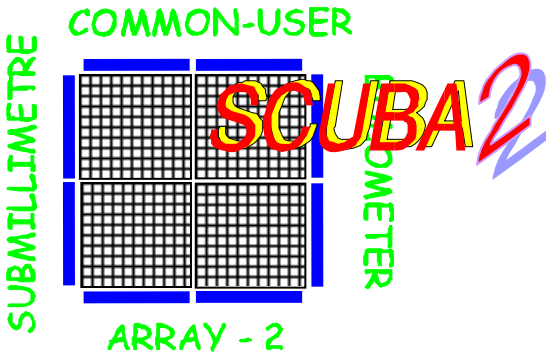

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1.0	1/11/06	All	Initial CDR release
1.1	2/11/06	2.5	Minor changes

Contents

Introduction

The FTS-2 data reduction engine consists of four sub-processes: Interpolation, Deglitching, Phase-Correction, and FFT. The Java class

ca.uol.aig.ftp.drpipeline.DRPipeline

integrates these sub-modules into a pipeline, i.e., the input of **DRPipeline** is a raw interferogram data file and its output is the corresponding spectrum data file. There is no intermediate output from individual modules. **DRPipeline** behaves like a black-box.

Normally, the users of the FTS-2 data reduction engine will not care about the details of individual modules. But for the purpose of debugging and the initial commissioning tune-up of various data reduction parameters, we need to know the intermediate output of individual modules. The Java class **ca.uol.aig.ftp.tuneup.DRTuneup** is such a tool. Note that this tool is not intended to be used in the process of routine observing.

Contrary to **DRPipeline**, **DRTuneup** is a not a black-box. It uses the graphics functionality of **javax.swing** and the data reduction functionality of **DRPipeline** to provide a powerful virtual tune-up/debug tool for the users of the FTS-2 data reduction engine (in fact, the data reduction class in **DRTuneup** is **DRPipelineDebug,** a variant of **DRPipeline**).

The following sections describe the usage of the Tune-up Tool software.

1. Invocation

The below example, TestDRTuneup, shows how to invoke DRTuneup:

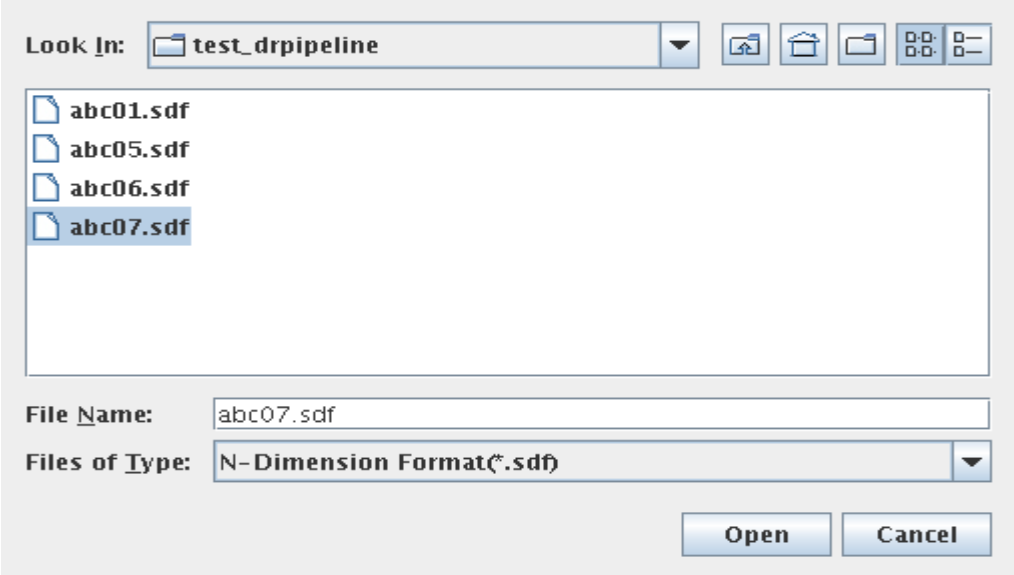
```
import ca.uol.aig.fts.tuneup.DRTuneup;

public class TestDRTuneup
{
     public static void main(String[] args)
     {
          DRTuneup tp = new DRTuneup();
          tp.initDRFrame();
     }
}
```

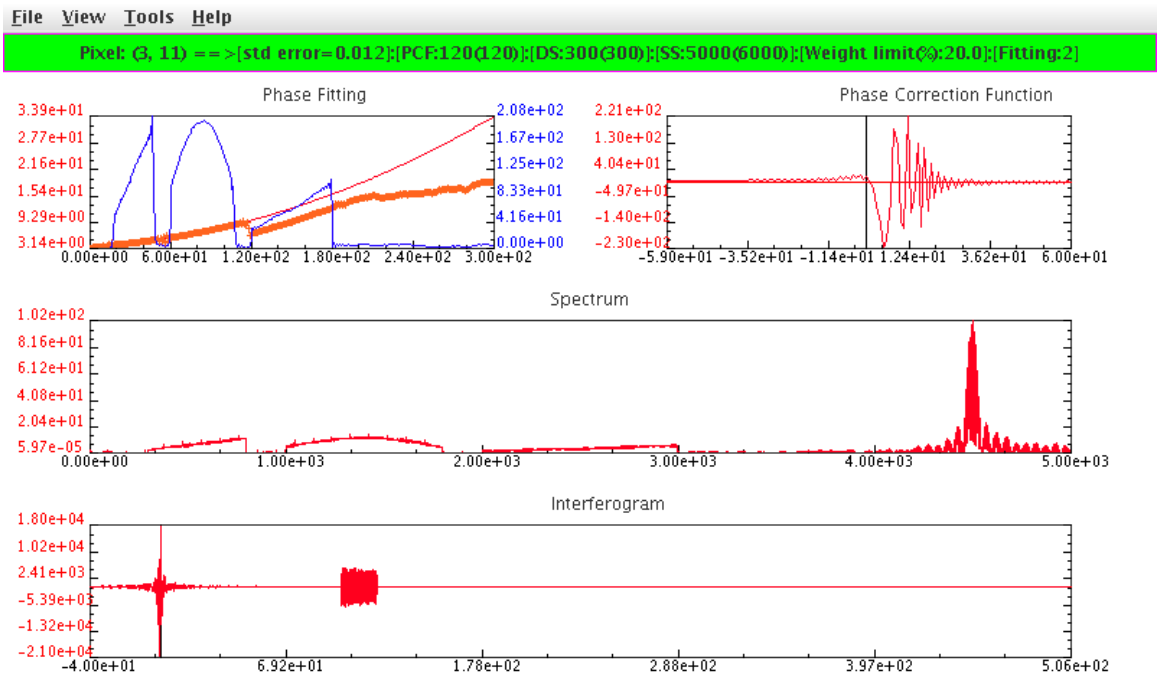
2. FTS-2 Tune-up Tool Usage

2.1. Starting up

When the software starts, the first thing that the user must do is to choose a data file for data reduction. File-> Choose a data file… (or use the key Alt-O), the following window will pop up (only NDF format files are supported):



Next, Tools->Run starts the data reduction. The result of data reduction will be shown in the following window:



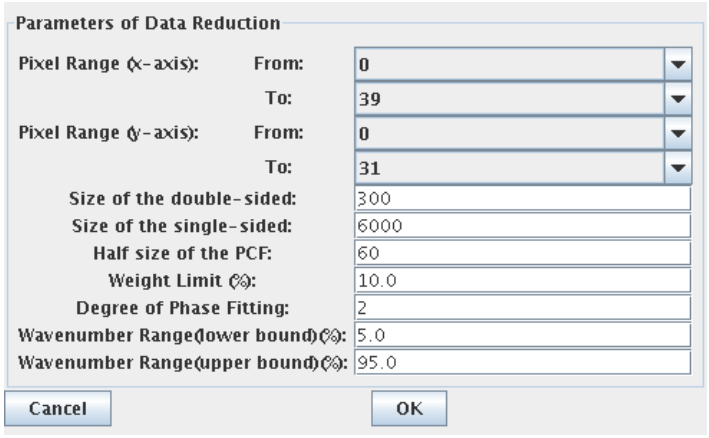
The top green box shows various pixel and data reduction parameters. “Pixel: (3, 11)” indicates that the current pixel is (3, 11). “[std error = 0.012]” indicates that the standard deviation of the phase-fitting is 0.012 (radian). “PCF: 120(120)” indicates that the actual size of phase-correction function is 120 and its pre-set (or required) size is 120. “[DS:300(300)]” indicates that the actual half size of double-sided interferogram is 300 and its pre-set (or required) size is 300. “[SS:5000(6000)]” indicates that the actual size of single-sided interferogram is 5000 and its pre-set (or required) size is 6000. “[Weight limit (%):20.0]” indicates that in the phase-fitting the wavenumber whose amplitude is less than 20% of the maxima of the whole frequency range will not taken into account in phase-fitting. “[Fitting:2]” indicates that the degree of phase-fitting is 2.

The upper left plot shows the original phase (‘+’) of the double-sided interferogram and the fit phase (solid line). The blue curve shows the spectrum amplitude as a function of wavenumber. The upper right plot shows the PCF curve.

The middle plot shows the spectrum for the current pixel. The bottom plot shows the original interferogram before interpolation and deglitching.

2.2. Setting data reduction parameters

Tools->Options…, the following window will pop up, allowing the user to select the range of pixels to process, the phase correction parameters, and the range for the phase fitting:



When the OK button is pressed, the parameters will be checked for valid ranges, and a new data reduction process can be started using Tools->Run menu.

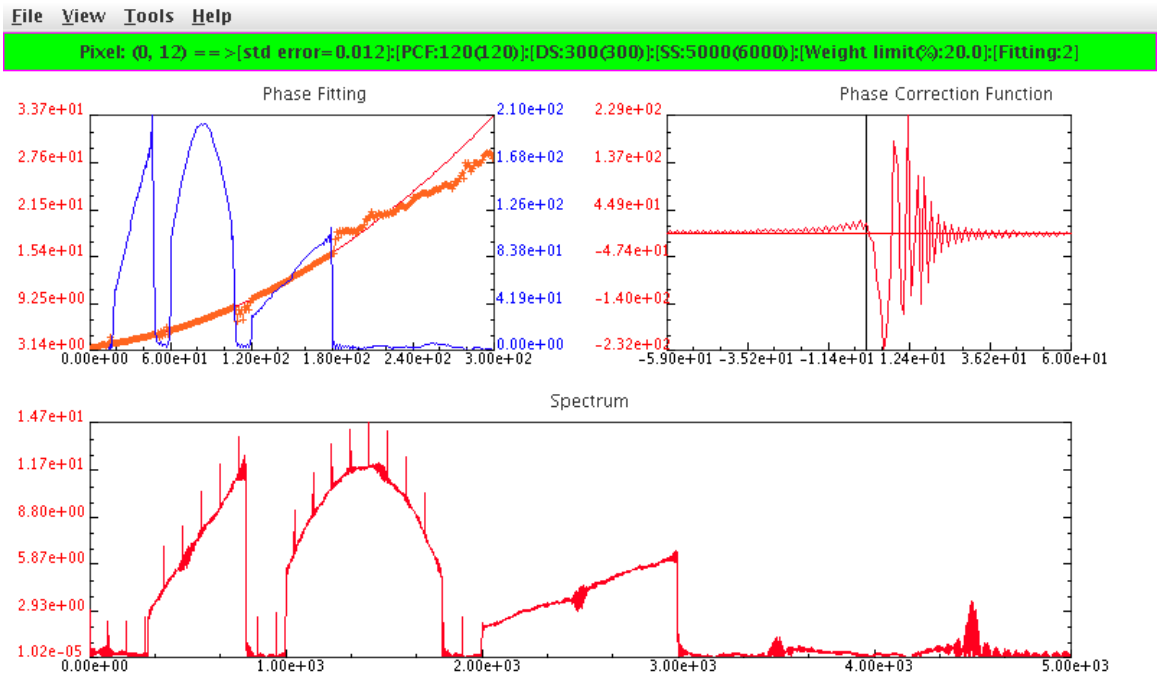
2.3. Setting Break Time, Pause, and Stop

After the pixel range for data reduction is chosen and the data reduction is started, the software will automatically show the intermediate results pixel by pixel. Between two adjacent pixels, there is a short pause so that the user can have enough time to examine the display. Tools->Break Time is used to change the pause time.

Users can also right-click the graphics display area to pause the whole data reduction. The second right-click will continue the paused data reduction. When the data reduction is paused, the top information area will become orange.
Tools->Stop will stop the whole data reduction. When the whole data reduction is stopped, the top information area will become red. When the data reduction is running, the top information area is green.

2.4. Interferogram and Deglitching display

If the user does not want to show the original interferogram, de-select View->Interferogram. Also, if the user does not need deglitching, de- select View->Deglitching(Core) or/and View->Deglitching(Tail).



2.5. Saving the output

In order to use other software to do further analysis, the user can save the current result to the readable text file. Before the user can save the current result, the data reduction must be paused (right-click the graphics display area) or stopped (Tools->Stop). Then, File->Save will save the current result. The user is prompted to input a filename prefix, *prefix*. Selecting "Save the current result…" will output 6 files: *prefix*_ifgm_orig.dat, *prefix*_ifgm_interp.data, *prefix*_phase.dat, *prefix*_pcf.dat, *prefix*_spectrum.dat, and *prefix*_info.dat.

*prefix*_ifgm_orig.dat contains the original interferogram and *prefix*_ifgm_interp.data contains the interpolated (and deglitched if applicable) interferogram. The first column in these files is the mirror position and the second column is the intensity of the interferogram.

*prefix*_phase.dat contains the phase information of the positive frequencies. The first column is the index number (or reduced wavenumber), the second column is the fitting phase, the third column is the original phase, and the fourth column is the amplitude.

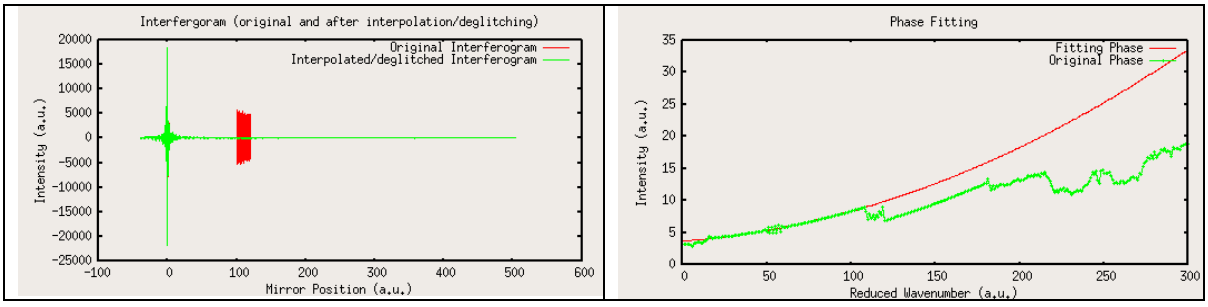
*prefix*_pcf.dat contains the phase correction function. The first column is the reduced positions and the second column is the intensity.

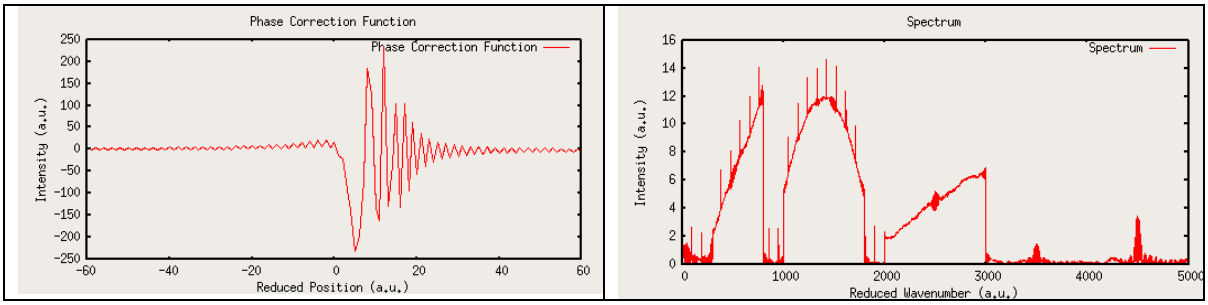
*prefix*_spectrum.dat contains the spectrum after data reduction. The first column is the index number (or reduced wavenumber), the second column is the intensity, and the third column is the wavenumber. *prefix*_info.dat contains various self-explanatory information about the current data reduction. For example:

```
/home/dr2fts-1.9/test/test_drpipeline/abc07
Size of PCF: 120(120)
Size of the double-sided interferogram: 300(300)
Size of the singled-sided interferogram: 5000(6000)
Degree of phase-fitting: 2
Weight Limit (%): 20.0
Pixel: (4, 27)
Std error of phase fitting: 0.013048725847430475
Unit of x-axis of the interferogram: 0.09999999892772138
Unit of x-axis of the spectrum: 0.006283185374552839
Deglitching: (Core, Tail)
The range of wavenumber used in phase-fitting: (0.05, 0.95)
```

2.6. Displaying using Gnuplot

The user also can use Gnuplot to display the current result, by selecting “File->Show the current result in Gnuplot”, as shown below:




Phase Correction Function
Phase Correction Function
Intensity (a.u.)
Reduced Position (a.u.)
Spectrum
Spectrum
Intensity (a.u.)
Reduced Wavenumber (a.u.)