omsource

August 16, 2005

Abstract

Interactive program that allows the user to either create or modify an existing source-list file by selecting sources on a displayed image. Interactive photometry can be done on the selected sources. The source-list file is compatible for use as an input file to the SAS task OMSRCLISTCOMB.

1 Instruments/Modes

Instrument	Mode
OM	IMAGING

2 Use

pipeline processing	no
interactive analysis	yes

3 Description

This program is an interactive image-analysis program which displays an OM image, using ds9, and allows the user to create or modify (add/delete sources) a source-list file and perform interactive photometry on any source in the list. This program creates a new source-list file with an identical structure to that produced by the SAS task omatt- it can therefore be used as an input file to the SAS task omsourcelistcomb.

4 Usage

The following gives the various command lines for running the program.

- **omsource** In this case the program will prompt the user to select an image file, either from a list of previously assessed files or from a directory. When the main window is displayed the user will also be able to select an existing source-list file by clicking on the **sourcelist** button. He/she can also load another image by clicking on the **load image** button.

- **omsource imageset=... newsrclistset=...** For creating a new source-list file (no parameter **oldsrclistset** specified). The image stored in the image file specified by the parameter **imageset** is displayed without any source regions displayed. The user can either select sources manually, or run the **SAS task omdetect** to detect sources. Again,the user can load a source-list by clicking on the **sourcelist** button.
- **omsource imageset=... newsrclistset=... wdxset=...** This is similar to the previous case, except that the **wdxset parameter** has been used. This parameter is needed when running omsource on images reduced using SAS software versions prior to 5.4. Please refer to the section **Input files** for more information about this file.
- **omsource imageset=... oldsrclistset=... newsrclistset=...** The sources stored in the source-list file specified by the parameter **oldsrclistset** are loaded the image file specified by the parameter **imageset** is displayed with the source regions overlaid. Each source is numbered.
- **omsource imageset=... oldsrclistset=... newsrclistset=... wdxset=...** Same as before, except that the **wdxset parameter** has been specified, which is needed when running omsource on images reduced using SAS software versions prior to 5.4.
- **omsource wdxset=...** Same as before, except that the **wdxset parameter** has been specified, which is needed when running omsource on images reduced using SAS software versions prior to 5.4.
- **omsource oldsrclistset=...** As before, except that the user wishes to modify an existing source-list file.
- **omsource oldsrclistset=... wdxset=...** Same as before, except that the **wdxset parameter** has been specified, which is needed when running omsource on images reduced using SAS software versions prior to 5.4

  When the program is running the user can load a new image/source-list file at any time. When the user exits the program and the parameter **newsrclistset** was omitted from the command-line and changes to source-list have been made, the program will display a text-input box allowing the user to type in the name of the new source-list file.

The task starts up by displaying a small progress-dialog box whilst it is doing some initialisation work. The image file is displayed using **ds9**. When the main task window is displayed the user has a choice of actions, each of which is initiated by clicking the appropriate button.

If the user did not load an existing source-list file, the user will first have to either manually select sources from the image (by clicking the **Add sources** button), or run the sas task **omdetect** (by clicking the **Run omdetect**) button to locate sources on the image.

In the former case a small window appears and the user selects sources by clicking the left-mouse button. In the latter case, a small window is shown which allows the user to change the default input parameter values to omdetect. Once done, this window is closed and is replaced by another one indicating that omdetect is running. For both cases, when finished, the main window is shown and the user can then proceed to either examine the parameters of a particular source, by selecting it, redo its photometry, or delete it.

4.1 Image operations

- **Select one or more sources from the image** Click the **Add sources** button and then select new sources by centering the cursor over the source and clicking the left mouse button. The user can change the aperture that will be used to compute the photometry.

When finished click the **Finished** button in the small window at the top-left hand side of the screen.

- **Select sources automatically by running omdetect** Click the **Run omdetect** button. A small dialog-box is displayed allowing the user to change the parameters **nsigma, minsignificance and detectextended**.

  When sources have been selected, by either means, or by using the optional parameter **oldsrclistset**, the region for each source is displayed on the image, as a yellow ellipse, and the top list box is loaded with some parameters of each source. The contents of the list can be printed by clicking the **Print list** button.

- **Delete the whole source list** Click the **Delete list** button. The source list is deleted. This feature is particularly useful if wishing to experiment with the **SAS task omdetect** parameters for performing automatic source detection.

4.2 Source Operations

A source operation can either be the action of deleting it or redoing its photometry. To to either, the source has first to be selected- there are two ways to do this:

1 In the **Source selection** control group click on the spin-box control to either increase or decease the source-number (the number is displayed to the left of the spin-box control). When the required source number is shown click the **Select** button. The source is then displayed by ds9. The region is displayed by a yellow ellipse and the photometry aperture, the inner and outer background radii, are indicated by red circles.

2 In the **Source list** displayed near the top of the screen highlight the required source using either the cursor or the up and down arrows on the keyboard. Then double-click within the highlighted area.

Having selected the source, parameters for that source some information (coordinates, count-rates and instrumental magnitude) about thr source is displayed, and the following actions can be performed on it:

1. **Delete source** The source is deleted by clicking the **Delete** button.
2. **Redo the photometry** The aperture radius and background annulus can then be changed by clicking on the appropriate spin-box contol. When the **apply** button is clicked the photometry is recomputed using the selected aperture radius and background annulus.

5 The task window

Information about a particular button, label or table, can be obtained by positioning the cursor over that particular item, where upon a text message will appear.

5.1 summary of window tables

- **Source list table** Stores information about each source in the current source-list. The source number corresponds to the number on the image.
- **logger table** Stores the recomputed photometry parameters for a selected source, including the original value. This table is cleared when a source is selected.

- **average magnitude table** This table stores the running average magnitudes computed from the logger table- each time the **apply** button is clicked an average magnitude is computed from all the entries in the logger table and added to the table.

5.2 summary of window buttons

- **Print list** Prints the contents of the the drop-down list.
- **Delete list** Delete the contents of the drop-down list- all the sources will be deleted.
- **View all** Displays the whole image, with the source regions overlaid.

  Add sources Allows user to select new sources from the image by positioning the cursor over the source and clicking the left mouse-button. The process is finished when the user clicks the **Finished** button in the **addsources dialog box window**.

  Run omdetect Runs the **SAS task omdetect**. A dialog-box is displayed which allows the user to change some of the input parameter to **omdetect**. The button is disabled if the source-list is not empty- The source-list can be deleted using the Delete list button, allowing **omdetect** to be run.

  photometry Displays the window for performing aperture photometry on the selected source. The source photometry parameter values are displayed at the top of the window. In the middle of the window spin-boxes allow the user to change the photometry aperture radius and the inner and outer background annuli. The user can also select the background-determination method
- **Select** Selects the source number currently displayed in the **source no spin box control** for editing. A source can also be selected from the source-list displayed near the top of the screen by double-clicking on it with the left mouse button. Having selected a source, some of its parameter values will be displayed.

  Apply Recomputes the photometry for the selected source using the aperture radius and the inner and outer background annulii currently set in the spin-boxes (**Aperture, BackGr r0 and BackGr r1**. The computed parameters for the source will be displayed and will replace the values for that source in the source-list. Also, an average magnitude will be computed for all the magnitude determinations made by the user, plus the original one, and displayed in the combobox near the bottom of the window. **Note that when a source is selected the contents of the table are erased.**

  Print table Prints the contents of the logger table.

  Print averages Prints the contents of the average-magnitude table..

  Delete table Deletes the contents of the average-magnitude table.

  Delete Deletes the currently selected source from the list.

  Quit Quits the program- a new source-list file is created containing the current sources. The original source-list file is not modified.

5.3 Image displayer

The image is displayed using ds9. Sources in the source-list are shown by yellow ellipses with the source number also plotted. The ellipses are drawn using the shape parameters for each source (semi-major, semi-minor axes and position-angle).

6 Photometry

Photometry on sources is done in a similar fashion to that done by the **SAS tasks omdetect and ommag**.

POINT-SOURCE PHOTOMETRY. The counts for a source are extracted within the aperture radius and the background (see the next paragraph) subtracted. If necessary, the background-subtracted counts are extrapolated to the coincidence-loss area corresponding to a circle of 12 unbinned pixels, using the point-spread function (this correction is tabulated as **psf1 corr**). A correction is then made for coincidence-losses (this correction is tabulated as **coinc corr**). For UV data, a further correction is made to extrapolate the counts to a radius of 35 pixels using the point-spread function (this correction is tabulated as **psf2 corr**). The count-rate is then corrected for the CCD dead-fraction and an instrumental magnitude derived from it. The user can change the aperture radius to exceed the coincidence-loss radius, in which case the photometry will be computed as for an extended source.

EXTENDED-SOURCE PHOTOMETRY. For each pixel within the aperture a coincidence-loss correction factor is computed by assuming this pixel is centred on a point-source and then computing the correction-factor as for a point-source. The pixel value is then corrected using the correction value. The background is computed from the pixels within the background annulus, which can be elliptical. The apertures can be elliptical, and the user can fix the ellipse parameters (the semi-minor axis, ellipticity and position-angle of the major-axis). **Please note that the accuracy of this method has not yet been evaluated.**

Source type A source can be of two types, **point-like** or **extended**. The former refers to an unresolved source with a 2-dimensional pixel distribution similar to that of the point-spread function, whereas the latter refers to any source that has an extent greater than that of the point-spread function.

In the **Source-type** group box there are two radio-buttons: textbfPoint source - if this is enabled the photometry in the normal way for a point source. **Extended source** - if this is enabled the photometry is performed as for an extended source. The user can change the axial-ratio **by clicking on the a/b spin-box** and position-angle **by clicking on the Pos angle spin-box**) and the inner and outer background radii for the background determintaion (**by clicking on the Inner bck and Outer bck spin-boxes, respectively**). **Note that the background region will have the same ellipticity and position-angle as for the photometry aperture.**

Background determination The Background determination group box allows the user to select one of three ways to subtract the background, by clicking the approriate button. **Annulus** If this is checked then an annulus region with the inner radius set by the **Inner bck spin-box** and outer radius set by the **Outer bck spin-box** is used to extract the counts to compute the background mode.

User regions If this is checked then the circular background regions will be used to determine a mean background per pixel which will be used for the background mode.

User value If this is checked then the value displayed in the background label will be used.

6.1 Notes

- The aperture radius can be changed between 6/bin and 12/bin pixels, where bin is the binning factor (1 for unbinned data, 2 otherwise). The upper limit corresponds to the cal calibration radius. Using a smaller radius than the upper limit will result in the source counts being scaled to the calibration radius using the point-spread function (this correction is the tabulated psf1 corr value).

7 Parameters

This section documents the parameters recognized by this task (if any).

Parameter	Mand	Type	Default	Constraints
imageset	yes	string	none	

name of OM OSW FITS image file

newsrclistset	yes	string	none	

name of new output OM OSW source list file

oldsrclistset	no	string	none	

name of input OM OSW source list file

wdxset	no	string	none	

name of input wdx file- Needed when using images reduced prior to SAS 5.4.

8 Errors

This section documents warnings and errors generated by this task (if any). Note that warnings and errors can also be generated in the SAS infrastructure libraries, in which case they would not be documented here. Refer to the index of all errors and warnings available in the HTML version of the SAS documentation.

Any memory allocation errors *(fatal)*

9 Input Files

- **Image file** file Modulo-8 corrected OSW FITS image product file (output from ommodmap (*OM*IMAGE_*FIT eg- P0123920101OMS006IMAGE_1000.FIT for exposure 006).
- **Source list file** Intermediate source list file created by omdetect **(pipeline product *I0*OMS*SWSRLI* eg I0123920101OMS006SWSRLI10001.FIT for exposure 006) or a source-list file created by omdetect, and subsequently modified by** OMMAG AND OMATT) **(pipeline product *P0*OM*SWS*SWSRLI* eg P0123920101OMS006SWSRLI100 for exposure 006)**.
- **wdx - window-data file** FOR DATA REDUCED PRIOR TO **SAS 5.4** THIS FILE IS NEEDED BY OMSOURCE TO OBTAIN SOME CCD PARAMETERS. THIS FILE WILL BE FOUND IN THE

ODF- **(*OM*WDX*FIT eg 0081_0123920101_OMS00800WDX.FIT)** - THERE IS ONE SUCH FILE FOR EACH EXPOSURE- THE EXAMPLE IS THE NAME OF THE WINDOW FILE FOR EXPOSURE 008 IN THE ODF.

10 Output Files

1. new OM OSW source list file that contains all the information needed by OMSRCLISTCOMB

11 Algorithm

```
subroutine omsource

1) Read in image
2) If present, read in the old source-list file
3) Display the image
4) Display the main window allowing the user to:
a) Select a particular source to either redo the photometry or delete it.
b) Select additional sources from the image to add to the source-list.
The position, shape, photometric and astrometric properties are calculated
for each source in a similar fashion to what the sas tasks omdetect, ommag
and omatt do.
c) Print the source list.
d) Display the main image (using ds9).
e) Run omdetect

When the user quits the program the new source-list file
is constructed from
the current stored source-list. This source-list
file can then be used as an
input source-list file to either omsource or omsourcelistcomb.


end subroutine omsource
```

12 Future developments

The program will be modified to do photometry on extended and overlapping sources.

References