Getting TOA Measurements from Single Pulses

This page describes the process to get a TOA measurement for a single pulse, assuming

- You know the rough TOA of the pulse
- The input data is a Sigproc Filterbank
- DSPSR and PSRCHIVE (with GUI) are available

Many steps of this process are automated on REALTA using this python script[gist].

<getting the .ar>

Generating a Noise-Free Model

We will use the `paas` tool to generate a noise free model, which will then be used for cross-corrlation or other analysis methods to determine the pulse TOA. Choose your brightest or most characteristic pulse and being the fitting process by running

```
paas -i \ # Interactive fitting
-d /xwin # Visual GUI of choice
    <input .ar> # Input profile to use as a reference
```

Once loaded in, focus on the pulse itself by pressing `z` to set the left limit of a zoom, and left click to select the right limit. Then, left click on the left and right edges of the pulse to set the phase limits of the pulse, you will then be able to select the peak of the pulse vertically.

Once you have a rough model in the view, you can press `f` to iteratively update the model to the data, continue to update the model until you believe a good fit of the amplitude and position of the pulse has been achieved and the residuals of the region (red lines) are similar to the noise floor.

You can then quit by pressing `q`, this will save the model to disk as 3 files, `paas.m` (the model we generated), `paas.std` (an archive profile containing the shape of the model) and `paas.txt` (an ASCII copy of the model)

We will be using the `paas.std` file for determining the pulse TOAs.

Determining Pulse TOAs using the Noise-Free Model

Now that we have our archives and model, we can use `pat` to determine the pulse TOAs. We typically perform this using the following command,

```
pat -f tempo2 \ # Output in the tempo2 format
-A PIS \ # Generate cross correlations using the Parabolic interpoaltion method, chosen for the it's performance on a test dataset from J2215+45
    -F \ # Sum across frequencies before determining TOA
    -m <paas model>.m \ # Model generated by paas in the previous section
    -s <paas profile>.std \ # Archive generated by paas in the previous section
    <input archives>.ar > <output filename>.tim


# Optional flags, you may need to remove -m for these
-t \ # Plot the profile, template and residuals
    -K /xwin \ # Using an xwindow
```

The output timing file can the be used for analysis in tempo2.

Revision #1
Created 20 May 2021 12:35:00 by David
Updated 20 May 2021 13:41:12 by David