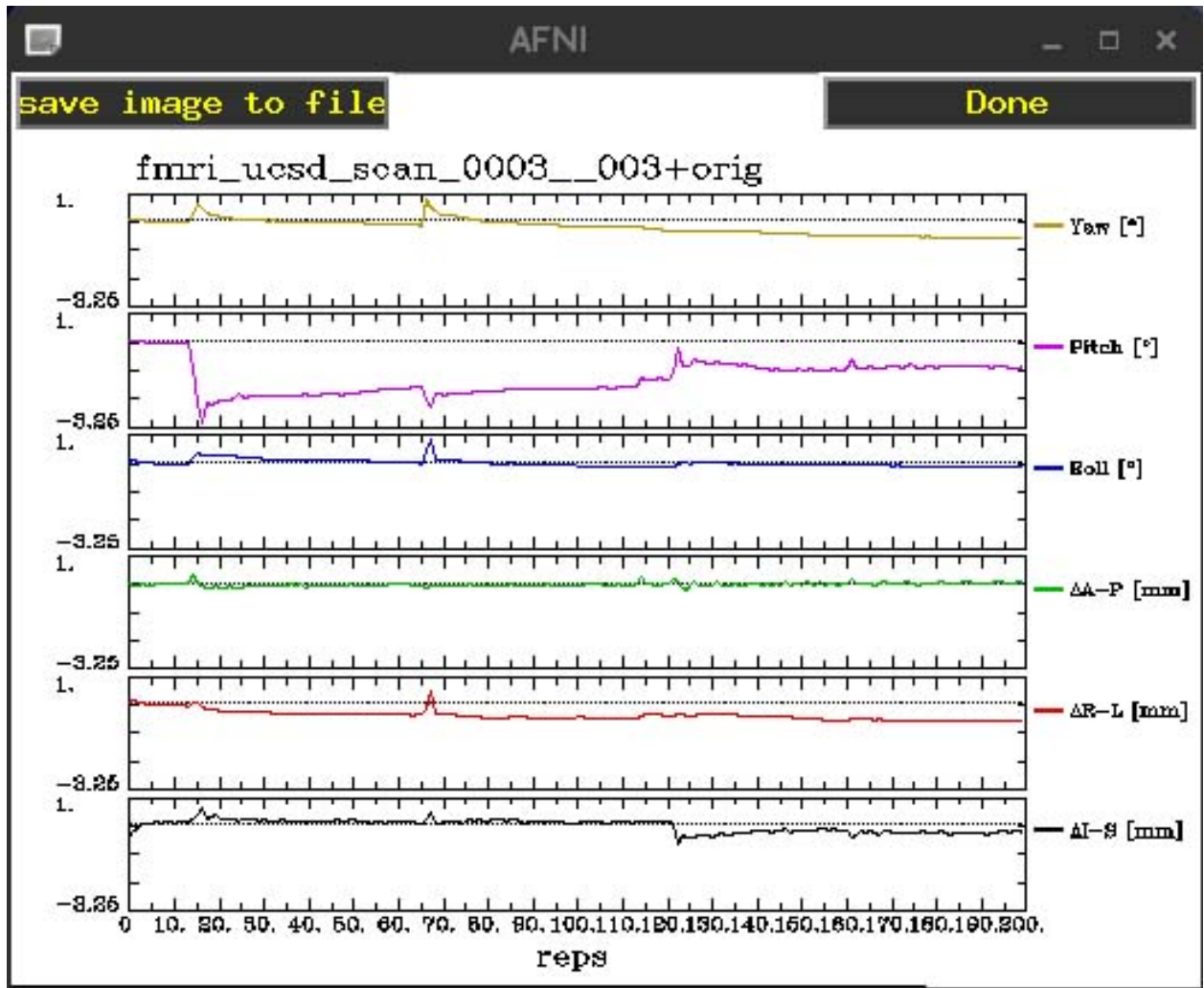
```
tail -f ~sdc/RTafni/var/log/logSince_<month_day_year_id>
```

3. Realtime Display (on realtime computer)

a. The realtime motion tracking will be displayed on the realtime computer. Make sure the realtime computer is ON and the monitor is ON.

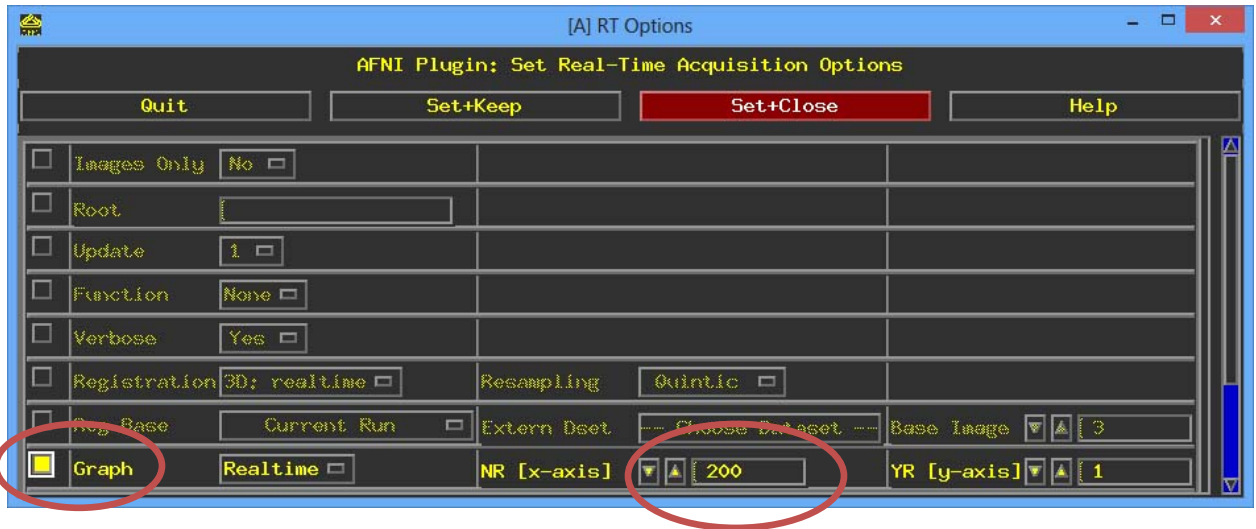
b. An AFNI window will popup automatically after the first localizer scan. As MRI images being generated on the scanner, the AFNI window will be updated with the new images.

c. For functional scans, shortly after each functional scan starts, the time course will be shown in an AFNI window. Additionally, 6 motion parameters (three translations and three rotations) will be displayed in real time in a motion graph as shown in the figure below.



The number of time points (x-axis) in the motion graph is preset to 200. If your functional scan acquires more than 200 time points, please follow the steps below to adjust the x-axis. The adjustment must be done before the functional scan starts, or the new value will not take effect.

- In the AFNI control window, click on **Define Datamode** -> **Plugins** -> **RT Options**
- RT Options window will open (see the screen shot below). Click the radio button next to **"Graph"** to enable editing. Set the value in the **NR [x-axis]** field to be the same as the total number of time points in your functional scan.
- Click **Set+Close** to close the RT Options window.



- d. The MRI data in AFNI format and the motion parameters are saved under /data0/rt/ on the realtime computer. Each exam directory name starts with E followed by a system generated number. Look for the most recent **E<num>** directory which contains data from the current session.

4. Stop Realtime (on scanner console)

- a. End exam on the console computer

Note: The exam must be ended first before stopping the realtime.

- b. In the command window, type: **RTctrl stop**

Note: Confirm the command output says “Real time is not running”.

- c. Close all open command windows

5. Data Transfer

- a. On the scanner console: use gecopy to transfer the dicom data.
- b. (Optional) On the realtime computer: use scp to transfer the MRI data in AFNI format and the motion parameters. The data is located in /data0/rt/. Look for the most recent **E<num>** directory which contains data from the current session.