

Commands list

[Through release 5.58. Last updated: 09-Feb-2010]

ABS

Compute the absolute value of the pixels intensity.

ACQ_DSLR [EXPOSURE]

Take an image with a Canon EOS series Digital SLR. The EXPOSURE time is given in seconds. The result of the exposure is loaded and displayed. See also [GET_DSLR](#) command and Acquisition command of Digital photo menu.

ADD [NAME]

Add the image in memory to the image designated by NAME on the disk (the image must be in the current directory).

ADD2 [NAME] [NUMBER]

Adds [number] images in the sequence of images having the generic name [name]. Example:

```
ADD2 I 3
adds the images I1.PIC, I2.PIC & I3.PIC.
```

[Click here](#) for an application.

ADD3 [NAME] [FWHM] [NUMBER]

When using the command [REGISTER](#) with deep-sky images, a file FWHM.LST is created on your hard drive. In this file, the first column contains an image index and the second one corresponds to the largest FWHM (along either X or Y axis, whichever is greater) of stars within the image.

Images indexes appears according to increasing FWHMs. So, it is possible to determine the best images in the series by a simple look at this file. The command ADD3 is essentially the same as ADD2, except that only the images with FWHM better that [FWHM] will be added. ADD3 uses the file FWHM to do so. Then you may add only the best images of the series. Example:

```
ADD3 M51- 1.9 12
```

ADD_MAX [NAME]

Suppose the intensity $I_1(x,y)$ of a pixel in the image I1 at coordinates (x,y) and the intensity $I_2(x,y)$ of a pixel in the image I2 at the same coordinates (x,y). ADD_MAX produce a new image, I, where the intensity of pixel (x,y) is:

$$I(x,y) = I_1(x,y) \text{ if } I_2 \leq I_1$$
$$I(x,y) = I_2(x,y) \text{ if } I_2 > I_1$$

In other word, a pixel of image I1 is replaced by a pixel of image I2 if the local intensity of I2 is superior to I1.

The usage of ADD_MAX is simple:

```
LOAD I1      (load in-memory the I1 image)
ADD_MAX I2   (compute substitution)
SAVE I       (save the result)
```

ADD_MAX is compatible with 16-bits format (gray level images) and 48-bits format (true-color images).

[Click here](#) for a typical application.

ADD_MAX2 [NAME] [NUMBER]

Function very similar to ADD_MAX but process many images simultaneously. For example for stack images I1, I2, I3, I4, I5, enter the command:

```
ADD_MAX2 I 5
```

This function is very efficient for construct long exposure star-trails images. About this method read the excellent paper of [Peter Michaud](#) (Gemini observatory) in the Marsh 2004 issue of Sky and Telescope.

[Click here](#) for an example.

ADD_MEAN [NAME] [NUMBER]

Calculate the average of a sequence of images.

ADD_NORM [NAME] [NUMBER]

Same command as [ADD2](#) but normalise intensity to 32700 if value of one or many pixels are upper to 32768 after coading.

ADD_NORM2 [NAME] [NUMBER]

Same command that [ADD_NORM](#) (addition of a sequence of images and normalize the most intense pixel to 32767 if necessary), but the zone where normalize is computed is selected with the mouse. This gives flexibility for some situation cases to avoid saturating a specified part of the image.

AF3 [COEF]

Adaptive filtering of the noise in an image. Adaptive filtering consists of adjusting the strength of the filter as a function of local statistical criteria. The filter will be most active where the signal to noise ratio is low. This type of filter reduces the noise while conserving a maximum of details in the image.

The parameter [coef] contains a value that fixes the global strength of the filter. The filter does not act if [coef]=0, and the filter gets stronger as the value of [coef] increases. Typically, [coef] is between 0.1 and 5.

AF3 uses a zone of 3x3 pixels, centered on the pixel being processed, for the statistical calculation.

See also: [AF5](#), [MMSE](#)

The AF3 command is a remarkably effective tool for reducing the noise in an image while preserving a maximum of details. This command (or [AF5](#)) is often chosen for this type of application instead of the filters whose action is isotropic (like those provided in the GAUSS command).

AF5 [COEF]

Same command as AF3 with a 5x5 array.

ANG_FILTER [XC] [YC] [FILTER STRENGTH]

Simplified and improved version of the initial angular filtering procedure of Iris.

[XC] [YC] are the coordinates of the blur center

[FILTER STRENGTH] is the amount of filter applied. Typical values are between 0.5 and 5.

A typical application: enhance and sharp structure of sun corona.

ANIM_PLOT [DATA] [OUTPUT] [DIM X] [DIM Y] [YMIN] [YMAX] [TITLE] [NUMBER]

Save a series of graphics images calculated with the data present in sequences of file of generic name [DATE] (the extension of the file is .DAT). These data files are text type and contain two columns (axes X and Y respectively). They are produced for example with command [DATA ANIM](#). Graphics are saved in the form of images of generic names [OUTPUT] and of size in pixel [DIM X] x [DIM Y]. The range along the Y-axis is defined with the parameters [YMIN] and [YMAX]. The number of data files in the sequence is indicated in the parameter [NUMBER]. The parameter [TITLE] is a character string which will be displayed on the top of each graphics. The white character is the symbol " _ ". Example:

```
ANIM_PLOT SPECT GRAPH 300 400 800 20000 It_is_a_spectrum 23
```

See also command [PLOT2](#) which displays only one graph in a similar way and which makes it possible to test ANIM_PLOT. ANIM_PLOT is often exploited in partnership with command [DATA ANIM](#) for the dynamic study of the spectra. An [example is here](#).

ASCALE

Enlarge of facteur two the current image (image in memory). This function preserve the intensity per unit of area. This command is useful for precise aperture photometry ([PHOT](#) and [PHOTM](#) commands). Enlarge first the image (apply many time ASCALE is necessary), then mesure the stellar image with large aperture cercles. [Click here](#) for details.

ASCALE2 [INPUT] [OUTPUT] [NUMBER]

Same as [ASCALE](#) but for a sequence of images. [Click here](#) for details.

ASINH [ALPHA] [INTENSITY]

This command is for processing red, green and blue (RGB) composites from three-band astronomical images. ASINH stretch the image to show faint objects, while simultaneously preserving the structure of bright objects of the field. The color contrast is boosted by the application a non-linear stretch: the Arc Sinus Hyperbolic function. This method permit to reveal an enoumous amount of information: index

color of stars, faint nebulae, galaxies having a distinctive colors (see for example, the Hubble Deep-Space images of the HST, many time processed with a function very similar to ASINH. The arcsinh is a new manner of defining the magnitudes scale, see R. Lupton, *Astronomical Journal*, 118, 1406-1410. This scale magnitudes has properties very interesting when one applies to color images colors because it boost the colors index of the objects (see R. Lupton & all, *PASP*, 116,133-137). The colors contrast is very strongly accentuated whereas the noise increase is contained.

The parameter [ALPHA] permit to adjust the non-linearity factor. A null value corresponds to a standard linear scale. Typical values are between 0.001 to 0.1. The parameter [INTENSITY] adjust the intensity of the final image. Typical values for this parameter go from 1 to 50 (carry out tests and exploit the visualization thresholds). [Click here](#) for an example.

BESTOF [NAME] [NUMBER]

Ordering of the must resolved images in a sequence. For details [click here](#).

BESTOF2 [NAME] [NUMBER]

Same function that [BESTOF](#) but more particularly adapted to objects presenting a high contrast.

BEST_STREHL [NAME] [NUMBER]

Ordering of the must resolved stellar images in a sequence (Strehl ratio criteria). For details [click here](#).

BG

Return the background level of the image in memory.

BGNOISE

Return the background noise level.

BIN_UP [VALUE]

The pixels having an intensity higher than [value] take value 255. The other pixels take value 0.

BIN_DOWN [VALUE]

The pixels having an intensity lower than [value] take value 255. The other pixels take value 0.

BINX [BINNING FACTOR]

Compute the binning of the along X axis.

BINY [BINNING FACTOR]

Compute the binning of the along Y axis.

BINXY [COEFFICIENT]

Compute the numerical binning of the in-memory image (sum of the pixels 2x2, 3x3..., like the analogic binning of CCD camera). Same as **Binning...** command of **Geometry** menu.

BINXY2 [IN] [OUT] [BINNING FACTOR] [NUMBER]

Bin a sequence of images.

BLACK

To restore just colors of tri-color images it is some time necessary to balance the white. Two new commands make it possible to carry out this operation with precision and speed. The first is the function BLACK which bring the sky background to zero in a zone selected with the mouse, and that simultaneously on the 3 colors plans in memory. The command return the background levels of sky in the zone for the three plans. These levels are automatically subtracted and the result is displayed.

See also the [WHITE](#) command.

BLIND [ITERATION #] [K-PARAMETER] [RELAXATION]

The [RELAXATION] parameter limit the importance of the noise. The typical values of relaxation parameter is between 0 and 2. In most general situation RELAXATION=0. The PSF solution is stored in the image @PSF.

Select the isolated point-like PSF, then perform the BLIND function.

BLINK [NAME1] [NAME2] [DELAY]

Compares two images by displaying them successively and cyclically on the screen. The names of the two images are in the parameters [name1] and [name2]. The images may have different sizes. It is recommended to adjust the dynamic and offset of images to minimize flickering effects between the images ([SCALECOLOR](#) is a good command for this operation).

The blinking time may be adjusted with the [delay] parameter that contains the visualization time of an image in milliseconds.

During blinking it is possible to adjust visualisation threshold, color palette, use some processing command like [TRANS](#) for register dynamically the two images... Processing concern the image [name1]. For example, try the commands:

```
BLINK M51 M51 200
OFFSET 100
TRANS 1 0
```

To stop blinking enter the command: [BLINKOFF](#).

The BLINK command is a [powerful tool](#) to bring out any difference between two images. It can be used for many kinds of investigations: detection of supernovae, novae, variable stars, comets, asteroids, etc.

BLINK2 [NAME1] [NAME2] [NAME3] [DELAY]

Same command as [BLINK](#) but with 3 images instead of 2 (that allows sometimes better identification of moving objects).

For example:

```
BLINK2 ASTER1 ASTER2 ASTER3 200
```

BLINKOFF

Stop the blink mode.

See also: [BLINK](#) and [BLINK2](#) commands.

BLUR [COEF]

Apply [a low-pass filtering](#) to an image. The value of the parameter [COEF] is the force of the filter (between 0 and 1).

BMP2PIC [INPUT] [OUTPUT] [NUMBER]

Convert of a sequence 8-bits BMP 8 images in a sequence of FITS or PIC images.

BORDER [LX] [LY]

Draw a black edge of width [LX] on the right and on the left of the image, and of width [LY] in top and bottom of the image.

CAPTURE

Same function that the One Shot command of the *Webcam* menu, but accessible from the console. For a general description of webcam and video functions, [click here](#).

CDG

Return the coordinates of the center of gravity in the zone selected with the mouse.

CENTER

Draw a cross at the center of into the current image.

CFA [R] [G] [B]

Extracts the RGB components from a CCD composed with a Color Filter Array (CFA), like Kodak KAF-0400C CCD. The **Iris** CFA command is dedicated to a Bayer array with the following aspect:

```
G R G R  
B G B G
```

G R G R
B G B G

The coordinates of the first red pixel in the bottom left corner of the image have to be set in the variables CFA_X & CFA_Y in the IRIS.INI file (this file is located in the windows directory).

CFA2PIC [IN] [OUT] [NUMBER]

Convert a sequence of CFA images into a sequence of 48-bits images. For convert only one image from the console use the command **CFA2RGB**.

CFA2RGB [R] [G] [B]

Converted CFA image in memory (CFA = Color Filter Array) into three files containing the primary color components.

CIRCLE [THRESHOLD]

Carry out the binarisation of the current image to the threshold THRESHOLD then calculates the best circle which passes by contour thus definite. The software return the coordinates of the center of the circle and its radius. The command is ideal for registration of sun or planetary images. See an example [here](#).

CIRCLE2 [THRESHOLD]

Compute the center and the radius of a circular object (planet, sun, moon, ...). The radius value is computed for a given intensity threshold in the image. CIRCLE2 differs from [CIRCLE](#) command by the method used for identify the objet. CIRCLE use a dragged rectangular area, CIRCLE2 define the rectangle from two clicked points (more useful for large images).

CLIPMAX [OLD] [NEW]

All the pixels with an intensity greater than [old] are assigned the value [new]. Examples:

```
CLIPMAX 200 0
```

The pixels whose intensity is greater than 200 are assigned the value 0.

```
CLIPMAX 4095 4095
```

The pixels with a value over 4095 are set to 4095.

The CLIPMAX command allows you to control the maximum intensity of the pixels in an image. It can be used, for example, when pixels with a high intensity may cause a calculation error in certain processes, or when you wish to reduce a 16 bit image to an 8 bit image.

See also: [CLIPMIN](#)

CLIPMIN [OLD] [NEW]

All the pixels with an intensity less than [old] are assigned the value [new].

The CLIPMIN command is practical for making the contents of an image strictly positive. For example:

```
CLIPMIN 0 0
```

See also: [CLIPMAX](#)

CMY2RGB [C] [M] [Y] [R] [G] [B]

Convert tricolor images Cyan, Magenta, Yellow (CMY) to tricolor images Red, Green, Blue (RGB). For details, [click here](#).

COASTRO [IMAGE1] [IMAGE2] [ADJUST MAGNITUDE (0 or 1)]

Fast version of the command COASTROS, using a direct projection plane to plane method (see "Fast Direct Plane-to-Plane Coordinate Transformation", D. Makovoz, PASP, 116, 971, Oct. 2004). The command is appropriate only then image scale are similar and for a gnomonic projection.

COASTRO2 [IN] [OUT] [ADJUST MAGNITUDE (0 or 1)] [NUMBER]

Apply COASTRO command to a sequence of images.

COASTROS [IMAGE1] [IMAGE2] [ADJUST MAGNITUDE (0 or 1)]

The two starting images [image1] and [image2] are gnomonic projected. The COASTROS geometrically transform the image [image2] into the [image1] reference. The result is displayed on the screen and can be saved on the disk. If the *Adjust magnitude flag* = 0, the intensity of the image 2 is not affected. If the *Adjust magnitude flag* = 1, the intensity of all pixels of the image 2 is multiplied by a factor to equalize the constant magnitude between image #1 and image #2. This command is ideal for two superimpose wide field deep sky images for search variables objects. For example, image 1 and 2 image can be subtracted to detect the differences, you can use animation function (View menu) or BLINK and BLINKOFF commands.

COASTROS2 [IN] [OUT] [ADJUST MAGNITUDE (0 or 1)] [NUMBER]

Apply COASTROS command to a sequence of images.

COG

Compute the barycenter of an area selected with the mouse.

COL2BW [INPUT] [OUTPUT] [NUMBER]

Convert a 48-bits true-colors image into a black and white sequence (simple add of the RGB layer).

COMPOSIT [NAME] [SIGMA] [ITERATION] [SATURATION] [NUMBER]

COMPOSIT is a powerful command to perform automatic combination of a sequence of images that were registered before. The simplest way to combine the images is of course to add them. COMPOSIT proceeds in that way, but will reject the pixels that have values significantly bad, i.e. for which the difference with respect of the mean of the values in all the images is greater that [SIGMA] times the standard deviation of the values. Moreover, the process may be iterative: at each iteration, a new analysis of the pixels statistics is made with the left ones. This method is called sigma-clipping. To be very efficient, it is necessary to have a large number of images to combine (at least 5). Try [SIGMA] values between 1.5 & 5.

The [NAME] parameter contains the generic name of the sequence, and the [#IMAGE] parameter contains the number of images in the sequence.

The [SATURATE] parameter is a flag. If saturate=1 the max intensity of the coadded image is normalized to 32700 if the level is upper to 32767.

This control is not realized if saturate=0. Example:

```
COMPOSIT M33- 2.5 2 0 7
```

Combines the images M33-1.PIC, M33-2.PIC...M33-7.PIC with a rejection level of 2.5 sigma. Two iterations are performed.

The COMPOSIT command is a powerful tool that gathers efficiency of the simple addition of images in terms of signal to noise ratio, and the power of median combination in terms of rejection of aberrant pixels (cosmic rays, satellites, ...).

See the general discussion about [deep-sky images preprocessing](#).

COMPOSIT2 [NAME] [FLAG. MAX] [NUMBER]

COMPOSIT2 method use a robust average image using a continuous adaptive weighting scheme that is derived from the data themselves - see Artificial Skepticism Stacking algorithm - Stetson 1989, V Advanced School of Astrophysics [Univerisidade de Sao Paulo], p.1. See also:

<http://archive.stsci.edu/hst/wfpc2/pipeline.html> and
http://archive.eso.org/archive/hst/wfpc2_asn/3sites/WFPC2_Newsletter.pdf.

The given parameters are only the generic name of the input image sequence, the normalized flag (0 or 1, see COMPOSIT) and the number of input image (an unlimited number).

The weights of the pixel values are computed by the equation:

$$w_i = \frac{1}{\sigma^2} \frac{1}{1 + \left(\frac{|r_i|}{\sigma_i}\right)^2}$$

where w_i is the weight of the i^{th} pixel value, σ_i is the sigma of the i^{th} pixel in the stack, derived from the readout noise and camera gain. The r_i term, which is the residual between the current average pixel value and the value of the i^{th} pixel, is computed at each iteration. This version of COMPOSIT2 use classical and internally coded value for CCD readout noise and camera gain (noise of 15 electrons RMS en 2 e-/ADU). COMPOSIT2 is a simple command to use and efficient for bad pixels rejection.

Important, before use commands like [SMEDIAN](#), [COMPOSIT](#) and COMPOSIT2 it is necessary to have the same sky background level for all the images of the sequence. Use the command [NOFFSET](#) if is not the case (or [NOFFSET2](#) for select a specific region for the harmonization of the sky level). Similar,

is the exposure time is not the same the image should be scaled before stacking ([MULT](#), [MULT2](#), [NGAIN2](#) commands for example).

The choice of the most optimal combining algorithm will depend on the nature of the data and on the exposure type. For produce a clean flat-field or a master dark frame the appropriate command is [SMEDIAN](#) (or [#SMEDIAN2](#)). For deep-sky imaging the classical sigma-clipping is a good choice for the best conservation of signal to noise (the median lose 30% in signal to noise typically relative to simple sum and the COMPOSIT/COMPOSIT2 commands). The COMPOSIT2 command is now an useful and fast alternative to the sigma-clipping scheme.

COMPUTE

Draw a rectangle around a star with the mouse. Then type COMPUTE. Iris reads the files POLX.LST & POLY.LST created by [Astrometry/Photometry](#) dialog box and returns the equatorial coordinates and the magnitude of the star.

See also: [SKY2REC](#), [REC2SKY](#).

COMPUTE_TRICHRO1 [MASTER] [R] [G] [B] [SIZE] [SELECT NB.] [TOTAL NB.]

This command carries out the automatic processing of trichromy images of planets. It connects commands [BESTOF](#), [SELECT](#), [PREGISTER](#) and [ADD_NORM](#), this for the three colors channels. At the end of the processing the trichromatic image appears on the screen (you can then save it on the disc with command [SAVEBMP](#), [SAVEJPG](#), ... or adjust its chromatic balance with the command **White balance...** from menu **View** for example).

Moreover, several sequences of images are created on the hard disk. The sequence @r1, @r2.... @rn (*n* is the total number of image treated) contains the registered images of the red color channel and sorted by order of decreasing spacial resolution. The sequences @g1, @g2... @gn and @b1, @b2... @bn contain same information for the green and blue channels.

COMPUTE_TRICHRO1 also automatically produces the 3 images @r, @g, @b (without indices) which represent the addition of the best *n'* images for the 3 colors channel (*n'* parameters being provided by the operator).

Command COMPUTE_TRICHRO1 using function [PREGISTER](#) to carry out the registration of the images (centering of the images of a sequence compared to the first image of this sequence), it is rather intended for the images being able not to have a contour of revolution, the such planet Saturn or lunar surface. Moreover, the use of [PREGISTER](#) imposes that the operator enters in parameter of COMPUTE_TRICHRO1 the size of the window for the calculation of registration (its must be equal to a power of two because the technique used for registration is the intercorrelation in the Fourier space). The parameters are:

[MASTER] is the generic name of a sequence of image from which IRIS will make sorts it better images (as command [BESTOF](#) and will calculate the parameters of registration for the 3 colors plans. The master sequence of images must contain images well exposed posed if possible and well resolved. Generally, in the case of the use of a Webcam camera, one will choose the images corresponding to the plan of green color.

[R], [G], [B] is the generic names of red, green and blue channel images respectively.

[SIZE] is the size of the zone for the calculation for registration (choose among values 128, 256, 512 for example).

[SELECT NB.] is the number of images added during the final composite. It is a number equal or lower than the total number of image to treat . This value is dependent on the degree of turbulence. For example for a sequence of 200 input images it is not abnormal to add only 50 images with final (they will be 50 best images).

[TOTAL NB.] is the total number of images to be treated.

Let us suppose that you extracted from a film AVI (command **Conversion AVI...** from **File** menu) or functions of Webcam acquisitions from IRIS (**Webcam** menu) from the sequences from 300 images whose generic names are R, G and B for respectively the plans colors red, green and blue. You make then for example:

```
COMPUTE_TRICHRO1 G R G B 128 40 300
```

The size of the window for calculation (here 128) must be higher (but not much higher, if not calculation can be very long) than the diameter of the planet disc of planet. It is necessary moreover for run the command to surround planet by a rectangle while dragging with the mouse (press left button).

It is significant that the rectangle thus defined either centered on the center of the planetary disc. It is necessary moreover that its dimension makes it possible to include the images of planet of the beginning and at the end of the sequence. The size and the position of the selection box are less critical in the case of the lunar images (but for this type of images the three-colour process in general presents well little interest and it is by far preferable to treat monochromic images).

Calculation can be relatively long. If a problem appears in the course of processing it is always possible to stop this one while click on the stop key of the bar of tools.

COMPUTE_TRICHRO2 [MASTER] [R] [G] [B] [SEUIL] [SELECT NB.] [TOTAL NB.]

This command is very similar to COMPUTE_TRICHRO1 except the uses of function CREGISTER for the registration of the images instead of PREGISTER. Function CREGISTER determines the position of planet by adjusting a circle on the circumference of the limb. It is necessary to provide to COMPUTE_TRICHRO2 the value of the threshold of intensity from which the calculation of the circle is carried out ([click here](#) for more information). Taking into account these characteristics, it is necessary to reserve the use of this command to planets having a good symmetry of revolution (Jupiter and generally Mars).

The parameter [THRESHOLD] define the level of threshold which will be used to adjust a circle around planet. For example:

```
COMPUTE_TRICHRO2 G R G B 80 60 300
```

Tip: to carry out images having a good chromatic balance it should be checked that the level of the sky background is homogeneous between the three colors plan. It is not rare with the images coming from the Webcam camera that the level of the sky is higher in blue than in the red and the green. Thus to bring back the level of the bottom of sky in the sequence blue you will make:

```
NOFFSET3 B B 0 300
```

after having to draw a selection box in one of the images of the sequence. You can also use for that the **Normalisation of the offset of a sequence...** command of **Processing** menu after having to notch the option *On a zone*.

To note that command COMPUTE_TRICHRO2 is appreciably faster than COMPUTE_TRICHRO1 and if you have the choice, it is COMPUTE_TRICHRO2 which you will use preferably.

See also command [SCALECOLOR2](#).

CONVERT_INDEX [IN] [OUT] [NUMBER]

Convert image name format in0001, in0002, in0003, ... to out1, out2, out3, ...

CONVERTBMP [IN] [OUT] [NUMBER]

Convert an 8-bits BMP input sequence [in] into an output sequence [out] in the current file format (fix the File type in the Settings dialog box - see the File menu). The number of image in the input sequence is [number]. You can set the base of the first index in the input sequence (see the [SETBASE](#) command). The first index of the output sequence is always 1.

CONVERTBMP24 [IN] [R] [G] [B] [NUMBER]

Convert an 24-bits BMP input sequence [in] into three output generated sequences [r] [g] [b] in the current file format (fix the File type in the Settings dialog box - see the File menu). The number of image in the input sequence is [number]. You can set the base of the first index in the input sequence (see the [SETBASE](#) command). The first index of the output sequence is always 1.

CONVERTBMP24BW [IN] [OUT] [NUMBER]

Convert an 24-bits BMP input sequence [in] into the mean of the RGB planes and copy the result in the output sequence [out]. The number of image in the input sequence is [number]. You can set the base of the first index in the input sequence (see the [SETBASE](#) command). The first index of the output sequence is always 1.

CONVERTDSI

Converted a raw image of the camera Meade DSI already in memory into an image color.

CONVERTDSI2 [IN] [OUT] [NUMBER]

Converted a sequence of RAW image Meade DSI (generic name [in]) into a sequence of color 48-bits images (generic name [out]). The number of images in the sequence is [number]. The geometrical transformations are not carried out by this command.

CONVERTRAW [IN] [OUT] [NUMBER]

EXAMPLE: >CONVERTRAW M42- RESULT 3

Produces the CFA sequence: RESULT1.FIT, RESULT2.FIT, RESULT3.FIT

(you'll probably have to rename your RAW images before, and also select your DSLR model in the camera setup dialog box). Use LOADRAW to load an individual image.

CONVERTSX [IN] [OUT] [NUMBER]

Convert a sequence of unsigned 16-bits images into a series of signed 16-bits images compatible with Iris (dynamic range between 0 and 65535). The level of the pixels is multiplied by 0.5 to respect dynamics 0...32767. See also: [SIGNED](#).

CONVERTSX2 [IN] [OUT] [NUMBER]

Convert a sequence of unsigned 16-bits images into a series of signed 16-bits images compatible with Iris. The level of the pixels is not modified, but the images are truncated for intensities higher than 32767. The final level lies between 0 and 32767.

CONVERTSX3 [IN] [OUT] [NUMBER]

Convert a sequence of unsigned 16-bits images into a series of signed 16-bits images compatible with Iris. Value 32767 is subtracted from all the pixels. The final level lies between -32768 and 32767.

CONVERTTIFF [IN] [OUT] [NUMBER]

Convert an 8-bits uncompressed TIFF input sequence [in] into an output sequence [out] in the current file format (fix the File type in the Settings dialog box - see the File menu). The number of image in the input sequence is [number]. You can set the base of the first index in the input sequence (see the [SETBASE](#) command). The first index of the output sequence is always 1.

CONVERTTIFF24 [IN] [R] [G] [B] [NUMBER]

Convert an 24-bits uncompressed TIFF input sequence [in] into an output sequence of RGB planes in the current file format (fix the File type in the Settings dialog box - see the File menu). The number of image in the input sequence is [number]. You can set the base of the first index in the input sequence (see the [SETBASE](#) command). The first index of the output sequence is always 1.

CONVERTTIFF24BW [IN] [OUT] [NUMBER]

Convert an 24-bits uncompressed TIFF input sequence [in] into the mean of the RGB planes and copy the result in the output sequence [out]. The number of image in the input sequence is [number]. You can set the base of the first index in the input sequence (see the [SETBASE](#) command). The first index of the output sequence is always 1.

COPY [NAME] [X1] [Y1] [X2] [Y2]

Copy in the current image the portion of the image [name] in the disk delimited by the coordinates (x1, y1)-(x2, y2).

COPYADD [IN] [OUT] [NUMBER] [NB_ADD]

This command adds the [nbadd] first images with the generic name [in] and saves the result with the name [out] with the index 1. Then the result of adding the next [nb_add] images of generic name [in] is saved with the name [out] with the index 2 and so on up to the image [in] with the index [number]. One of the interests of this command is that the acquisition time put in the header of the added images is the barycentre of the individual images. As a consequence the dating accuracy contained in the input images is transferred to the added images.

COPYFWHM [IN] [OUT] [FWHM] [NUMBER]

Copy images of the sequence [in] to a new sequence [out], but select only images where the FWHM is inferior to [fwhm] parameter. The command return the selected image number. It is necessary to apply before the [REGISTER](#) command (see also [ADD3](#)). COPYFWHM is perfect for isolate good images, before compositing, for example:

```
COPYFWHM M51- I 1.6 12
```

[See here](#) a typical use.

COPYMED [IN] [OUT] [NUMBER] [NB_MED]

Same command as [COPYADD](#), but uses median averaging instead of adding the [nb_med] images.

COPYX [X_ORIG] [X_DEST]

Copy the colum of position [x_orig] to the colum [x_dest].

COPYY [Y_ORIG] [Y_DEST]

Copy the line of position [y_orig] to the line [y_dest].

COREGISTER [IN1] [IN2]

Performs geometric transforms on [IN2] so that it may be superimposed on [IN1]. The output file is the new [IN2] file.

Example:

```
COREGISTER N266_1 N266_2
```

For a typical application, [click here](#)

See also: [SETFINDSTAR](#), [SETREGISTER](#).

COREGISTER2 [IN] [OUT] [NUMBER]

Same function that [COREGISTER](#) but applies to a sequence of images.

COREGISTER3 [NAME1] [NAME2] [SIZE]

Registration of the images [NAME1] and [NAME2] by applying a translation (dx, dy) calculated automatically starting from three zones of the images. [For details, click here](#).

COREGISTER4 [IN] [OUT] [SIZE] [NUMBER]

Registration of a set of image by applying a translation (dx, dy) calculated automatically starting from three zones of the images. [For details, click here](#).

COSME [LIST FILE]

Apply the local mean to a set of pixels on the in-memory image (cosmetic correction). The coordinate of this pixels are in an ASCII file [list file]. COSME is adapted to correct residual hot and cold pixels after preprocessing (the coordinate of this points is constant for a given CCD). For example, if the goal is to correct pixels of coordinate:

```
(120,310)
(9,501)
(232, 140)
and line (100) and column (20)
```

Create the following text file (use your favorite word processing):

```
P 120 310
P 9 501
P 232 140
L 100 0
C 20 0
```

Save under the name CORRECT.LST (for example, but the extension .LST is important). The file is saved in the working path (see Settings... dialog box of the File menu).

Now, load the image to correct, then:

```
COSME CORRECT
```

You can correct up to 500 pixels (i.e. 500 lines max in the .lst file).

See also: [COSME2](#)

COSME2 [INPUT] [OUTPUT] [LIST FILE] [NUMBER]

Same command as [COSME](#) but for a sequence of [number] images. [input] is the generic name of the input sequence and [output] is the generic name of the corrected sequence. For example:

```
COSME2 M51- I
CORRECT 4
```

process the sequence: M51-1, M51-2, M51-3, M51-4 and produce the sequence I1, I2, I3, I4.

See also: [COSME](#)

COSME_CFA [FILE_LIST]

Same function that COSME but applying to RAW images (Bayer matrix images). All the types of RAW files recognized by Iris can be treated (Canon, Nikon...). The processing is distinct for red, green and blue pixels of CFA matrix). The file whose name is given in argument contains the list of the hot pixels. Those can be found automatically with command [FIND_HOT](#).

[Click here](#) for an example.

COSME_CFA2 [INPUT] [OUTPUT] [FILE_LIST]

Same function that [COSME_CFA](#), but applying to a sequence of images.

COUNT_DOWN [VALUE]

Return the number of pixels having an intensity lower than [value].

See also command [COUNT_UP](#).

COUNT_UP [VALUE]

Return the number of pixels having an intensity lower than [value].

See also command [COUNT_DOWN](#).

CPU [TIME (S)]

Measure the frequency of clock of the CPU.

[Click here](#) for more details.

CREGISTER [IN] [OUT] [THRESHOLD] [NUMBER]

Carry out the registration of a sequence of image from the coordinates of the center of a circle determined from a contour defined for the intensity THRESHOLD in each image.

[Click here](#) for an example.

See also: CIRCLE.

CVIGN [A] [B] [C]

Apply the vignetting correction with the given polynomial coefficients. Load the image to correct, then

```
>CVIGN -1.125e-7 -2.654e-5 1.153
```

CVIGN2 [IMAGE] [TEST]

[IMAGE] is the name of the image file to correct. [FLAT] is the file name of an uniform screen taken in the same conditions (same lens, same aperture). Iris adjust a second order polynomial function onto the "flat" image and applied the inverse polynomial function to the image to be corrected. The result is displayed on the screen after processing

D_ALPHA [ALPHA] [INTENSITY]

Display a great right ascension circle in the in-memory image after an astrometrical reduction. [alpha] is the right ascension and [intensity] is the intensity of the drawing.

D_DELTA [ALPHA] [INTENSITY]

Display a declinaison circle in the in-memory image after an astrometrical reduction. [delta] is the declinaison angle and [intensity] is the intensity of the drawing.

See example [here](#).

DATA_BIN [IN] [OUT] [BINNING FACTOR]

Carry out the binning of a data file, for example a file resulting from the [photometric analysis](#), in order to increase the signal to noise ratio. [BINNING FACTOR] is the factor of binning (typically value: 2 to 4).

DATA_REJECT [IN] [OUT] [COEF]

Analyze a data file (file DELTA.DAT coming from the automatic photometric analysis for example) and eliminates the points deviating of more than [COEF]. sigma of the average value (sigma is the standard deviation of the distribution). [IN] is the name of the input file (it must have extension DAT on the disc). [OUT] is the name of the output text file.

DATA_RESAMPLE [IN] [OUT] [STEP]

Re-sampling points of a data file (use of the spline interpolation). Useful command for example to represent data spectral or an intensity distribution curve with a integer step.

DATA_STAT [DATA FILE]

Turn over statistical data on the data file [DATA_FILE].

DATA2IMAGE [INPUT] [COEFFICIENT] [NUMBER]

Create an image in memory starting from a sequence of text file having extension DAT. The contents of the first file are used to produce the first line of the image. The contents of the second file build the second line of the image, and so on. The text files must contain two columns of real data. The image is built with information of the second column. With final, the size of the image along axis X is equal to the number of lines contained in files DAT and the size along the axis Y is equal to the number of file DAT. Parameters are:

[INPUT] is the generic name of files DAT

[COEFFICIENT] is a multiplicative parameter by which one multiplies the second column of files DAT before assigning them to the pixels of the image in memory.

[NUMBER] is the number of files DAT

[Click here](#) for an example.

DATA2PIC [DATA FILE NAME]

Converted a text ASCII file with two columns into an image whose axis Y contains the values (standardized to 32767) contained in the second column of the file. This command is useful to import in IRIS spectral data.

DATA_ANIM [IN] [OUT] [X1] [X2] [STEP]

Powerful function allowing for example to interpolate at the same time along wavelength and temporally a whole of spectral data in order to carry out an animation.

The parameter [IN] is the name of a text file having the extension LST. It contains two columns. The first give a spectral file name having extension DAT, the second is the date of acquisition of these spectra in Julian day or reduced Julian day. Here contents characteristic of an input file:

```
290601 245678.345
300701 245689.446
220801 245693.945
```

.....

It indicates that spectral profile 290601.DAT was acquired the day Julian 245678.345, that spectral profile 300701.DAT was acquired the day Julian 245689.446, that spectral profile 220801.DAT was acquired the day Julian 245693.945, and so on.

The parameter [OUT] is the name of a text file having the extension LST. It contains two columns. The first give the spectral file name (DAT extension) which will be interpolated, the second is the date of the files interpolated in Julian day or reduced Julian day. Here contents characteristic of a file of an output file:

```
R1 245679.0
R2 245690.0
R3 245691.0
```

.....

It indicates that command DATA_ANIM must produce spectral profiles in files of names R1.DAT, R2.DAT, R3.DAT, respectively for the dates in Julian days 245679.0, 245690.0, 245691.0.

The parameters [X1] and [X2] define an interval in wavelength for the interpolation which an interpolation step of [STEP].

The mode of interpolation along the temporal axis is linear. One uses an interpolation spline along the wavelengths axis.

Once the interpolated profiles, you can displaying this in a graphic form with the software of your choice then to create animations of the evolution of the spectrum according to time. It is possible also to produce an image of the dynamic spectrum starting from command [DATA2IMAGE](#).

[Click](#) to see examples here.

DATE

Return the current date.

DATE2JD [DAY] [MONTH] [YEAR]

Convert une date to Julian (example : DATE2JD 27.76 08 2001).

DECONVFLAT [COEFFICIENT]

Counter the smearing effect in an image exposed without obturator. [coefficient] is the ratio between the reading time of a CCD line and the exposure time. See an example [here](#).

DEDISTOR POL

The argument of DEDISTOR command is the generic name of the polynomials files (we use here the default files POLX and POLY described [here](#)). Note: you can define your proper transformation equations and to apply them to any image with command DEDISTOR.

[Click](#) to see example here.

See also command [QR3](#)

DESC_HDR [IMAGE NAMES] [DESCRIPTION FILE] [NUMBER]

[IMAGE NAMES] is the generic name of the sequence.
[DESCRIPTION FILE] is the name of the description file.
[NUMBER] is the number of images in the sequence.

DILATE

Perform a dilatation operation to the current image. Example:

```
LOAD M51
ERODE
ERODE
DILATE
DILATE
```

See also: [ERODE](#).

DISK1 [X] [Y] [R]

DISK1 draw a dark disk on the in-memory image. This function simulate for example a coronographic effect on Sun images. The parameters are the coordinates of the disk center and the radius.

For example:

```
DISK1 381.5 306.6 283.6
```

DISK2 [X] [Y] [R]

This function is the opposite of the DISK1 function: The outer part of the defined disk is masked.

The simultaneous use of DISK1 and DISK2 is a solution for enhance the aspects of prominence on the Ha image relatively to the disk.

Example: Apply the DISK1 command, multiply the result by 4 (try some value) and save the result:(give the name OUTER for example):

```
DISK1 381.5 306.6 283.6
MULT 4
SAVE OUTER
```

Click [here](#) for an illustrated use.

DISK2 [X] [Y] [R]

This function is the opposite of the DISK1 function: The outer part of the defined disk is masked.

The simultaneous use of DISK1 and DISK2 is a solution for enhance the aspects of prominence on the Ha image relatively to the disk.

Example: Apply the DISK2 command, multiply the result by 4 (try some value) and save the result:(give the name INNER for example):

```
DISK2 381.5 306.6 283.6
```

```
MULT 4
```

```
SAVE INNER
```

Click [here](#) for an illustrated use.

DISK2 [X] [Y] [R]

This function is the opposite of the DISK1 function: The outer part of the defined disk is masked.

The simultaneous use of DISK1 and DISK2 is a solution for enhance the aspects of prominence on the Ha image relatively to the disk.

Example: Apply the DISK2 command, multiply the result by 4 (try some value) and save the result:(give the name INNER for example):

```
DISK2 381.5 306.6 283.6
```

```
MULT 4
```

```
SAVE INNER
```

Click [here](#) for an illustrated use.

DIST

Computes the distance between two stars.

DISTANG [RA1] [DEC1] [RA2] [DEC2]

Return the angular distance between two points (ra1, dec1) and (ra2, dec2) of celestial sphere.

Example:

```
>distang 12h32m 23d40' 12h25m11s 23d46'20"
```

DISTOR [NAME1] [NAME2] [ORDER]

Morphing is not just a special effect for artistic applications. Morphing techniques have various ranging from lens distortion correction, motion capture data interpolation, waves atmospheric turbulence correction, etc. This section describe the turbulence correction of planetary image (but the procedure is the same for correct optically distorted wide-field CCD images for examples).

The goal of the processing is to resample a target image relative to a reference image for minimize geometrical difference between the two. So, the blurring effect of the turbulence in the Earth's atmosphere is now partially compensated: If you stack the two images (or more), the spatial resolution is increased.

The atmospheric distortion was calculated using DISTOR.

The parameters are:

[NAME1] is the name of a good contrasted reference image on the disk.

[NAME2] is the name to resample relative to the reference image.

[ORDER] is the order of a 2-D quadratic equation used for fit the distortion. Range is between 1 (linear correction) and 5 (complex distortion). The recommended value is 3 or 4 for most the case. DISTOR use an iterative scheme for aberrant points elimination.

Before running the DISTOR command it is necessary to define point interactively with mouse in the reference image. If possible, this point mark contrasted details (light/shadow region on the moon surface, planetary limb, stars, ...). The geomtric correction is only valid into the pointing area (outside this area Iris extrapolate).

For an application example, [click here](#).

DISTOR2 [NAME1] [NAME2] [ORDER] [NUMBER]

Same as [DISTOR](#) but for a sequence.

DIV [NAME] [COEFFICIENT]

Divide the image in memory by the image on disk designated by NAME. The resulting image is multiplied by the value COEFFICIENT.

DIV2 [IN] [OPERAND] [OUT] [COEF] [NUMBER]

Divides a sequence of images having the generic name [IN] by the image [OPERAND] and multiplies the result by [COEF] (see also [DIV](#)). The [OUT] parameter is the generic name of the output images. The number of images to process is [NUMBER].

DRAW_AIRY [DIM X] [DIM Y] [INTENSITY] [FOC LENGTH IN mm] [CENT OBS] [WLENGTH IN μm] [IMAGE SCALE (ARCSEC/PIXEL)]

DRAW_ALPHA [ALPHA0] [DELTA0] [FOCAL LENGTH] [PIXEL SIZE] [ALPHA] [INTENSITY]

Trace a circle of coordinate in right ascension. [alpha0, delta0] are the approximate equatorial coordinates of the center of the field (the same used under display map dialog box). The focal length of

the telescope and the size of the pixels of the sensor are provided in millimeters. The parameter [intensity] is the intensity of the circle of coordinated traced in the image. Finally (alpha, delta) are the coordinates of the drawn circle.

For example of command use see [here](#).

DRAW_DELTA [ALPHA0] [DELTA0] [FOCAL LENGTH] [PIXEL SIZE] [DELTA] [INTENSITY]

Trace a circle of coordinate in declination. [alpha0, delta0] are the approximate equatorial coordinates of the center of the field (the same used under display map dialog box). The focal length of the telescope and the size of the pixels of the sensor are provided in millimeters. The parameter [intensity] is the intensity of the circle of coordinated traced in the image. Finally (alpha, delta) are the coordinates of the drawn circle.

For example of command use see [here](#).

DRIZZLE [NAME] [RESOLUTION] [NUMBER]

This command performs an optimal adding of images as far as resolution is concerned. The principle is that, at sub-pixel level, shifts between individual input images are nearly randomly distributed. For example, a star in the first image may be centered perfectly in the middle of a pixel, whereas it will be across two pixels in the second one, and so on. Since it is easy to know the exact shift between the images, it is possible to create an output image with a finer sampling, in which resolution may be increased with respected to each input image. In fact, energy from each input pixel is dropped in the output image, and the whole processus may be compared to a drizzle...

The DRIZZLE command is adapted to under-sampled images, for example when the telescope focal length is too short for the pixel size. One may consider that the system is under-sampled when FWHM is smaller than 2 pixels.

Before using DRIZZLE, it is necessary to know the shift between the images. We suppose that only a linear translation exists between images (with no distortion and no rotation). The shift values are in the file SHIFT.LST (to create this file, refer to the command [REGISTER](#)). You can also create this file manually, by measuring the shifts along X & Y individually (the sign convention is image#1 - image#i).

It is important that all the input images are acquired in the same conditions: same exposure time, same sky background level. If this is not the case, you have to adjust offset and gain prior to use DRIZZLE (see commands [OFFSET](#) and [MULT](#)).

The parameters of the command are:

[NAME] is the generic name of the input image.

[RESOLUTION] is the over-sampling factor with respect to the input images. A factor or 2 to 2.5 may be considered as a coherent objective when the number of images is between 5 and 10. If the number of images is much larger, this factor may be increased to values as high as 3 or more.

[NUMBER] is the number of images in the sequence. A minimum of 5 images is generally necessary.

[Click here](#) for a discussion about dithering technique and examples.

DTRANS [X] [Y]

Select a star in an image by drawing a small rectangle around it with the mouse. Then, the command DTRANS translates the images with the values:

```
DX=[x]-XM  
DY=[y]-YM
```

where (XM, YM) is the centroid of the object in the rectangle.

The DTRANS command is very useful to register a sequence of images with respect to a reference star at coordinates ([x], [y]) in the reference image. [Click here](#) for an example.

ECHO [MESSAGE]

Print a message into the output windows during execution of a batch file (**RUN** command). Space character are not authorized (use "_" character). Example:

```
ECHO CLICK_HERE
```

EDGE [X1] [Y1] [X2] [Y2]

The coordinates ([X1], [Y1]) and ([X2],[Y2]) mark a frame outside of which the pixels of the image in memory are set to zero.

Sometimes the edges of images contain no significant information or have defects (artefacts due to previous processing). In these cases, the EDGE command can be used to fix the image.

ENTROPY

Return the value of the entropy in a zone of the image selected with the mouse.

ERASE

Clean the information located inside a selection box. An interpolation of the central zone is carried out by using pixels located on the periphery. The texture of the erased area is preserved for a neutral rendering. This command can be used for example to erase residual dust umbra in the image.

EQUAL [X1] [Y1] [X2] [Y2]

Fit a polynomial surface in the area defined by the point (x1, y1)-(x2, y2), subtract this model (only the area is modified) and add the median level.

EQUALIZE_CFA

See [GREY_FLAT](#)

ERODE

Perform an erosion operation to the current image.
See also: [DILATE](#).

EVIGN

Load the "flat" image and run the **EVIGN** command (no parameters). Iris return the polynomial coefficients in the output window:

Relative to the X distance from the image center, the vigneting is modeled by the function:

$$- 1.125 \cdot 10^{-7} X^2 - 2.654 \cdot 10^{-5} X + 1.153$$

EXPORT [NAME] [HEADER] [BYTE PER PIXEL] [REVERSE]

Exports images in a non standard format. The program writes the header at the beginning of the file, whose length in bytes should be specified in [header]. This header is filled with zeroes. In the parameter [BYTE PER PIXEL], you must indicate whether the pixels are coded on one or two bytes. If the coding is on two bytes, you must also indicate in the parameter [reverse] the order of the bytes in the 16 bit word. If [reverse]=0, they will be in the INTEL format (most significant/least significant), while if [reverse]=1, they will be in the MOTOROLA format (least significant/most significant). See also: [IMPORT](#).

Example:

```
EXPORT FILE.IMG 256 2 0
```

Converts the image in memory as a free format image with the name FILE.IMG, and with a header length of 256 bytes and pixels coded on 16 bits in the INTEL format.

EXPORT2 [NAME] [HEADER] [BYTE PER PIXEL] [REVERSE]

Same as EXPORT, but the natural internal coding of Iris [-32768..32767] is mapped into [0..65535].

EXPORTASC [NAME]

Saves the images with an ASCII format in 3 rows. the two first rows contain the pixel coordinates (origin at (1,1)), whereas the third row contains the image intensity. Warning: the result file may be very big for large input images.

See also: [IMPORT_ASC](#)

FCONV [IMAGE] [PSF]

Used to convolute an image with a synthetic airy disc created with DRAW_AIRY command. Before Fourier transform operation a good idea is to promote the image to a size equal to a power of two (128, 256, 512, 1024, ...). The command **WINDOW3** is the ideal tool for this.

FCORREL [IMAGE #1] [IMAGE #1] [COEF]

Compute the cross-correlation of [IMAGE #1] and [IMAGE #1]. The [COEF] coefficient is an intensity scale factor for the result. Example:

```
FCORREL MARS1 MARS2 1
```

FFTD [MODULUS] [PHASE]

IRIS can compute a FFT (Fast Fourier Transform) to evaluate fixed pattern noise of an image. First, the Direct (Forward) FFT is computed with FFTD. Next, the fixed pattern noise is corrected through boxcar filtering ([FFILL](#)). Finally, the reverse FFT ([FFTI](#)) is computed to display the corrected image. The modulus (magnitude) of the FFT is stored in the output file [MODULUS] and the phase is stored in the output file [PHASE].

[Click here](#) for an example.

FFTD2 [IN] [MODULE] [PHASE] [NUMBER]

Calculate the direct Fourier transform of a sequence of images.

See also [FFTD](#)

FFTI [MODULUS] [PHASE]

Compute an Inverse Fast Fourier Transform from the magnitude and phase data contained in files [MODULUS] and [PHASE].

See also the command [FFTD](#).

FFT2 [IN] [MODULE] [PHASE] [NUMBER]

Calculate the inverse Fourier transform of a sequence of images.

See also [FFTI](#)

FFILL [VALUE]

Symmetric fill of a region defined by the mouse. Used to process an image in the Fourier (FFT) domain.

See also the commands [FFTD](#) and [FFTI](#).

FILE_AFFINE [IN] [OUT] [NUMBER]

Iris can register wide-field stellar images. For that, it is recommended to use the powerful **Three matching zones** function of **Stellar registration** dialog box (**Processing** menu) - (see [details here](#)), or run command COREGISTER4 from the console.

The interest of this file is the possibility to apply in a second time the same transformations to a sequence of images without having to remake the complete calculation of registration (see also command FILE_TRANS function, the partnership of TRANS command).

For example

```
> COREGISTER A B 20  
> FILE_AFFINE A C 20
```

The produced sequences B1, B2,... B20 and C1, C2..., C20 are strictly identical.

FILE_CONV [KERNEL NAME]

Convolution of the in memory image by a matrix whose coefficients are contained in image [kernel_name]. The value of the coefficients is multiplied by Iris by 0.001 before calculation itself. The image must be obligatorily square and of odd size. The maximum size is of 41x41 pixels. You can use command IMPORT_ASC to charge a matrix with convolution starting from a textual file, which you then save in the format PIC or FITS.

FILE_COREGISTER [IN] [OUT] [NUMBER]

After the execution of a [COREGISTER2](#) command (registration of a sequence of image by simultaneously using geometrical transformations like translation, rotation and scaling), it is now possible to start again a registration with FILE_COREGISTER which use parameters of transformation already calculated with [COREGISTER2](#).

For example:

```
COREGISTER2 A B 5  
register the sequence A1..., A5 by producing the B1 sequence..., B5.
```

So, then you type

```
FILE_COREGISTER A C
```

the C1 sequence..., C5 is strictly identical to B1..., B5, but the result is obtained considerably more quickly because the transformations are not recomputed. FILE_COREGISTER can also be used to register very large images after having calculated the parameters of registration in a cropped part of those. See also commands [FILE_TRANS](#) and [FILE_ROT](#), equivalent for the a translation and a simple rotation.

FILE_TRANS [IN] [OUT] [NUMBER]

Registration of a sequence of images by using information which is in file SHIFT.LST.

See also the command: [REGISTER](#)

FILL [VALUE]

Fills the whole current image with pixels having the [VALUE] intensity.

FILL2 [VALUE]

Fill the selected zone with the intensity [VALUE].

FILL3 [X1] [Y1] [X2] [Y2] [VALUE]

Fill a zone of the image delimited by the coordinates (x1, y1) - (x2, y2) by the intensity [VALUE].

FILL_ELLIP [VALUE]

Draw an ellipse in a selection box. The ellipse is filled with the intensity [value].

FILL_INV [VALUE]

Give the intensity [value] at the pixels located outside a selection rectangle.

FIND_HOT [LIST FILE] [THRESHOLD]

The command makes it possible to generate a file lists (format text) in the working directory which contains the co-ordinates of the pixels which have an intensity higher than only one provided by the user.

This file, known as *cosmetic file*, is then used by IRIS to correct certain systematic defects during the preprocessing of the deep-sky images. Thus, if command FIND_HOT applies to an image of the dark signal, the produced file will contain co-ordinates of the pixels affected by an abnormally high dark current (hot pixels). When this file is read by a function of preprocessing, the pixels in questions in then treated images are replaced by a computed value starting from the intensity of the close pixels.

The two parameters are:

[LIST FILE] the name of the file lists produced. The name is supplemented by extension .LST.
[THRESHOLD] the threshold for the discrimination of the hot points.

To note that IRIS turns over in the console the number of hot points found. For a normal CCD it is necessary to be arranged to adjust the threshold so as not to find much more than one ten hot points. For example:

```
LOAD DARK
FIND_HOT COSME 300
```

Here a typical contents of the produced file (file COSME.LST in the example):

```
P 1086 1
P 402 7
P 1434 13
P 403 23
P 1372 27
C 468 0
```

The letter P indicates that it is necessary to correct only one pixel of the image. The co-ordinates of the first sick pixel is (1086, 1). Second is at the co-ordinates (402, 7) and so on.

The last line starts with C and was added manually to the file (for example with an editor like WordPad). It indicates to IRIS that it will be necessary during the pretreatment to replace the column of row 468 (on the basis of the left) by the average value of the adjacent columns.

In the present case the action of the last line of file COSME.LST is equivalent making:

```
REPAIRX 468
```

If the cosmetic file contains the line:

```
L 34 0
```

That means that it is necessary to replace the line of co-ordinates 34 (starting from the bottom of the image) by the value of the adjacent lines. To note that in the case of the correction of the lines and the columns the third value in a line of the cosmetic file must have a null value.

To apply the cosmetic corrections registered in the file lists you can use commands COSME and COSME2. Some dialog boxes can now also take into account information of a cosmetic file.

FINDSTAR

Detects stars having a level greater than [sigma] times the level of the sky background noise (see the [SETFINDSTAR](#) command). A file of the type STAR.LST is created on the drive. This file may be edited (e.g. EDIT command of MS-DOS). It contains parameters about detected stars (position, instrumental magnitude, FWHM). More precisely for each colon:

- star number,
- X coordinate of the star in the image,
- Y coordinate of the star in the image,
- instrumental magnitude of the star,
- astrometric right ascension (in decimal degrees),
- declination (in decimal degrees),
- true reduced magnitude,
- isolation criteria for the star (1 is the most isolated),
- the FWHM along X & Y.

Note that STAR.LST file is used with automatic astrometry and photometry command. See [astrometric functions](#).

FITS2FIT [NAME] [NUMBER]

Convert a FITS extension sequence to a FIT extension sequence (example the file name M57-2.FITS is converted to M57-2.FIT).

FITS2PIC [IN] [OUT] [NUMBER]

Convert a sequence of FITS image into a sequence with the proprietary PIC format. Parameters:

[IN] is the generic name of the input sequence.

[OUT] is the generic name of the output sequence.

[NUMBER] is the number of images in the sequence.

FLAT [NAME] [HL] [LL] [LEVEL] [#ITER] [#IMAGE]

The FLAT command allows you to calculate a flat-field without having to take specific images at dusk (images without stars or other objects). The flat-field can be obtained from merely the images of the observed objects taken during the night.

Other methods can also be used to obtain flat-field images from night images. They use the calculation of the median of a set of images (see the [SMEDIAN](#) command). However, the technique used in FLAT can resolve difficult cases:

- you do not have a dusk flat-field and the night images contain dense star fields or extended objects.
- you do not have a dusk flat-field and the night images are planetary images.

In these two cases, correctly extracting a flat-field with a median set technique is very unlikely.

The FLAT command is useful in these situations (the median set technique is still a good method in normal situations because it is faster and easier to implement). The command uses an iterative process and works with the logarithmic values of the images. It is recommended to have as many images as possible to get the best result (typically between 5 and 10 images, the maximum number allowed is 15).

Several conditions must be respected:

- The dark current and offset signal must have been subtracted from each image.
- The images must have the same signal level (for the control, use the sky background level at the same place on the detector, or the level of a detail common to all the images). Use the OFFSET command to adjust the levels.
- the images must be of the same celestial object and must be taken through the same filter if one is used (this last condition is a general rule for flat-fields, no matter which technique is used).
- The images must be displaced by some number of pixels along both the X and Y axes, with respect to each other. These shifts can be non integer pixel values (measure the displacements with the cursor, or commands such as REGISTER, PREGISTER...). The shifts must be measured with respect to first image in the series. The only restriction on the shifts is that they not be colinear, nor have a common multiplier:
- If a_i is the displacement vector of the image "i", and a_j is the displacement vector of the image "j", there must not be a real constant k such that $a_i = k \cdot a_j$.

The displacement values do not affect the quality of the result. However, it is recommended to not displace the images too much, because the complete calculation of the flat-field image can only be done on the parts common to all the images. The parts of the flat-field outside the common area are still valid, but they are calculated with less precision because of the smaller number of images used in the calculation. Also, note that the calculation time grows with the displacement values. Large image are prohibited because large computation time (up to 400 pixels size image are correct).

It is recommended to choose the reference image (first image) so that the relative displacements are as isotropic as possible for the set of images.

Before executing FLAT it is necessary to produce the file SHIFT.LST containing the relative displacements of the images with respect to the first image. Each line of this file contains the displacements with respect to the reference image (first the displacement along the X axis, then along the Y axis, with one or more blanks between the numbers). The first line of this file contains the elements of the first image (the reference image), that is (0,0). This file can be created with a word processing. Remember that automatic registration commands in **Iris** (REGISTER, FULL_PR, PREGISTER...) produce a shift file SHIFT.LST in the working directory.

The command arguments of FLAT are:

[NAME]: the generic name of the images to be processed. The generic name is the root of the name of the image, which will have a number and an extension added to it. The first number added is 1, and the last is [#IMAGE]. Thus, with the generic name "IMAGE" and [#IMAGE]=5, the processing will be done on the images:

IMAGE1.PIC
IMAGE2.PIC
IMAGE3.PIC
IMAGE4.PIC
IMAGE5.PIC

[#IMAGE]: the number of images to be used in the calculation (between 5 and 15).

[#ITER]: the number of iterations. This number is chosen as a result of the previous tests. Typically, between 1 and 3 iterations are used.

[HL]: eliminates pixels with a level over [hl] from the calculations. This can be useful when processing a field with saturated stars (the saturated parts do not contain radiometrically useful information). In general, [HL] should have the value of the maximum dynamic range of the image.

[LL]: eliminates pixels with a level less than [LL] from the calculations. In particular, the value of [LL] can be adjusted to reject pixels with a negative value, thus [LL] is usually 0.

[LEVEL]: the generated flat-field will have the average intensity [LEVEL]. Most of the time this value will be the same order of magnitude as the average level of the processed images. [LEVEL] must be greater than 1.

Reference: J. R. Kuhn et al., Publications of the Astronomical Society of the Pacific - Vol 103, 1097, October 1991

Click [here](#) for an example, and [here](#) for a second example.

FPOLREC [MODULUS->REAL] [PHASE->IMAGINARY]

Transform the frequency domain images from polar to rectangular. The two arguments are filenames containing the [MODULUS] and [PHASE] on input, and the [REAL] and [IMAGINARY] components on output, respectively. **NOTE:** this command rewrites the contents of the specified files! Make a copy to preserve the originals.

FRECPOL [REAL->MODULUS] [IMAGINARY->PHASE]

Transform the frequency domain images from rectangular to polar. The two arguments are filenames containing the [REAL] and [IMAGINARY] components on input, and the [MODULUS] and [PHASE] on output, respectively. **NOTE:** this command rewrites the contents of the specified files! Make a copy to preserve the originals.

FULL_PR [IN] [OUT] [DARK] [OFFSET] [FLAT] [NB]

Computes the automatic processing of a sequence of [NB] images having the generic name [IN], i.e. subtracts the offset signal, removes the dark current signal, and divides by the flat-field image. The images are then automatically registered. At last, the images are added.

- The [DARK] parameter contains the name of the dark current map (note: this image must not contain the offset signal).
- The [OFFSET] parameter contains the name of the offset image (or bias image).
- The [FLAT] parameter contains the name of the flat-field image (note: this image must not contain the offset signal or the dark current signal).

Example: we want to process a sequence of 3 raw images of the SH2-136 nebula. The image names are SH136_1.PIC, SH136_2.PIC and SH136_3.PIC. We have also the images OFFSET.PIC, DARK.PIC and FLAT.PIC. Load the first image in the sequence:

```
LOAD SH136_1
```

With the mouse, select a rectangle typically 50 pixel in width with contain only one non-saturated star. This rectangle will be used for matching the images. Then type:

```
FULL_PR SH136_
RESULT
DARK
OFFSET
FLAT 3
```

The final image is fully preprocessed and corresponds to the combination of the 3 input images (simple addition).

The FULL_PR command also created 3 images in the current directory : RESULT1, RESULT2 and RESULT3 in this example). These images are fully preprocessed. So you may choose between several combination methods. for example, for a simple addition, you will do:

```
ADD2
RESULT 3
```

For a median combination, you will type:

```
SMEDIAN
RESULT 3
```

And of a sigma-clipping combination, you will do:

```
COMPOSIT
RESULT 1.5 1 3
```

You can also use the ADD3 command, that select the finest images for the addition.

FULL_SPEC [IN] [OUT] [DARK] [FLAT] [OFFSET LEVEL] [ANGLE] [FLAG] [LINE WIDTH] [NUMBER]

Automatic processing of a sequence of spectra. Compute the preprocessing, correct orientation, register the sequence to the first spectral image, and finally add the images. IN is the generic name of the input sequence. OUT is the registered sequence. DARK is the dark current image name. FLAT is the flat-field image name. OFFSET LEVEL is the mean level of the level. ANGLE is the orientation of the spectra relative to the horizontal axis. FLAG=0 for a registration with an absorption line and FLAG=1 for a registration with an emission line. LINE WIDTH is the typical width of the line profile in pixel. NUMBER is the number of images in the sequence.

First, draw a rectangle in the current image with the mouse around a significant spectral line then run the command FULL_SPEC.

GAMMA [coefR] [coefG] [coefB]

Apply a transformation to the level of RGB layers of a true color images according to a power function (correction known as "gamma"). If the image in memory is 16 bits image (N&B), it is converted into an image 48 bits. The levels of a given layer are accentuated if the corresponding coefficient has a great value. The characteristic excursion of the coefficients lies between 0,1 and 5. See also the command **Gamma adjustment...** of **Visu** menu.

GAUSS [SIGMA]

Convolve the current image by a two-dimensional Gaussian whose width is given by the parameter [SIGMA].

The convolution of an image by a Gaussian with a small sigma (less than 1) can be used to attenuate the noise. A high value for sigma produces a fuzzy effect.

GAUSS2 [SIGMA]

Same command as GAUSS, but the processing is here done for the whole image, including the sides (that makes this command slower than the GAUSS).

GAUSS3 [SIGMA] [BORDER SIZE]

Same function that the command GAUSS but while excluding from calculation a border of the image having a size in pixel of equal to [size edge]. This makes it possible to filter images with minimum artefact.

GC [AD1] [DEC1] [AD2] [DEC2]

Draw a great circle between two points with equatorial coordinates (ra1, dec1) et (ra2, dec2) - after astrometric reduction of course. Example :

```
>gc 12h32m 23d40' 12h25m11s 23d46'20"
```

GEN_OUT [FILE] [TEXT] [X1] [X2] [STEP]

Utility function to generate an output file for command DATA_ANIM, this last allowing to produce dynamic spectra.

[NAME] is the name of output LST file.

[TEXT] is the generic name of the first column of LST file.

[Y1] and [Y2] are the date limits of the second column (normally the Julian day).

[STEP] is the temporal step of the second column.

For example:

```
GEN_OUT OUT R 2310 2317 0.5
```

Generates this file OUT.LST contains:

```
r01 2310.500000  
r02 2311.000000  
r03 2311.500000
```

```
r04 2312.000000
r05 2312.500000
r06 2313.000000
r07 2313.500000
r08 2314.000000
r09 2314.500000
r10 2315.000000
r11 2315.500000
r12 2316.000000
r13 2316.500000
r14 2317.000000
```

GET [X] [Y]

Returns the intensity of the pixel at coordinates ([x],[y]).

GET_DSLR

Load the latest image stored in a Digital DSLR CompactFlash (Canon EOS compatible).

See also [ACQ_DSLR](#) command.

GRADX [OPTION]

Filters the current image with a gradient along the X axis. The option (1 or 2) allows to choose the orientation of the gradient (left or right). For example:

```
LOAD M51
GRADX 1
OFFSET 1000
VISU 1200 800
```

GRADY [OPTION]

Filters the current image with a gradient along the Y axis. The option (1 or 2) allows to choose the orientation of the gradient (up or down).

GRADX2 [OPTION]

Same command as GRADX, but with a stronger effect.

GRADY2 [OPTION]

Same command as GRADY, but with a stronger effect.

GREY_FLAT

Convert a flat-field taken with a digital camera to a neutral tone flat-field ([click here](#) for detail of use).

This command is improved in Iris V5.0. Notice, if the processed image is a flat-field, it is important to remove the offset signal (and dark signal if necessary) before.

HISTO

Calculate the histogram of the in memory image and produces file HISTO.DAT in the working directory. This function calculates also the cumulated histogram (file CUMUL.DAT) and the opposite cumulated histogram (file CUMUL_INV.DAT).

HSI2RGB [H] [S] [I] [R] [G] [B]

The HSI2RGB command converts a color image defined by its color components Hue, Saturation and Intensity into a trichromatic image in Red, Green, and Blue. The parameters are:

- [H], [S], [I]: the names of the H, S, I components, respectively.
- [R], [G], [B]: the name of the R, G and B components.

See also: [RGB2HSI](#) and [TRICHRO](#).

IMAGE2SPEC [FILE] [LINE/MM] [DIST] [P_ZERO] [PIXEL]

Carry out the spectral calibration of an image spectral profile when the position of grating zero order is accessible. Parameters are:

[FILE]: the name of the file of the calibrated spectral profile which will be created on the disc. It is an ASCII file with two columns. In the first column one finds the wavelength in angströms and in the second the intensity of the spectrum.

[LINE/MM]: the number of groove by millimeter of the grating.

[DIST]: the distance separating the grating from the CCD in millimeters.

[P_ZERO]: the position in pixel of the center of the zero order image along the horizontal axis of the image.

[PIXEL]: size of the pixel along the horizontal axis of the image in millimeters.

For an example of application of this command [click here](#).

IMPORT [NAME] [X] [Y] [HEADER] [#BYTE] [REVERSE]

Imports images with a nonstandard format. The program skips the header at the beginning of the file. The number of bytes in the header should be specified in the parameter [HEADER]. The [#BYTE] parameter indicates whether the pixels are coded on one or two bytes. If the coding is on two bytes, you must indicate the order of the bytes in the 16 bit word in the parameter [REVERSE]. If [REVERSE]=0, they are in the INTEL format (most significant/least significant), while if [REVERSE]=1, they are in the MOTOROLA format (least significant/most significant). Finally, the parameters [X] and [Y] contain the image format in pixels along the X and Y axes, respectively (the X axis is the one which is read more quickly in the file). Example:

```
IMPORT EXTERN.IMG 512 800 256 2 0
```

Imports the image EXTERN.IMG with the following characteristics: pixels coded in 16 bit INTEL format, 256 byte header, 512x800 format.

See also: [EXPORT](#)

IMPORT_ASC [NAME]

Imports an image that was saved in a 3-row ASCII format. The two first rows contain the pixel coordinates (origin in (1,1)), whereas the third row contains the pixel intensity. The extension .ASC is added automatically. Note that this file may be very big for large images. Example:

```
IMPORT_ASC FILE  
See also EXPORTASC.
```

IMPORT_ASC2 [NAME] [SIZE X] [SIZE Y]

Load an image stored in an ASCII file in the simple form of a single column of real numbers. The length of this vector must be equal to [SIZE X] x [SIZE Y].

See also command [IMPORT_ASC](#).

INFO

Returns information about current image (size, date/time of exposure, integration time). For a FITS file the command return also principal keyword of the header.

INFO_ASTRO

Return infos about astrometrical reduction and cartographic projection of the current images. See RESET_ASTRO.

INIT_DATE [DESCRIPTION FILE]

Modify the date in the header of a sequence of images. The names of the images and the new corresponding dates are defined in a text file (list file, extension .LST). The typical is:

```
var1 13/12/2005 16:49:20.3  
var2 13/12/2005 16:52:39.8  
var3 13/12/2005 16:55:00.4
```

Let us suppose that the name of this file is FILE.LST. If one makes

```
>INIT_DATE FILE
```

Iris load the image *var1* and define the new date in the header, here December 13 2005 at 16 hours 49 minutes 20,.3 seconds. The file image *var1* is saved automatically, but with an updated header. Iris makes in the same modifications with the images *var2*, *var3*... [See an application here](#).

INSERT [IN1] [IN2] [MASK] [VALUE]

For a given pixel of coordinate (x,y) in the [IN1], [IN2] and [MASK] images, if the intensity in the [MASK] image is equal to [VALUE] then the in-memory intensity image pixel is [IN2], else the intensity is [IN1]. Example:

```
LOAD M51
```

```
OFFSET -500
CLIPMIN 0 0
SAVE MASK
INSERT MASK
M51 MASK 0
```

JD2DATE [JULIAN DAY]

Convert Julian day to date.

JPG2PIC [IN] [OUT] [NUMBER]

Convert a sequence of JPEG file to PIC or FITS sequence (the final format is dependant of the choice in the setup dialog box of **File** menu).

Consider the input sequence IM1.JPG, IM2.JPG and IM3.JPG. To convert to image R1.PIC, R2.PIC and R3.PIC (or R1.FIT, R2.FIT and R3.FIT), enter the command:

```
JPG2PIC IM R 3
```

L_ADD [LINE1] [LINE2]

Computes for each row of the current image the add of lines between [line1] and [line2]. The sum is maximized to 32767. The "L_" commands (line commands) are adapted for spectra processing. [Click here for details.](#)

The result is represented as a new image with the same width as the input image and 20 identical lines in height. Each pixel corresponds to the mean of the input lines in the current row.

L_ADD2 [LINE1] [LINE2] [SKY BACKGROUND] [GAIN] [READOUT NOISE]

Same as L_ADD but by taking into account the noise for the calculation of a weight function. SKY BACKGROUND is the present sky level in ADU (Analog Digital Unit). GAIN is the camera gain (i.e 2 electrons/ADU). READOUT NOISE is the noise of camera in electrons (i.e. 18 electrons).

L_BIN

Carry out an operation of binning along vertical axis on a spectrum whose dispersion axis is horizontal. The addition zone along the vertical axis is such as with final the result of the addition contains 93% of the information of the real spectrum. Iris calculates the optimal addition width zone for reduce noise in the result. The max intensity in the binned image is normalized to 32766. The result is an image of the spectral profile where this one is to duplicate 20 times along the vertical axis. Before run the command you must frame the spectrum of a rectangle to be traced with the mouse.

For an introduction tutorial to spectrography, [click here.](#)

L_BIN2

Same function that L_BIN, but the normalization is carried out starting from the most intense pixel which is in the selection zone and not over the entire length of the spectrum.

L_CORREL [NAME]

Compute the shift in pixel unit along the x-axis of the in-memory spectrum and the [name] file spectrum. Before running L_CORREL define with the mouse a rectangle for the cross-correlation computation.

L_COUNT

Compute the mean level of a 2D spectrum (in ADU or Analog/Digital Unit). The concerned part is selected with mouse.

L_CURVE [LINE1] [LINE2] [RADIUS]

Same as L_ADD but the binning is made along a curved spectrum. The radius of curvature of the spectrum is [RADIUS]. [Click here](#) for details.

L_CURVE_TEST [LINE1] [LINE2] [RADIUS]

Draw line along the spectrum to test parameters of L_CURVE command.

L_DIV [NAME] [COEF]

Same principle as L_SUB with a division with the line and a [coef] coefficient.

L_EXPAND [HEIGHT]

Creates a new image with [height] identical lines equal to the line obtained with, L_MEDIAN, or L_ADD.

L_EQUAL

For each column of the image, the software calculates a median value specific of the intensity of the pixels and withdraws (subtracts ???) this median value of the whole of the pixels of the column.

The median is calculated between two vertical positions defined interactively after initiating the command using the mouse.

Example: to remove the gradient parasites around the solar disc (phenomenon of diffusion of the light by optics and the atmosphere) so as to improve the observation of the weak protuberances.

Note 1: To create a red version of the image:

SAVE R, FILL 0, SAVE G, SAVE B, TR R G B.

Note 2: the command L_EQUAL can also be used to eliminate the darkening centre/bord from the disc.

L_GAUSS [SIGMA]

Convolution of a vector image by a gaussian function. The sigma of the gauss function is given in parameter. For a typical application [click here](#).

L_MEDIAN [LINE1] [LINE2]

Same command as L_ADD except that a median is applied instead of a mean.

L_MEDIAN_CURVE [LINE1] [LINE2] [RADIUS]

Useful for spectra processing. Same command as L_MEDIAN but along a curved spectrum. The radius of curvature in pixels is [RADIUS].

See examples [here](#).

L_MERGE [FILE #1] [FILE #2] [X1] [X2]

Merge two spectra [FILE #1] and [FILE #2]. The point of at the coordinate [X1] (pixels unit) into the spectrum #1 correspond to the point [X2] into the spectrum #2. The intensity are normalized at around this point. [Click here](#) for an example.

L_MERGE2 [FILE #1] [FILE #2] [X1] [X2]

Same as L_MERGE. The only difference: the spectra are not normalized at the common point.

L_NOISE

Compute the mean level and the RMS noise of a 1D spectrum - The wavelength limits of the computation are selected with the mouse.

L_OPT

An easy to use optimal extraction function of the 1D spectrum from the 2D spectrum. See [L_OPTBIN](#).

L_OPT2 [IN] [OUT] [NUMBER]

Compute an optimized binning on a sequence of 2D spectra.

See [L_OPT](#).

L_OPTBIN [LINE1] [LINE2] [GAIN (e/ADU)] [RON (e-)] [MEAN SKY LEVEL (ADU)] [KAPPA]

Optimal extraction for CCD spectroscopy. [Click here](#) for a description.

L_OPTBIN2 [LINE1] [LINE2] [GAIN (e/ADU)] [RON (e-)] [MEAN SKY LEVEL (ADU)] [KAPPA]

Optimal extraction for CCD spectroscopy. [Click here](#) for a description.

L_ORI

Return the orientation of a spectrum relative to the horizontal axis. Draw first a rectangle in the current image with the mouse around the spectra.

L_PLOT [HEIGHT]

Creates a new image with a plot of the line obtained with L_MEDIAN, or L_ADD. The width of the plot is the line width, and its height is [height]. This command produce also the ASCII file PLOT.LST.

L_POS [FLAG] [WIDTH]

Compute the position of a spectral line. If FLAG=0 the line is in absorption. If FLAG=1, the line is in emission. WIDTH is the typical width of the line(FWHM). Select un area around the line with the mouse then execute L_POS.

L_POS2

Precise evaluation of the position of a spectral in a 1D spectrum. The line influence zone is selected with the mouse. The command return the position in pixel and also the FWHM of the line.

L_POSY

Return the vertical poistion of a 2D spectrum.

L_REGISTER [IN] [OUT] [FLAG] [WIDTH] [NUMBER]

Register a sequence of NUMBER spectral images with the aim of a spectral line. If FLAG=0 the line is in absorption. If FLAG=1, the line is in emission. WIDTH is the typical width of the line(FWHM). Select un area around the line with the mouse then execute L_REGISTER.

L_REGISTER3 [IN] [OUT] [NUMBER]

Registration of a sequence of 1D spectra along the spectral axis only, by using the intercorrelation method.

L_REGISTRY [IN] [OUT] [NUMBER]

Registration of a sequence of 2D spectra along the space axis only (vertical axis).

L_SINC [FACTOR]

Scale a spectral image by the coefficient [FACTOR]. This function use the *sinc* intrepollation. For an application example [click here](#).

L_SKY [LINE1] [LINE2] [LINE3] [LINE4]

Computes the median value for each row of the current image between [LINE1] and [LINE2]. This give the value V1. Computes the median value for each row of the current image between [LINE3] and [LINE4]. This give the value V2. The value $(V1+V2)/2$ is computed and subtracted to each row of the current image. L_SKY is useful to correct gradient background for spectral image. In the normal situation the area between [LINE1] and [LINE2] is upper the spectrum and the area between [LINE3] and [LINE4] is in the opposite side relative to the spectrum.

L_SKY2

Command allowing to estimate the level of the sky background on both sides of a spectrum. The sky background is modelled by calculating for each columns of the images taken independently the median value of the intensities of the pixels in two zones that one definite interactively. The operator define these two zones by 4 clicks of the mouse as shows it the following image:

The click order of the points is not critical. L_SKY2 then substrat from all the columns the average of the two median intensities calculated in each one of them. The effect is to bring the level of the sky background to zero. It is an essential operation before being able to extract the spectral profile from a spectral image because it fixes the origin of the scale of the intensities. [Click here](#) for an illustration.

L_SKY3

Command, very similar to L_SKY2, allowing to estimate the level of the sky background on both sides of a spectrum. The sky background is modelled by fitting linear lines distinct for each columns from the image. The pixels of the image which are used to calculate these fit are in two zones on both sides spectrum that the operator define by 4 clicks of the mouse as shows it the following image:

L_SKY_CURVE [LINE1] [LINE2] [LINE3] [LINE4] [RADIUS]

Same as L_SKY but along a curved spectrum. [Click here](#) for exemple of use.

L_SUB [NAME]

Subtracts from each line of the current image the line in the [name] image obtained with L_MEDIAN, or L_ADD.

LAPLACIAN

Calculate the Laplacian of the image in memory.

LFILL [X0] [VALUE]

Mask the left part of an image relative to the [x0] coordinate. Iris give the level [value] to the masked area.

See also command: [RFILL](#)

LOAD [NAME]

Load an image in memory from the current directory (defined in the item Current Directory from the Settings tab – File menu). You can also indicate in which directory to load a particular image by specifying the full path of the image. For instance:

```
LOAD c:\nuit7\m51
```

LOADBMP [NAME]

Load a 8-bits BMP file in memory from the current directory.

LOADBMP24 [NAME] [R] [G] [B]

Load a 24-bits BMP file from the current directory and copy the RGB planes in the images [r], [g], [b] respectively.

LOADBMP24BW [NAME]

Load a 24-bits BMP file from the current directory in memory and convert the RGB planes into a B&W images.

LOADCAM [NAME]

Converted RAW file coming from a digital camera into a color image which is displayed (see also **Load...** command of the **File menu**). Example:

```
LOADCAM CRW_0347
```

LOADCFA [NAME]

Display a CFA image extracted from a RAW file (CFA = matrix of coloured filters covering the pixels of the electronic sensor).

LOADDSI [NAME]

Load in memory a FITS image coming from the camera Meade Deep Sky Imager. LOADDSI converted YCMG matrix into an48-bits colors image corrects the ratio aspect induced by the rectangular pixels of the sensor ICX 404K which equips this camera (pixels of 9,6 microns X 7,5 microns). On the other hand the command does not correct the white balance, an operation which must be carried out specifically according to the context (see the command " RGB Balance... " of the Digital photo menu - typically the layers red, green and blue must be multiplied respectively by 0,53, 1,00 and 2,23).

LOADDSI2 [IN] [OUT] [NUMBER]

Converted a sequence of RAW image Meade DSI (generic name [in] and .fts extension) to a sequence of color 48-bits images (generic name [out] and .pic extension). The number of images in the sequence is [number]. The geometrical transformations are carried out by this command.

See also the commands [LOADDSI](#), [CONVERTDSI](#) and [CONVERTDSI2](#).

LOADDRAW [NAME] [R] [G] [B]

Converted a RAW in three files containing the primary layers of colors. For example:

```
LOADDRAW CRW_0347 R G B
TR R G
B
```

LOADSB [NAME]

Loads an image in CCD SBIG (ST4, ST4X, ST6, ST7, ST8...) format into memory. This command also accepts compressed format.

Example:

```
LOADSB M51
```

LOADSX [NAME]

Load into memory an unsigned 16-bits image (dynamic range between 0 and 65535). The level of the pixels is multiplied by 0.5 to bring final dynamics between 0 and 32767. See also: [CONVERTSX](#), [SIGNED](#).

LOADSX2 [NAME]

Load into memory an unsigned 16-bits image. The level of the pixels is not modified, but the images is truncated for intensities higher than 32767.

LOADSX3 [NAME]

Load into memory an unsigned 16-bits image. Value 32767 is subtracted from the intensity of all the pixels. The final level lies between -32768 and 32767.

LOADTIFF [NAME]

Load a 8-bits uncompressed TIFF file in memory from the current directory.

LOADTIFF24 [NAME] [R] [G] [B]

Load a 24-bits uncompressed TIFF file from the current directory and copy the RGB planes in the images [R], [G], [B] respectively.

LOADTIFF24BW [NAME]

Load a 24-bits uncompressed TIFF file from the current directory in memory and convert the RGB planes into a B&W image.

LOG [NORM]

Calculates the base 10 logarithm of an image where [norm] is a coefficient which adjusts the maximum dynamics of the output image and Max(input image) is the intensity of the brightest pixel in the input image.

The logarithm of an image is used to display the range of intensity levels in one visualization. Often, during deep sky image processing, the OFFSET command is used first to bring the sky background close to level 0. The depiction of faint details is then greatly improved.

Let's calculate the logarithm of the image M51.FIT, whose sky background level is around 130:

```
LOAD M51
OFFSET -100
LOG 1000
VISU 1000 400
```

With the STAT command, you can verify that there are no pixels with intensities over 1000 in the final image.

The LOG command allows you to transform the linear intensity scale into a magnitude scale, to within a constant. This can be very useful in photometry or in various kinds of image representation (for example isophotes visualization).

LOG2 [IN] [OUT] [NORM] [NUMBER]

Calculate the logarithm of a sequence of images.

LRGB [IN_R] [IN_G] [IN_B] [IN_L] [OUT_R] [OUT_G] [OUT_B]

Give tri-color images IN_R, IN_G & IN_B, the program compute the RGB to HSI conversion, then replace the I image by the IN_L image (luminance image). Finally, the program perform the HSI to RGB conversion for producing the output images OUT_R, OUT_G & OUT_B.

See also: RGB2HSI, HSI2RGB, RGB2PCA, PCA2RGB, TRICHRO.

LUCAM [EXPOSURE] [GAIN]

For examples:

```
>LUCAM 0.01 1
>LUCAM 2.7 5
```

LUCAM_AVI [AVI file] [EXPOSURE] [GAIN] [BINNING] [DURATION] [MODE]

The first parameter is the AVI file name (stored in the working directory, Iris add the extension .avi for you). The binning factor can be 1 or 2 (use binning=2 for very fast acquisition, up to 130 frames/sec). The parameter [duration] is the duration of the capture in seconds. If [mode] value is 0, a preview is also displayed. If [mode] value is 1, the video stream is captured without displaying it (the higher quality and frame rate mode). Example:

```
>LUCAM_AVI JUPITER 0.018 2 1 10 1
```

LUCAM_SET [EXPOSURE] [GAIN]

For example:

```
>LUCAM_SET 1.5 4
```

An AVI file can be captured from the Lumenera source (8 bits data only, i.e. a standard AVI file). Use the command LUCAM_AVI:

LUCAM_START

Note: you can take a snapshot during preview mode by using **LUCAM** command or the **Lumenera snapshot acquisition** dialog box.

For stop the preview mode:

LUCAM_STOP

For modify exposure time and gain during preview mode, run the command

MAP [INPUT LISTE] [OUTPUT LIST]

Creates an image in a given cartographic projection from an image defined in a different projection.

Cartography is a method that allows you to represent, on a plane, a surface that is generally not flat, such as the earth or any other planetary surface. This science is thus necessarily inexact since local or global deformations of the surfaces to be represented are inevitable. The choice of a cartographic projection is generally based on a compromise between different desired properties (for example, global view of the planet, conservation of area, polar view, etc.).

For examples and complete description [see here](#).

MAP2REC [FILE CARTO] [LONGITUDE] [LATITUDE]

Obtains the coordinates of planetary features for which the longitude and latitude are known.

The parameter [FILE CARTO] contains the name of the cartographic file containing information of ephemeris of planet at the time of acquisition.

The parameters [LONGITUDE] and [LATITUDE] contain the longitude and the latitude of the planetary features.

See also the [REC2MAP](#) and [MAP](#) commands.

MAX [PIXEL NUMBER]

Draw a rectangle in the current image with the mouse before running that command. This will replace the [pixel number] brightest pixels of the rectangle by the median value of the remaining pixels (the median value is computed at each iteration).

This command is good for interactively removing cosmetic artefacts in an image, such as warm pixels. To remove a single pixel you will type MAX 1. But you may also remove several pixels at a time, and even remove a star (e.g. MAX 30).

MEDIAN3 [COEF]

Performs median filtering on the current image. The median value of the intensities of the pixels in a 3x3 matrix around a pixel is calculated for each pixel in the image. The corresponding point in the output image is set to this median value.

[coef] is a parameter that adjusts the strength of the filter (the action of the filter is maximum if [par]=0). If we number from n=1 to 9 the values of a 3x3 matrix sorted on increasing order, if I(n) represents the intensity of the points in the matrix and if I0 represents the intensity of the point at the center of the 3x3 matrix, MEDIAN3 performs as follows:

- if the absolute value of (I0 - I(5)) is greater than: [coef]. * (I(8)-I(2)) then the corresponding pixel I0 in the output image will be given the median value I(5);

- otherwise, the pixel I0 of the output image will keep the value of I0 from the input image.

Median filtering is an excellent tool for eliminating impulse noise in an image (cosmic rays, interference in one or two pixels, etc.). The original version of the median filter is very energetic. Used without finesse, this filter may suppress useful information (faint stars) and give an artificial texture to the filtered image. This is why a weighting factor has been added to the Iris implementation of the median filter. For images that are not too noisy, the parameter [coef] is typically between 0.80 and 0.99:

MEDIAN5 [COEF]

Same command as MEDIAN3 but with a 5x5 matrix.

MEDIANF [SIZE] [COEF]

Carry out same work as MEDIAN3 or MEDIAN5 but by using a kernel (zone in which the median is calculated) of adjustable [SIZE]. Size must be imperatively an odd value. For example MEDIANF 9 0.8. This command is practical to erase the details of relatively large size.

MEM [#ITER]

[Deconvolution](#) using a Maximum Entropy Method. The process is iterative and contains [#iter] iterations. The size of the image must be square and equal to a power of 2 (see [WINDOW3](#) and [PADDING](#) commands). Before running the command, select an isolated star with the mouse. It has to have a good signal to noise ratio, but not too bright, in order to avoid saturation.

Generally, 15 to 20 iterations are recommended. Try also to have a sky background close to zero (use the [OFFSET](#) command) but strictly positive.

MERGE_CFA [C1] [C2] [C3] [C4]

Recombine a single CFA image separated with [SPLIT_CFA](#) command.

See [SPLIT_CFA](#).

MERGE_CFA2 [A] [B] [C] [D] [OUT] [NUMBER]

Merge a sequence of splitted CFA image (see **SPLIT_CFA** command) into an unique CFA sequence of images (generic name [OUT]). For merge only one image use the **MERGE_CFA** command.

MERGE_HDR [DESCRIPTION FILE] [THREHSOLD]

See DESC_HDR

MERGE_RGB [R] [G] [B]

Generate a true color 48-bits image from the R, G and B separate components. The command is synonym to **TRICHRO** and **TR** commands.

MERGE_RGB2 [R] [G] [B] [OUT] [NUMBER]

Merge sequences of the R, G and B separate component of colors images into a sequence of 48-bits sequence.

MIN [PIXEL NUMBER]

Same command as **MAX**, but applies on pixels having a level lower than the median level of the area (e.g. for removing non active pixels).

MIRRORX

Rotate the image around a vertical axis.

MIRRORY

Rotates the image around an horizontal axis.

MIRRORXY

Invert the X and Y axis.

MIRRORXY2 [IN] [OUT] [NUMBER]

Permutation of axes X and Y for a sequence of images.

LOAD M51

With the mouse, define a rectangle about 30 to 40 pixels in width, avoiding the galaxy and stars. then run the [STAT](#) command (contextual menu). Iris returns a standard deviation around 8 (it is the estimation of the sky background). Then type:

MMSE 8.0

The MMSE command allows reduction of noise in the image while preserving fine detail.

MMSE [SIGMA]

Filters adaptatively noise by using the "Minimum Mean-Square Error" method. The [SIGMA] parameter contains the typical value of noise in the sky background. This value may be obtained for example with the [STAT](#) command. For example, load the M51.PIC image.

MODULO [VALUE]

Computes for each pixel the value modulo [VALUE]. The result is the current image in memory. This command allows to produce some isophote effects that may be useful to visualize images with large dynamic ranges. Select the false color palette to a better rendering.

MOSA [NAME] [DX] [DY] [TYPE]

[MOSA](#) allows you to include a set of elementary images in one image. The images are merged two at a time. The first image is in memory. The second image is designed by the parameter [NAME].

The shift between two points on the images you want to merge is contained in the variables ([DX],[DY]).

When the two images have points that overlap (which is not required), the value contained in the variable [type] allows you to choose the state of the overlapping zone in the final image:

- If [TYPE] = 0: the second input image (the name in IN2) overwrites the first input image (the name in IN1) unless the pixels in the second input image have the intensity zero. In this case, the values from the first input image are used.
- If [TYPE] = 1: the first input image overwrites the second input image unless the pixels in the first input image have zero intensity, in which case the values from the second input image are used.
- If [TYPE] = 2: the pixels in the output image take the maximum value of the pixels from the two input images.
- If [TYPE] = 3: the pixels in the output image take the minimum value of the pixels from the two input images.
- If [TYPE] = 4: the pixels in the output image take the average value of the pixels from the two input images.
- If [TYPE] = 5: a bilinear interpolation is performed on the common parts of the two input images.

The format of the input images can be different.

The MOSA command is used primarily to put together several shots of the same object in order to have a single image of this object. [Click here](#) for an example.

MOUSE_SELECT [X1] [Y1] [X2] [Y2]

The command simulate the selection of a area of the image with the mouse. Example, for compute the barycenter of an area limited par the coordinates (20, 94)-(196, 287), enter:

```
>MOUSE_SELECT 20 94 196 287  
>COG
```

MULT [COEF]

Multiply all the current image pixels by the constant COEF.

MULT2 [IN] [OUT] [COEF] [NUMBER]

Multiplies all the pixels of a sequence of images by [COEF]. The generic name of the [NUMBER] input images is [IN], whereas the generic name of the output images is [OUT]. Example:

```
MULT2 I J 0.5 7
```

NEW [X] [Y]

Creates a new image filled with zeros. The image has a size of [X] x [Y].

NGAIN [NORM]

Normalizes the median level of an image to [norm] by multiplying the image by a constant value. This command is generally used to change the median level of a flat-field image, in order to prepare a median sum.

NGAIN2 [IN] [OUT] [NORM] [NUMBER]

Normalizes the median level of a sequence of [number] images having a generic name [in] to [norm] by multiplying each image with a constant value. The generic name of the output images is [out].

NGAIN3 [IN] [OUT] [NORM] [NUMBER]

Normalization of a sequence of images. For the difference of NGAIN2 it is necessary to define with the mouse the zone of the image in which the calculation is carried out.

NOFFSET [NORM]

Normalizes the median level of an image to [norm] by adding a constant value to the image.

NOFFSET2 [IN] [OUT] [NORM] [NUMBER]

Normalizes the median level of a sequence of [NUMBER] images of generic name [IN] to [NORM] by adding a constant value to each image. The generic name of the output images is [OUT].

NOFFSET3 [IN] [OUT] [NORM] [NUMBER]

Normalizes the median background level of a series of [NUMBER] images having the generic name [IN] to [NORM]. The generic name of the output images is [OUT]. You have to select the area in which the background level will be estimated before running the command. Use the mouse for that. This command is very useful to normalize background levels in a series of planetary images. For example, the [PREGISTER](#) command works best when the background level is close to zero, and when the image background is uniform including near the image edges (windowing is often necessary to avoid edge effects). So, a typical sequence to register a series of planetary images will be for example:

```
WINDOW2 JUP I 5 5 170 170 9 (in order to suppress bad border)
NOFFSET3 I J 0 9 (in order to make zero level background around
the planet)
PREGISTER J K 256 9 (in order to register the images)
MULT3 K K .3 9 (in order to avoid integer overflow when adding
the images)
ADD2 K 9 (in order to composite the 9 images)
```

NUMBER [GENERIC NAME]

Return the number of images of an image sequence. For example, if the sequence is M31_1.FIT, M31_2.FIT and M31_3.FIT, then:

```
NUMBER M31_
will return 3.
```

OFFSET [VALUE]

Adds the constant [value] to the current image. The constant can have a negative value.

OFFSET2 [IN] [OUT] [OFFSET] [NUMBER]

Adds the value [offset] to [number] images having the generic name [in]. The parameter [out] contains the generic name of the output images.

OPACITY [MASK NAME] [COEFFICIENT]

The opacity mask attenuate some part of the in memory image proportionally to the mask intensity. The [coefficient] parameter adjust the global intensity. [For details, click here.](#)

OPT [DARK FRAME NAME]

In long exposure CCD imagery, one of the major difficulties posed during preprocessing is the dark current correction. This interference signal, due to thermal charges, is added to the signal produced by the observed objects. The problem is to suppress this interfering component of the image because it is noise that impairs the detectability.

A classic solution is to take an exposure of the object under study with an integration time T, then to take another exposure of length T while placing the detector in total darkness. This last exposure is called the dark current map. This map is a constant, to within a coefficient, for a given CCD. To first order, the coefficient is proportional to the temperature of the CCD and to the integration time. In the preceding procedure, the dark current map is simply subtracted from the image of the object.

This is, however, far from the ideal solution. In fact, this procedure implies that a dark current map must be taken after each image of the object. This is very constraining when the exposure time is several minutes or more.

Things seem to go better if the temperature of the CCD is perfectly stable. In this case, a priori only one map is necessary. It can be taken, for example, at the beginning of the observing session, and can be used to correct all the images. If the exposure time is not the same on the dark map and the image to be processed, the dark map must be multiplied by a coefficient before the subtraction. The coefficient is the ratio of the exposure time of the image to the exposure time of the dark map.

Besides the fact that it is a delicate matter to maintain the detector at a fixed temperature, this method has the following inconvenience - the dark map has its own noise (readout noise) and when the map is subtracted from the images, this noise is actually added to the images.

There is a more efficient method:

- Take several (5 to 10) dark images with integration times that are not necessarily equal, but long enough to be sensitive to the dark current (they should have the same duration as the observation exposures). The CCD should be cooled to reduce the readout noise as much as possible.
- For each exposure in darkness, another one with a minimal integration time is taken. This provides the offset map.
- For each of the dark images, subtract the corresponding offset map. The resulting images then contain only the thermal component of the signal.
- Sum all the images from the previous step to obtain the dark map. This adds the thermal contributions from each image, but averages the readout noise. This map can be considered constant for a given CCD (it is still good to redo this procedure every 1 or 2 months to allow for any possible change in the electronic characteristics of the detector).
- Now a given image must be corrected. The difficulty is in finding a multiplicative coefficient, to apply to the dark map, which will optimally correct this image. This is what the command OPT does.

Iris solves this problem nearly instantaneously using an analytical approach.

You have to select an area typically 30 to 100 pixels in width with the mouse. Then run the command. [dark frame name] is the name of the dark current map. The program will return the coefficient to apply to the dark current map to create a new map that is optimal for the image to process. Example:

```
OPT DARK
```

calculates the optimal coefficient for the dark map DARK.PIC to correct the current image.

The OPT command should be systematically used to preprocess deep sky images. With this command in hand, you do not need to worry about taking dark images during the night. The result is quite good because the criteria chosen minimize the noise.

OPT2 [IN] [DARK] [OUT] [NUMBER]

Same command as OPT but applies on a sequence of [NUMBER] images having the generic name [IN]. [OUT] is the generic name of the output images.

OPT3 [IN] [DARK] [OUT] [NUMBER]

Same command as OPT2 the with a more fully procedure (it is not necessary to select a zone in the image).

OPT_SUB [NAME]

Convolution of the image in memory by a kernel calculated by the command so that the PSF of stars are most similar to the image [name]. The kernel is saved at ends under the name @k.

PADDING [LX] [LY]

Sets the size of the current image to [lx], [ly]. If the image is larger than ([lx], [ly]), it is truncated. If the image is smaller than ([lx], [ly]), it is completed by pixels of zero intensity.

This command is generally useful for comparing images taking with different CCD or before using commands that perform Fast Fourier Transforms for which the image must have a size equal to a power of 2. For example, the command:

```
PADDING 256 256
```

guarantees that the image in memory has a size of 256x256 pixels.

PADDING2 [IN] [OUT] [LX] [LY] [NUMBER]

Same function that PADDING, but applying to a sequence of images.

PANO_EDGE [TRHESHOLD]

TRHESHOLD define the intensity of typical pixel just outside the valid image. A small value is recommended (between 0 and 100). Try for example:

```
>PANO_EDGE 1
```

PANO_MAX [NAME] [NUMBER]

NAME is the generic name of the individual images of the panorama. NUMBER is the number of elementary images.

PANO_MEAN [NAME] [NUMBER]

NAME is the generic name of the individual images of the panorama. NUMBER is the number of elementary images.

PCA2RGB [C1] [C2] [C3] [R] [G] [B]

The PCIA2RGB command performs the reverse transformation of the RGB2PCA command, that is, it goes from the space of the principal components to the space of the fundamental colors (R,G,B). To do this, this function needs the file containing the matrix of the eigenvectors of the covariance matrix of the three initial trichromatic images (pci.lst). For more information on this technique, see the RGB2PCA command.

PHOT [RADIUS1] [RADIUS2] [RADIUS3] [OPTION]

Computes aperture photometry. After running the command, one or several circles appear in the field. By centering the circles on the stars and then clicking on the left button of the mouse the program returns information about the star intensity.

If [option]=1, a simple circle appears. The returned information is the sum of the intensities of the pixels inside the circle (i.e. the sum of the star intensity and the sky background).

If [option]=2, two circles appear. The signal of the star plus the sky background is integrated in the inner circle. In the area between the two circles, the mean sky background is measured. PHOT then returns the signal of the star alone (sum of the intensities I, and instrumental magnitude M). The inner circle radius is [radius1], and the outer circle radius is [radius2].

If [option]=3, three circles appear. The most outer circle radius is [radius3]. It is the same method as previously, except that the background level is calculated from the area between circles 2 & 3. This allows sometimes to avoid close stars to the measured star, that may bias the measure of the sky background.

To exit the PHOT mode, execute the commande PHOTOFF.

Examples:

```
PHOT 6 0 0 1
PHOT 6 11 18 3
```

Note: it is important that a rather large number of pixels are used to determine the sky background. Moreover, as far as the inner circle is concerned, it has to be large enough to contain the whole star, but not too big in order to minimize noise level.

See application [here](#).

PHOTM [RADIUS1] [RADIUS2] [RADIUS3] [OPTION]

This command is close to the PHOT command. The difference is that a median is used to compute the sky background level instead of a simple average. It may be useful to minimize the effect of feeble stars in the measure annulus. To exit the PHOT mode, execute the commande PHOTOFF.

PIC_ANIM [INPUT] [OUTPUT]

Function very close to DATA_ANIM. The latter calculates interpolations starting from data curves, in particular of spectra ([click here](#) for an example). PIC_ANIM applies to 2-D images to improve fluidity of the animation of a sequences. For that of the intermediate images are calculated by simple linear interpolation starting from the acquired images.

The parameter [INPUT] indicate the name of a text file which respectively contains on two columns the name of the acquired images and date of acquisition of these images (or all other identifying function of time, as for example an index value which goes into increasing).

The parameter [OUTPUT] indicate the name of a text file which respectively contains on two columns the name of the interpolated images and dates for which the interpolation is calculated (or an identifier function of time, in conformity with that used in the input file).

Suppose 5 images to be interpolated with the names MET1, MET2, MET3, MET4 and MET5. We create in the working directory a text file of name IN.LST containing (use a text editor for that):

```
met1 1
met2 2
met3 3
met4 4
met5 5
```

We create the output file OUT.LST:

```
r1 1.00
r2 1.25
r3 1.50
r4 1.75
r5 2.00
r6 2.25
r7 2.5
r8 2.75
r9 3.00
r10 3.25
r11 3.50
r12 3.75
r13 4.00
r14 4.25
r15 4.50
r16 4.75
r17 5.00
r18 4.50
r19 4.75
r20 5.00
r21 4.50
r16 4.75
r17 5.00
```

The images R1 and R5 for example will be identical to images MET1 and MET2 (correspondence of the dates). But moreover, between the two images observed, command PIC_ANIM will generate the intermediate images R2, R3 and R4, and so on for the whole of the sequence.

Note: file OUT.LST can be created automatically with the assistance of command GEN_OUT, which is quite practical for long sequences. In the example one will make:

```
GEN_OUT OUT R 1 5 0.25
```

After having saved the file IN.LST and OUT.LST, we produce the interpolated sequence:

```
PIC_ANIM IN OUT
```

The sequence R1 ... R17 synthesized can be visualized with the **Animation...** command from **Visualisation** menu. You can also save the sequence in the form of BMP images for produce an animated GIF or a AVI film for example with the assistance of an adequate software:

```
PIC2BMP R RR 17
```

You have now on the disc a sequence RR1.BMP..., RR17.BMP.

PIC2BMP [INPUT] [OUTPUT] [NUMBER]

Convert of a sequence of FITS or PIC images to a sequence of 8-bits BMP images.

PIC2DATA [DATA FILE NAME]

Convert the values of the first line of the image in memory into a text file of name [DATA FILE NAME]. This command is particularly useful for the analysis of the spectral data starting from a spreadsheet or a program of display of curves.

And also an improved version of the command NUMBER. Suppose the sequence M57-1, M57-2, M57-3. The command NUMBER M57- return the number of images in the sequence (3) but mid-date of the acquisition.

PIC2FITS [IN] [OUT] [NUMBER]

Convert a sequence of PIC image into FITS a sequence. Parameters:

[IN] is the generic name of the input sequence.

[OUT] is the generic name of the output sequence.

[NUMBER] is the number of images in the sequence.

PLOT2 [DATA] [DIM X] [DIM Y] [YMIN] [YMAX] [TITLE]

Same as function [ANIM_PLOT](#) but applying to only one data file [DATA].

POINTON

This command permits selection of any points on a sky background. The list of points will then be used by commands such as POLY and SYNTH in order to produce synthetical sky backgrounds.

Each time you click with the mouse, a small cross appears in the image, a counter increments and the pixel coordinates and intensities are stored in memory. The maximum number of points is 5000.

To come back to normal cursor mode type: POINTOFF. For an example [click here](#).

See also: [POLY](#), [SYNTH](#).

POINTOFF

See [POINTON](#).

POL2REC [X] [Y] [R] [SCALE (deg./pixel)]

Convert a polar representation of an object to a cartesian representation. The parameters are the same to the [REC2POL](#) command.

POL2REC2 [X] [Y] [R] [POS. ANGLE] [SCALE (deg./pixel)]

Very similar to [POL2REC](#) but the added parameter [pos. angle] offer the possibility to adjust the origin of angle in the rectangular representation. You can take into account the apparent orientation of rotation axis of the sun for example. The angular value is given in degrees (the default value of the POL2REC command is [pos. angle] = -180°).

POLAR [0°] [60°] [120°] [DEGREE] [ANGLE] [SCALE]

Computes the polarization angle and level from 3 images obtained through a polarizing filter at angles of 0°, 60° & 120°. The three parameters [0°], [60°], and [120°] contain the names of the three corresponding images. The two resultant images contain the linear polarization level (named with the [degree] parameter), and the polarization angle (named with the [angle] parameter), respectively. The parameter [scale] allows to normalize the levels in the degree of polarization image. If [scale]=100, the image will contain the polarization degree in percents. The intensities in the polarization angle image corresponds to degrees of polarization (between 0° and 180°). The angle origin correspond to the filter with the 0° orientation. Angles are oriented counter-clockwise.

Example:

```
POLAR P0 P60 P120 POL ANGLE 100
```

[Click here](#) for examples.

See also [POLAR CARTO](#) command.

POLAR2 [0°] [45°] [90°] [135°] [DEGREE] [ANGLE] [SCALE]

Computes the polarization angle and degree from 4 images obtained through a polarizing filter at angles of 0°, 45°, 90° & 135°. The four parameters [0°], [45°], [90°] and [135°] contain the names of the four corresponding images. The results consists in an image containing the polarization level (named with the [degree] parameter), and an image containing the polarization angle (named with the [angle] parameter). The parameter [scale] allows to normalize the levels in the polarization degree image. If [scale]=100, the image will contain the polarization degree in percents. The intensities in the polarization angle image corresponds to degrees of polarization (between 0° and 180°).

For an application, we are going to process a set of four images of the moon taken through a polarizing filter with four position angles 45° apart. This filter was placed just in front of a CCD detector. The exposure times are identical for the four images, which are called MP1.PIC, MP2.PIC, MP3.PIC, and MP4.PIC. The offset signal has been subtracted from each of these images (see the SUB command) and they have been carefully centered to within a fraction of a pixel with respect to each other. Then:

```
POLAR2 MP1 MP2 MP3 MP4 P A 100  
LOAD P  
VISU 5 0
```

The intensity levels in P.PIC express the polarization degree. For the moon the degree is often small as 5%. Comparing the polarization map and the albedo image is instructive. For the most part, the polarization rate is higher in the continental zones than in the seas. Nevertheless, there are some notable local exceptions. You will also note that some craters have a particularly high polarization rate. [Click here](#) for an example.

This type of polarization map provides information about the roughness of the lunar surface. The interpretation of this kind of document requires prudence (for example, the polarization rate at a given point on the moon is strongly dependant on the elevation of the sun at the point, and on the mineralogical makeup of the ground).

POLAR3 [0°] [45°] [90°] [DEGREE] [ANGLE] [SCALE]

Same as POLAR2 but for only three angles : 0°, 45° and 90° of the polaroid analyzer.

POLAR_CARTO [DEGREE] [ANGLE] [STEP] [SCALE]

The POLAR_CARTO command creates a polarization map from an image containing the polarization magnitude and an image containing the polarization angle (in degrees). The output image is formed of small vectors whose length is proportional to the polarization degree and whose orientation is equal to the polarization angle. An angle of 0° corresponds to a vertical vector. The center of the vector is at the point where the calculation was done.

[MAGNITUDE] is the polarization magnitude image name and [ANGLE] is the angle image name. The calculation of the vectors is performed at the intersection of a mesh whose stepsize, in pixels, is contained in the parameter [STEP]. Note that the displayed result is the average of the polarization degree and the polarization angles calculated on a zone of dimension [STEP] centered on the point.

The parameter [SCALE] adjusts the length of the vectors as a function of the polarization rate. It is expressed in pixels per percent of polarization (if the polarization rate is itself in percent).

Example:

```
POLAR_CARTO POL ANGLE 10 30
```

Draws a polarization map from the images POL and ANGLE. The calculation stepsize is 10 pixels, and each segment has a length of 30 pixels per polarization percentage (this requires that a polarization rate of 100% is equivalent to level 100 in the image POL.PIC).

POLY [ORDER]

In many cases it is very important that the level of the sky background becomes as uniform as possible, and with a given value (for low flux detection, photometry,...). If the background is not uniform enough after preprocessing to perform such analyses, a solution may be to synthesize a background using mathematical functions that fits the real background. The synthetic background will be then subtracted from the original image.

POLY calculates the coefficients of a polynomial by the method of least squares from data obtained by making pointings in the image background (see the command [POINTON](#)).

The parameter [ORDER] contains the order of the polynomial to calculate. The order can range from 0 to 5. For a fifth degree, the polynomial has the form:

$$V = \text{CONSTANT} + C1.X + C2.Y + C3.X.Y + C4.X^2 + C5.Y^2 + C6.X^2.Y + C7.X.Y^2 + C8.X^3 + C9.Y^3 + C10.X^4 + C11.Y^4 + C12.X^5 + C13.Y^5$$

When a lesser order polynomial is calculated, only the related coefficients are included (the others are set to zero). For example, for a second degree polynomial, only the coefficients from C1 to C5, as well as the constant, are significant.

Click [here](#) for an example.

See also: [SYNTHE](#), [SUBSKY](#), [POINTON](#), [POINTOFF](#)

POWER [VALUE]

Rise the intensity of the pixels of the current image to the power. The value of the power is provided by the user ([value]).

PR [INPUT] [DARK + OFFSET] [FLAT] [OUTPUT] [NUMBER]

The PR command (PR=PreProcessing) is an important command for the preprocessing of a sequence of [NUMBER] images. The [INPUT] parameter contains the generic name of the images to process. [DARK + OFFSET] is the name of sum of the dark current image and of the offset signal. So, the dark image has either to be obtained in the same conditions as the images themselves (same exposure time, same temperature), or to be computed (see the OPT command). [FLAT] contains the flat-field image. [OUTPUT] is the generic name of the output images. See also: FULL_PR

The command PR produce preprocessed images that may be, for example, combined later after registration (see REGISTER, ADD2, ADD3, DRIZZLE, COMPOSIT, SMEDIAN, FULL_PR commands). [Click here](#) for details.

PREGISTER [IN] [OUT] [SIZE] [NUMBER]

Performs the registration of [NUMBER] planetary images having the generic name [IN] using an intercorrelation method. The size for the intercorrelation is given by [SIZE]. It must be a power of 2 (128, 256, 512...). The size should be larger than the planet diameter. [OUT] is the generic name of the output images. Before use PREGISTER define a selection rectangle around the planetary disk (drag with the mouse). Note that the size of rectangle is not important (the rectangle mark only the center of interest of the image).

Example:

```
PREGISTER MARS I 256 7
```

To verify the efficiency of this command, you may subtract an image from another one, e.g.:

```
LOAD I1  
SUB I3 2000  
VISU 3000 1000
```

The observed residuals mainly come from the atmospheric turbulence.

[See here](#) for an application example.

PREGISTER2 [ENTERED] [LEFT] [SIZE] [A] [NUMBER]

Very similar function that [PREGISTER](#) for the registration of the planetary images by the technique of the intercorellation in the Fourier domain. PREGISTER relative make registration of each image of the sequence to the first image of this sequence. PREGISTER2 on the other hand calculates the intercorellation of the image of row N relative with the image of row $N-1$. This is of an interest when the detail which is used to center the images changes of form notably (a solar protuberance for example).

PREREGISTER [IN] [OUT] [NUMBER]

Command for fast registering of a sequence image. The algorithm is fast (special cross correlation in the spatial domain) but *less precise* compared to [REGISTER](#), [PREGISTER](#), or [CREGISTER](#) for example (PREREGISTER use a registration at the nearest pixel for minimal degradation of image

quality). PREREGISTER is used as a first step registration for difficult case (if traditional registration command are not applicable - situation of large de-registration for example). Applied command like REGISTER or COREGISTER for a second pass (registration at a pixel fraction). Parameters:

[IN] generic name of the input sequence
[OUT] generic name of the output sequence
[NUMBER] image number

Before run PREREGISTER select with the mouse a rectangle around a contrasted details. For important de-registration do not hesitate to select the whole image.

PROD [NAME] [COEF]

Performs the multiplication pixel by pixel of the current image by the image [NAME]. The result is multiplied by [COEF]

Example: To calculate the square of the image M51.PIC:

```
LOAD M51
PROD M51 .05
VISU 10000 0
```

PROMPT [TEXT]

Improved version of **PROMPT** command (batch mode). Now the command accept an optional informative text. Use the character "_" for simulate space character.

PUT [X] [Y] [V]

Attributes the intensity [V] to the pixel at coordinates ([X], [Y]). See also: [GET](#)

QM [NAME1] [NAME2] [TYPE] (or QMOSA [NAME1] [NAME2] [TYPE])

Assemble the image [name1] and [name2] in an unique image. QM is optimized for stellar images : the commun point between the two images is a star selected with the mouse (a simple click). QM is very easy to use but the operation is rudimentary: only the relative translation between the images is considered, not the distortion for example. QM is an interactive version of MOSA command. The parameter [type] define the junction zone of the two images. If type=1 the image 1 is on image 2, if type=2 a pixel in the commun zone is the maximum of image 1 and 2, if type=3 a pixel in the commun zone is the minimum of image 1 and 2, if type=4 the commun zone is the mean intensity of image 1 and 2, if type=5 an interpolation is computed between images 1 and 2 for a more natural transition . For the majority of situation the type=5 option is preferred. QM can process black and white images and true colors images.

QM2 [NAME1] [NAME2] [TYPE] (or QMOSA2 [NAME1] [NAME2] [TYPE])

Same as [QM](#) but for non-stellar images. Iris use the intercorellation technique around the clicked zone.

QR [NAME1] [NAME2] (or QREGISTER [NAME1] [NAME2])

Command for a quick and easy registering of deep-sky image pairs. The method used involve interactively identifying common point sources (stars) in overlapping images fields. This functions are compatible with 16-bits (black & white) and 48-bits images (true colors). [NAME1] and [NAME2] are the file name of the images to be register. The reference is the image [NAME1]. The QR command applied a sample translation to the image [NAME2] for superposition. [Click here for details.](#)

QR2 [NAME1] [NAME2] (or QREGISTER2 [NAME1] [NAME2])

Command for a quick and easy registering of deep-sky image pairs. The method used involve interactively identifying common point sources (stars) in overlapping images fields. This functions are compatible with 16-bits (black & white) and 48-bits images (true colors). [NAME1] and [NAME2] are the file name of the images to be register. The reference is the image [NAME1]. The QR2 applied an affine transform to the image [NAME2] for superposition. [Click here for details.](#)

QR3 [NAME1] [NAME2] (or QREGISTER3 [NAME1] [NAME2])

Carry out the registration of stellar images [name1] and [name2] starting from a transformation of degree 2. It is pointed out that command QR applies a simple translation to superimpose the images (uses one star), whereas command QR2 applies an affine transformation (translation, rotation, scaling and use 3 stars). Click [here](#) for examples about this functions. The interest of command QR3 is to take into account some distortion of the images. In counterpart, it is necessary to work with a greater number of stars, at least 6. For example, QR3 is adapted to register images carried out with photographic objectives lens with short focal length (see [example](#)).

QR3 is adapted in the difficult cases of registration between images, when the geometrical transformation is not linear any more, and when the functions like COREGISTER fails (difficulties for automatically matching star lists).

The reference image is [name1] and Iris modifies the geometry of the image [name2] for which superimposes on [name1].

The operation proceeds in two times. First, IRIS automatically load in memory the image [name1]. You have to click with the mouse (right button of the mouse) on stars regularly distributed in the image (at least 6 and up to 50). Choose bright stars, unsaturated and insulated if possible. Select the same stars in the second image, which is loaded also automatically. At the end of the selection calculation is carried out.

For a full demonstration of these commands and virtual equatorial demo, [click here](#).

QR21, QR22, QR23, QR24

Interactive registration functions. [See details here.](#)

R_COLOR [R] [G] [B]

Change the color of a reticle in the video preview window.

R_SIZE [SIZE]

Change the size of a reticle in the video preview window.

R_START

Display a reticle in the video preview window.

R_STOP

Stop the display of a reticle in the video preview window.

RADIAL_BLUR [XC] [YC] [FILTER STRENGTH] [METHOD]

[XC] [YC] are the coordinates of the blur center

[FILTER STRENGTH] is the amount of filter applied. Typical values are between 0.5 and 20.

[METHOD] if method = 0, spin blur; is method = 1, zoom blur.

RADIAL_WEIGHT [X] [Y] [RADIUS] [COEFFICIENT] [POWER]

Multiply the intensity $I(r)$ of a given pixel image by a Lorentz function of the form:

$$I'(r) = I(r) \frac{1}{1 + \left(\frac{r - r_0}{\text{coefficient}} \right)^{\text{power}}}$$

where r is the distance relative to a center of coordinate (x_c, y_c) , r_0 is an offset radius, *coefficient* and *power* are adjustment parameters of the function shape. Normally , $\text{power}=2$.

The parameters x , y , r_0 , *coefficient* and *power* are the successive argument of the **RADIAL_WEIGHT** command. A typical application is the simulation of a radial density filter during a total eclipse observation.

RAINBOW [NAME] [LAMBDA1] [LAMBDA2]

Useful for the representation of the spectral data. Colorize with the rainbow colors the image [NAME]. The coloured distribution is realistic and takes into account which the first pixel on the left is with the wavelength [LAMBDA1] and which the last pixel on the right is with the wavelength [LAMBDA2].

REC2MAP [FILE CARTO] [X] [Y]

Allows to obtain the cartographic coordinates (longitude, latitude) of a detail of a planetary image.

The parameter [FILE CARTO] contains the name of the cartographic file containing information of epermeris of planet at the time of acquisition.

The parameters [X] and [Y] contain the co-ordinates in the image of the details which one wishes the co-ordinates cartographic.

See also [MAP2REC](#) and [MAP](#).

REC2POL [X] [Y] [R] [SCALE (deg./pixel)]

Transform the natural "circular" aspect of the sun chromosphere to a polar representation (an axis is the distance from the center of the disk and an axis represent angular values). (x, y) are the coordinate of the disk center image in pixel. [r] is the max. radius of the polar representation in pixels. The [scale] parameter is the number of degrees by pixel unit in the final image (typical values are from 0.5°/pixel to 0.1°/pixel).

Click [here for examples](#)

REC2SKY [X] [Y]

REC2SKY returns the equatorial coordinates of a point on the image whose Cartesian coordinates in pixels are in the parameters ([x],[y]), using the polynomial files POLX.POL and POLY.POL (created by [Astrometry/Photometry](#) dialog box).

Example:

```
REC2SKY 12.67 321.12
```

Calculates the equatorial coordinates of the point with Cartesian coordinates (12.67, 321.12) from the parameters contained in the files POLX.POL and POLY.POL.

See also the cartographic possibilities of IRIS ([MAP](#) command).

REDUCE_HDR1 [GAMMA]

REDUCE_HDR2 [GAMMA] [SHARPNESS]

REDUCE_HDR3 [GAMMA] [COLOR] [SMOOTHNESS]

REDUCE_HDR3 modifies tone reproduction of High Dynamic Range images. The object is to mapping high dynamic range to low dynamic range compatible with computer screen or photographic print. Compared to commands **REDUCE_HDR1** and **REDUCE_HDR2**, which deal with the same problem, **REDUCE_HDR3** offers a better control of coloured contrast. The parameter GAMMA fixes the intensity contrast. The typical adopter value ranges between 1.2 and 3.0. The COLOR parameter fix simultaneously the saturation of the image. The characteristic value of this parameter lies between 0.5 and 3 (saturation increases when the value increase). Lastly, the parameter SMOOTHNESS adjusts a high-pass filter which applies to improve the sharpening. A value should be chosen between 0 and 1 (when the parameter SMOOTHNESS is zero, there is no sharpening is applied).

RFILL [X0] [VALUE]

Mask the right part of an image relative to the [x0] coordinate.

See also command: [LFILL](#)

REGISTER [IN] [OUT] [NUMBER]

Registers [NUMBER] images of a sequence having the generic name [IN] with respect to the first one. The generic name of the output images is [OUT]. The registration consists here in a simple translation.

Draw a rectangle with the mouse around an isolated, non-saturated star. The registration of the images will be done with respect to that star. The size of the rectangle has to be large enough so that it contains the displacement of the star between two contiguous images (if this not the case, Iris could take a wrong star to perform the registration).

Example:

```
REGISTER I J 7
```

Registers the images I1.PIC ... I7.PIC and produces the output images J1.PIC ... J7.PIC.

The registration is generally followed by a combination of the images (see e.g. [ADD2](#), [ADD3](#), or [COMPOSIT](#)).

[Click here](#) for an example.

REINDEX [IN] [OUT] [FIRST INDEX IN] [FIRST INDEX OUT] [NUMBER]

Reorganize the indices of a sequence. Let us suppose a sequence: I1, I2, I3, I4. One wants to transform it into a sequence J5, J6, J7, J8. One will write:

```
REINDEX I J 1 5 4
```

The input and the output sequences cannot have the same name. [NUMBER] is the number of image to be converted.

REMOVE@

Delete all the files of the working directory starting with the character @. Equivalent with command DOS: DEL @*.*

REPAIRX [X]

Replaces the column of rank [x] by the average of the columns of rank [x]-1 and [x]+1. Example:

```
REPAIRX 66
```

Replaces the column of rank 66 by the average of columns 65 and 67.

REPAIRX is used for the cosmetic correction of images: suppressing electronic interference or a defective line in the detector.

See also [REPAIRY](#).

REPAIRX2 [IN] [OUT] [X] [NUMBER]

Same as [>REPAIRX](#) but for an image sequence.

REPAIRY [Y]

Replaces the line of rank [Y] by the average of the columns of rank [Y]-1 and [Y]+1. Example:

REPAIRY 90

REPAIRY2 [IN] [OUT] [Y] [NUMBER]

Same as [REPAIRY](#) but for an image sequence.

RESET

Update position of dialog box (command , threshold, ...). Useful when the screen resolution is modified.

RESET_ASTRO

Erase all informations related to astrometric solution into the current image.

RGB2HSI [R] [G] [B] [H] [S] [I]

The RGB2HSI command converts an image defined by its Red, Green, and Blue components into an image defined by its Hue, Saturation and Intensity components.

The starting element is a trichromatic image whose three components have been obtained in distinct spectral bands (not necessarily red, green, blue). The names of these images are in the parameters [R], [G], AND [B].

Starting from these three images, RGB2HSI produces three new images:

- An image [H] that expresses the hues of the trichromatic image in a gray scale. In this image, pixels that are predominantly red in the trichromatic image will be represented by high levels, pixels that are predominantly green will be represented by intermediate levels, and pixels that are predominantly blue will be represented by low intensity levels.
- An image [S] that expresses the saturation of the colors in the trichromatic image in a gray scale. The areas of the trichromatic image where the colors are purest will be represented by the high levels in S.
- An image [I] that expresses the average intensity of the three components in a gray scale. The I image is the one that most resembles each of the monochromatic components of the trichromatic image.

See also: [HSI2RGB](#), [LRGB](#), [RGB2PCA](#), [PCA2RGB](#), [TRICHRO](#)

RGB2PCA [R] [G] [B] [C1] [C2] [C3]

The RGB2PC1 command (PCA = "Principal Component Analysis") corresponds to a coordinate transformation of a trichromatic image that is represented in the space of fundamental colors (Red, Green, Blue). After the transformation, the axes are the eigenvectors of the covariance matrix of the three input images. The three resulting images are obtained by projecting the three starting axes (R,G,B) onto the three resulting axes. Without going into the mathematical details, it is interesting to choose this coordinate system because it defines three new images that are as uncorrelated from each

other as possible, from the chromatic point of view. The matrix of eigenvectors, as well as the associated eigenvalues, are stored in a separate text file (pci.lst).

The first axis, also called the principal axis, corresponds to the largest eigenvalue of the covariance matrix. Generally, this axis is very close to (but not coincident with) the "achromatic axis" (which is the axis of the I image in the RGB2HSI command). This axis contains most of the intensity information and is often close to the average of the input images..

The two other axes (ordered in decreasing eigenvalues) can thus be interpreted as linear combinations of the input images that lead to information that is not correlated to the first axis or to each other. The two corresponding images generally have much weaker dynamics, and are centered around zero. These images thus have a rather low signal to noise ratio, especially for deep sky images, and sometimes require a low pass filter (median type, for example) in order to be correctly visualized.

The interest in this transformation is twofold:

(1) First, visualizing the three images in principal components allows a hierarchical classification of the information contained in the starting trichromatic image. This visualization can be done independently, or trichromatically (by putting the image of the first eigenvector in red, the second in green, and the third in blue). In this case, it is clear that the resulting image is not at all representative of the "true" colors of the image, nor is it very aesthetic, but it is the representation that gives the optimal visualization of the chromatic information in the image.

(2) Second, processing can be done in the space of principal components (primarily adaptations of the dynamics and filtering) and the results can then be brought back to the starting space (R, G, B) (with the PCA2RGB command) to obtain a visual improvement in the original trichromatic image. It is worth noting that for this particular manipulation, the transformation is not as rigorous as the commands ([RGB2HSI](#), [HSI2RGB](#)), and is trickier to use. It is generally reserved for images with a good signal to noise ratio (for example, planetary images or bright planetary nebulae).

See also: [PCA2RGB](#), [RGB2HSI](#), [HSI2RGB](#), [LRGB](#), [TRICHRO](#)

RGBBALANCE [Rcoef] [Gcoef] [Bcoef]

Multiplied components red, green and blue of the 48 bits in memory image respectively by the coefficient Rcoef, Gcoef and Bcoef. This function is equivalent to **RGB balances...** command of **Digital Photo** menu.

RGBBALANCE2 [IN] [OUT] [Rcoef] [Gcoef] [Bcoef] [NUMBER]

1

Same function as [RGBBALANCE](#), but applied to a sequence of images.

RGRADIENT [XC] [YC] [DR] [DALPHA]

Computes the rotational gradient of an image. Starting from an input image (in memory), RGRADIENT creates two images, with a radial shift ([dr] in pixels) and a rotational shift ([dalpha] in degrees) with respect to the point ([xc], [yc]). Between these two images, the shifts have the same amplitude, but opposite signs. The two images are then added to create the final image. In polar coordinates (r, a) with respect to the point ([x],[y]), we have:

$$B'(a,r,da,dr) = 2.B(a,r) - B(a-da, r-dr) - B(a+da, r-dr)$$

with:

B = the starting image

B' = the resulting image

da = the parameter [alpha] of the command

dr = the parameter [dr] of the command

The RGRADIENT command can be executed also from a dialog box (**Processing** menu).

The rotational gradient is used to observe poorly contrasted details in a bright object which exhibits a symmetry of revolution (dust in an elliptical galaxy or jets in the tail of a comet). The gradient removes the object with a symmetry of revolution with respect to ([x], [y]).

[Click here](#) for a typical application.

RING_MEDIAN [RADIUS]

Use a particular version of median filtering in order to eliminate from the image of large sizes. The value of the parameter [radius] must be roughly the size in pixels of the objects which one wishes to erase.

RL [#ITER] [COEF]

Restores an image using the [Richardson-Lucy method](#). [#ITER] is the number of iterations to be performed (typically between 10 and 50). If [COEF]=0, the original Lucy algorithm is applied. If [COEF]>0, a relaxation method is used to reduce noise, but convergence is slower. Before running the command, lower the level of the sky background to a level close to zero (use the [OFFSET](#) command, the [BG](#) command allows you to measure this level). Then choose with the mouse (small rectangle around a star) an isolated, non-saturated star, then run the command, e.g.:

```
RL 15 0
```

It is recommended (but not mandatory) that the image has a square size equal to a power of 2 (128, 256, 512...).

[See here](#) for examples.

RL2 [NB ITER] [COEF]

Modified version of the Richardson-Lucy deconvolution algorithm. The difference with command [RL](#) comes from the reduction of granular structure and ringing effect around the bright point-like objects. The reconstruction is effective only for pixels which have an intensity higher than the computed sky background. Just like RL, RL2 command use Fourier transforms and it is recommended to crop the image so that these with dimensions has a size equal to a power of 2 (128, 256, 512 pixels). Use for that [WINDOW3](#) command, especially designed to isolate a squared part of an image. RL2 is used like RL (select with the mouse an unsaturated star before run it).

[Click here](#) for an example.

ROT [XC] [YC] [ANGLE]

Rotates the current image around the point ([xc], [yc]) by the angle [angle]. The center of the rotation can be off the screen. Note that the coordinates of this center can be noninteger. [angle] is in degrees.

The rotation of an image is used to orient an image with respect to a reference direction (towards the north, for example). ROT is also used with TRANS and SCALE to register images taken with different instruments.

In the following example, we will rotate the image M51.PIC, then go back to the initial orientation:

```
LOAD N2207
ROT 100 130 22.3
ROT 100 130 -22.3
```

ROT2 [IN] [OUT] [XC] [YC] [ANGLE] [NUMBER]

Same as [ROT](#) but for a sequence of images.

RREGISTER [IN] [OUT] [SIZE] [NUMBER]

Command RREGISTER carries out the registration of a sequence of images of the deep sky by taking into account an accidental field rotation. The principle of the command rests on the pointing of two stars of the fields rather distant from each other but present in all the images of the sequence. The first selected star will be used to carry out registration in translation and will also be used as pivot at the time of the following phase of angular registration (the first star is the center of rotation). The position of second star pointed compared to first star is used to calculate the swing angle of field from one image to another. If possible it is necessary that the stars are not saturated (i.e. too brilliant) to reach a maximum precision.

The pointing of two stars is carried out by using the **Select objets** command of the **Analysis** menu. It is only after the two pointed stars operation (click with the mouse) that you can run command RREGISTER. Parameters:

[IN] is the generic name of the sequence of images to be treated.

[OUT] is the generic name of the centered images.

[SIZE] is the size in pixel of with dimensions of a rectangular surface which must contain at least stars pointed between two successive images of the sequence. This size is all the more large since the displacement of the successive images is significant.

[NUMBER] is the number of images of the sequence.

For an application, [click here](#).

RUN [param1] [param2] ... [param5]

Version 5.00 implements the possibility to run a succession of commands from a script file in text format. This script file (or batch file) must mandatory have the extension "pgm", for example "myprogram.pgm".

Scripts are run with the RUN command from the console.

The "batch" mode is very elementary. The execution is strictly linear. It is not possible to carry out conditional tests or loops for examples. The script is thus not a true program, but the process can be of a certain help for repetitive tasks.

The minimal parameter of RUN command is the name of the batch file (no extension). If no path precedes the file name, Iris search the file into the working directory.

The name of the file can be followed by optional parameters which are provided to the script file. It is possible to pass up to 5 parameters by this method. In the script file the first argument is identified by the item "\$1", the second parameter by the item "\$2", and so on.

For example, a script file which produces an effect of gradient ("bas-relief") in an image with a variable force can be written

```
load $1
trans $2 $3
save tmp
load $1
sub tmp 0
visu 200 -200
```

Edit the file with a word processing software, and save the result under the name test.pgm in the working directory.

From the console, enter the command

```
> RUN TEST M51 1 1
```

The script which is executed is then equivalent to the typing:

```
load m51
trans 1 1
save tmp
load m51
sub tmp 0
visu 200 -200
```

You can easily start again the batch by positioning cursor prompt on the command line and by modifying one or more parameters. For example:

```
> RUN M51 TEST 2 0
```

The hundreds of Iris command can be used in a script "pgm" file:

```
load $1
scale 3 $2 $2
mirrorxy
...
```

Some commands require to define an area on the current displayed images. Just before this command, add in the script file the command PROMPT. PROMPT freeze the execution of the batch file and open a "Prompt" dialog box. Select the area of the image, then, click the "OK" button of prompt dialog box. For example:

```
load m51
prompt
window3 200
```

In this example, during prompt, define a rectangle with the mouse. Iris crop a 200x200 pixels zone of the images M51 centered on the selected area.

PROMPT command is also useful for step-to-step run of the script.

You can also add comment into the script file. If the first word of a sentence is not a valid command, the corresponding line is a comment line. For example:

```
=====
My program load Messier 51
=====
```

```
load m51
End of my program
```

SAVE [NAME]

Save the image in memory in the current directory (defined in the item Current Directory from the Settings tab). You can also indicate in which directory to save a particular image by specifying the full path of the image. For instance: save c:\nuit7\m51

SAVE_TRICHRO [R] [G] [B] (or SAVE_TR [R] [G] [B])

Save the colors layers of the current displayed true color image into three distinct file.

SAVEBMP [NAME]

Save the image in memory in the current directory under the form of a bitmap file. The color palette used to create the file is the active palette. The BMP image is a 24-bits images if a tri-color is loaded (see [TRICHRO command](#)).

SAVEJPG [NAME] [QUALITY]

Save current image into a JPEG file. You have the possibility to adjust the compression factor. A value 1 for quality parameter offers best fidelity. A quality of 5 corresponds to the maximum compression ratio. It is also possible to produce an JPEG image from the **Save...** function of **File** menu.(quality = 2).

SAVEPPM [NAME]

Store current image in the form of a PPM file (Portable Pixel Map - 24-bits format). You can save true colors images (24-bits) but also, black and white images (16-bits)

SAVEPSD [NAME]

Save the in-memory image into a Photoshop PSD 48-bits file (16-bits by color plane).

Note: The image must not contain any negative pixel values for this function to work correctly.

See also commands: [CLIPMIN](#), [OFFSET](#), [MULT](#), and [SAVEPSD2](#).

SAVEPSD2 [NAME]

Same as SAVEPSD, but the natural internal coding of Iris [-32768..32767] is mapped into [0..65535].

SBLUR [SIGMA] [GAMMA]

Command SBLUR (for *Selective Blur* i) generates a blur in the image with a force more higher since the objects are more intense. This function is used on star fields to produce an [Akira Fujii effect](#), for example to reveal the contour of the constellations. The parameter SIGMA permit to adjust the degree of the blur (select values between 2 and 15) and the parameter GAMMA makes adjust the sensitivity to

the brightness of stars (the characteristic value is between 4 and 10). For an optimal effect it should be taken care that the most brilliant stars are not saturated. This command boost the colors and can be also used in combination with [ASINH](#).

[Click here](#) for examples.

SCALE [OPTION] [XF] [YF]

The SCALE command can be used to enlarge or reduce the current image. Each axis can have a different scale factor.

The parameters are:

- Type of interpolation:

- [option] = 1, for an enlargement, interpolation by pixel duplication; for a reduction, interpolation by undersampling
- [option] = 2, bilinear interpolation
- [option] = 3, spline interpolation (only for enlargements).

- [xf] = scale factor along the X axis

- [yf] = scale factor along the Y axis.

The SCALE command can be used to detail regions of an image by enlarging it. Some types of processing, like restoration, photometry, and astrometry, become more precise when the image is oversampled. You can artificially oversample with the SCALE command.

Reducing images is also useful when they take up too much space, or to build a library of quick-look images (where only an approximate look is important).

To see the influence of the different types of interpolation, execute the following commands:

```
LOAD M51
SCALE 1 3 3
```

Interpolation by pixel duplication conserves the sharpness of the image, but of course the result has an artificial look.

```
LOAD M51
SCALE 2 3 3
```

Bilinear interpolation gives the image a smoother look than simple pixel duplication. Nevertheless, for large enlargement factors, some artificial geometric structures can appear around stars. The spline interpolation reduce this effects.

```
LOAD M51
SCALE 3 3 3
```

Try also:

```
SCALE 2 2.7 0.76
```

SCALE2 [IN] [OUT] [OPTION] [XF] [YF] [NUMBER]

Same function that SCALE but applies to a sequence of images.

SCALECOLOR [IN] [OUTPUT] [REFERENCE INDEX] [NUMBER]

Scale the input images sequence [I] for color combining (or [drizzling](#) algorithm). For each images, a rescaled sky was subtracted and a gain adjusted relative to a reference image of the input sequence. The index of the reference image is [REFERENCE INDEX]. The generic name of the output sequence is [OUTPUT].

Before SCALECOLOR command select an unsaturated star with the mouse (the images are to be registered before applying SCALECOLOR, see [REGISTER](#) or [COREGISTER](#) for example). Ideally, for a good color balancing, select a solar type star (a G star).

Example:

```
SCALECOLOR I J 2 3
```

Scale the images I1, I2, I3 relative to the image I2. This produce the scaled sequence J1, J2, J3. If J1 is the R component of a tricolor image, if J2 is the G component and J3 is the B component, than you can made:

```
TRICHRO J1 J2 J3
```

SCALECOLOR2 [R] [G] [B]

Adjust the respective levels of the images [R], [G], [B] so that their intensities are identical on average in a zone of the image defined as a preliminary with the mouse. More precisely, Iris multiplies the images [G] and [B] by a distinct coefficient and their additions a constant to equalize them with the image [R]. This command is very practical to carry out the chromatic balance of the planetary images ([click here](#) for an example). For the stellar images it is necessary to employ command [SCALECOLOR](#).

SCAN [X1] [Y2] [INTEGRATION TIME] [LINE NUMBER]

Acquisition in scan mode (TDI) since a Audine camera. [Click here](#) for more details.

SCAN2PIC [NAME] [X0] [NUMBER]

Select the column of coordinate [X0] in the first image of a sequence of [NUMBER] images of generic name [NAME]. This column becomes the first column of a new image which is built in the memory of the computer. The column of coordinate [X0] in the second image of the sequence becomes the second column of the image in memory, and so on for all the images of the sequence. Finally, the image in memory, and which is displayed after the processing, has a horizontal format equal to the number of images of the sequence and a vertical format equal to the number of pixels along the axis Y in the images of the sequence.

A use of SCAN2PIC is the synthesis of a monochromatic image of the Sun while scanning its disc on the entrance slit of the spectrograph and by making a regular acquisition of images simultaneously. These images become the input sequence of SCAN2PIC. The coordinate [X0] is for example the core of a spectral line (the H-alpha line in the red for example) or the close continuum if one want an image standard photosphere.

[Click here](#) for an illustration of this principle.

It is necessary if possible to adjust the frequency of acquisition of the images with the scanning speed if one want that the scale of the image is the same following axes X and Y. The final improvement of a different scale along the axes is possible with [SCALE](#) command which acts independently as X and Y.

Command [WIN WEBCAM](#) is useful to isolate the strictly necessary of the image during acquisition (some pixels on the right and on the left of a spectral line for example).

SCAN2PIC2 [NAME] [X0] [NUMBER]

(a spectroheliogram construction family command - see [Lhires 3](#) spectrograph documentation).

SCAN2PIC3 [NAME] [X0] [NB COL] [IMAGES NUMBER]

(a spectroheliogram construction family command - see [Lhires 3](#) spectrograph documentation).

SCAN_CALIB [NAME] [NUMBER]

Method of synchronization of PC time. [Click here](#) for an application example.

SETBASE [BASE]

Define the first index for an input sequence for the commands CONVERTBMP, CONVERTBMP24, CONVERTBMP24BW, CONVERTTIFF, CONVERTTIFF24 and CONVERT24BW. The default value is 1. The over typical value is 0. For this enter the command:

```
SETBASE 0
```

SETFINDSTAR [SIGMA]

Define the threshold above the noise for stars detection with [FINDSTAR](#) and [COREGISTER](#) commands. The RMS noise in the background image is determined, then the threshold is : [SIGMA] x (RMS noise). The default value for SIGMA is 7. Example:

```
SETFINDSTAR 10  
set the sigma coefficient to 10.
```

SETMATCH [METHOD]

IRIS includes two algorithms to find correspondences between two star lists. This type of algorithm is in the heart of astrometrics functions and registration commands like COREGISTER.

Using

```
SETMATCH 2
```

Selects the new improved algorithm (see [new improved algorithm](#) for details)

Using

```
SETMATCH 1
```

Selects to original algorithm. This is the default setting.

SETNBSTAR [NUMBER]

Set the number of the brightest object used during the matching process of command like [COREGISTER](#), full Deep-sky registration or astrometry. The default value is 30 objects, but some time it is necessary to increase this number (max value is 200) if the matching fail. If you run the command without argument, the actual default value is returned. The fixed value is conserved if you re-start the software.

SETREGISTER [POLYNOM ORDER]

Define the order of the polynom for registration with the [COREGISTER](#) command. The default is a polynom of degree one. If it is necessary to correct distortion between images you can increase this value. The max value is 5. Example:

```
SETREGISTER 2  
set the polynom to the order2.
```

SETSPLINE [MODE]

If you carry out command SETSPLINE 0 all operations of registrations run since the line of commands use the bilinear interpolation to calculate the registered images. If you carry out command SETSPLINE 1 same the operations use the spline interpolation method. The advantage of the spine interpolation spline is a less smooth of the images and thus a better preserved details. On the other hand the calculating time is longer. The commands concerned are for example REGISTER, PREGISTER, CREGISTER, RREGISTER. For the simple translation or the simple rotation of the image in memory you can use commands STRANS and SROT to profit from the spline interpolation spline (symmetrical functions the TRANS one and ROT which use they a bilinear interpolation). The profit of the spline mode is particularly visible in deep sky imagery.

The interpolation spline was already present in the preceding version of IRIS, but only for the accessible commands since the menus (for example the command **Registration of stellar images...** of **Processing** menu).

SETSUBSKY [SIGMA] [POLYNOM ORDER]

Define the polynom order for the fit of the sky with the [SUBSKY](#) command and the threshold above the noise for background detection. The default value are standard for the majority of situations (SIGMA=5, POLYNOM ORDER=3). Example:

```
SETSUBSKY 8 1  
set the fit to order to one and the sigma coefficient to 8.
```

SET_DATE [DATE]

Modify the date of acquisition of an image. Example: SET_DATE 16/09/2000

SET_FITS [BSCALE] [BZERO]

If necessary define *manually* the parameters BSCALE and BZERO before loading a FITS image (for example for fit the dynamics to the authorized range for Iris [-32768..32767] for difficult case like no full compatible FITS header).

The operation of command SET_FITS was extended to make adjustment of the dynamic during conversion of 32-bits real FITS files. Remember that if x is the value of a pixel in file FITS, the value x' managed by Iris is then:

$$x' = \text{BSCALE} \cdot X + \text{BZERO}$$

For example, before loading images FITS coded with very small real numbers:

```
> SET_FITS 5000 0
```

SET_HOUR [HOUR]

Modify the hour of acquisition of an image. Example:

```
SET_HOUR 20:05:45
```

SHARP [COEF]

Apply [a high-pass filtering](#) to an image. The value of the parameter [COEF] is the force of the filter (between 0 and 1). The synonymous name is **CRISP**.

SIGNED

Convert 16 bits unsigned in-image to a 16 bits signed image. Usefull for some imported images.

See also: [LOADSX](#), [CONVERTSX](#).

SKY2REC [RA] [DEC]

Starting from the polynomial files POLX.POL and POLY.POL (created by [Astrometry/Photometry](#) dialog box), SKY2REC returns the Cartesian coordinates of a point on the image whose equatorial coordinates are in the parameters ([alpha], [delta]). Example:

```
SKY2REC 8H34M20.3s -05d12'34"
```

SLANT [Y0] [ALPHA]

Rectification of tilted stellar spectra. [See here](#) for an application.

SLANT2 [INPUT] [OUTPUT] [Y0] [ALPHA] [NUMBER]

Equivalent to [SLANT](#), but for an images sequence.

SMAX [NAME] [NUMBER]

For a given pixel in the output image, SMAX calculates the maximal of the intensities of the corresponding pixels in a set of images whose generic name is in the parameter [name]. The number of image in the stack is [number].

See also: [SMIN](#).

SMEDIAN [NAME] [NUMBER]

For a given pixel in the output image, SMEDIAN calculates the median of the intensities of the corresponding pixels in a set of images whose generic name is in the parameter [name]. The pixel in the output image is set to the value of the median intensity.

The generic name is the root of the name of an image which is completed by a number and an extension. The first number added is 1 and the last is [number]. Thus, with the generic name "image" and [number]=5, the processing will act on the images:

IMAGE1.PIC
IMAGE2.PIC
IMAGE3.PIC
IMAGE4.PIC
IMAGE5.PIC

Recall the definition of the median. Start with the set of numbers:

5, 9, 1, 0, 3

Arranging these numbers in an increasing order gives:

0, 1, 3, 5, 9

The median value is the number 3.

At the end of the calculations, SMEDIAN provides the percentage of the contribution from each input image to the final median image.

The maximum number of images is 19 (see also: SMEDIAN2).

Example:

```
SMEDIAN IMAGE 5
```

The principal application of SMEDIAN is the calculation of a flat-field from a sequence of images containing stars. For the flat-field to be correct, the field of view should be different for each image in the sequence. This way, the median flat-field will not have stars, since there is little chance that a star would be on the same pixel on all the images in the sequence if the number of images is relatively high (greater than or equal to 5).

On the other hand, SMEDIAN can be used on a set of centered deep sky images. In this case, you obtain an image with the same density as an individual image, but on which most of the artefacts have been eliminated (electronic interference, cosmic rays, satellite tracks, etc.).

Before calculating the median image, it is important for each image in the set to have the same signal level (see NGAIN2 and NOFFSET2 commands).

It is good to compare this image with one of the individual images to see that in the flat-field image the stars have totally disappeared and the noise is noticeably attenuated.

It is important to study the contribution of each input image to the median image. Ideally, the percentage for each image would be identical. In this case, since we have used 5 images, the

percentage for each one should be about 20%. Any significant difference is a sign of an anomaly. This is one way to find that an image is not homogeneous with respect to the others (bad offset, for example).

[Click here](#) for a typical application example.

SMEDIAN2 [NAME] [NUMBER]

Same command as SMEDIAN, slower but unlimited as far as the number of images is concerned.

SMILE [Y0] [RADIUS]

Change the curve of the spectral lines to compensate an distortion optical defect of *smile* type, a traditional problem in spectrograph. The parameter [RADIUS] is the radius of curvature of the spectral lines. [Y0] is the vertical coordinates corresponding to the vertex of the curve. For an example, [click here](#).

SMILE2 [IN] [OUT] [Y0] [RADIUS] [NUMBER]

Same command that SMILE but applying to a sequence of image. This makes it possible to correct the distortion of the spectral lines in order to make them quite right, which is in particular significant in a command like [SCAN2PIC](#) during the synthesis of a spectroheliogramme of the Sun.

SMIN [NAME] [NUMBER]

SMIN calculates the minimal intensities of a stack of [number] images of generic name [name]. Click [here](#) for an application.

See also: [SMAX](#).

SPLIT_CFA [C1] [C2] [C3] [C4]

This function concern only RAW images of digital camera (DSLR). The command split the CFA structure into four distincts files (one for each of the colors/positions in the periodic Bayer matrix). One image contain the intensity of red pixels, two images contains the intensity of green pixels, and one image contain the intensity of bleu pixels. These four images can be processed individually, then recombined in a new single image CFA with [MERGE_CFA](#) command.

SPLIT_CFA2 [IN] [A] [B] [C] [D] [NUMBER]

Separate the pixels R, G and B of a sequence of images CFA (Bayer matrix pixels organisation) in 4 distinct images (an image for the red pixels, an image for the blue pixels, two images for the green pixels). [Click here for details](#).

SQR [NAME1] [NAME2] (or SQREGISTER [NAME1] [NAME2])

Same as [QR](#) command, but use spline interpolation. [Click here for details](#).

SQR2 [NAME1] [NAME2] (or SQREGISTER2 [NAME1] [NAME2])

Same as [QR2 command](#), but use spline interpolation. [Click here for details](#).

SROT [CX] [CY] [ANGLE]

Command similar to ROT but using the spline interpolation instead of the bilinear interpolation. SROT makes it possible to obtain images having a factor of smoothing less significant than ROT, which preserves resolution.

STAT

Return global statistic of the image.

STAT2 [X1] [Y1] [X2] [Y2]

Calculate the local statistics of an image. The coordinates of the calculation area are delimited by (x1, y1)-(x2, y2).

STAT3 [NAME] [NUMBER]

Calculate global statistics of a sequence of images. The result is a text file named "STATS.LST" in the working directory with 6 columns:

```
Column 1: name of the image.  
Column 2: mean intensity.  
Column 3: maximum intensity.  
Column 4: minimal intensity.  
Column 5: standard deviation.  
Column 6: median intensity.
```

STAT4 [NAME] [X1] [X2] [Y1] [Y2] [NUMBER]

Same function as [STAT3](#), but applying to a part of the images.

STRANS [DX] [DY]

Command similar to STRANS but using the spline interpolation instead of the bilinear interpolation. STRANS makes it possible to obtain images having a factor of smoothing less significant than TRANS, which preserves resolution.

SUB [NAME] [OFFSET]

Subtract to the image in memory the image on disk designated by [name]. The constant value [offset] is added to the result.

SUB2 [IN] [OPERAND] [OUT] [OFFSET] [NUMBER]

Subtracts from the [number] images of a sequence of images with the generic name [in] the image [operand] then adds the value [offset] to these images (see the command SUB). [out] is the generic name of the output images.

SUBSKY

Computes the level of the local sky background and subtracts it from the image. The level is determined from 2000 points in the image (avoiding stars and galaxies). From these measures, by default, a 3rd-degree polynomial is computed that fits the sky background. A synthetic image is then created and subtracted from the original one. See also: [SETSUBSKY](#).

SUBSKY2 [IN] [OUT] [NUMBER]

Same as SUBSKY but for a sequence of NUMBER images.

SUBSTITUTE [NAME1] [NAME2] [DELTA]

Performs the pixel by pixel comparison of the images [NAME1] and [NAME2], and for each of these pixels:

```
if ABS([NAME1]-[NAME2])>[DELTA] then
    result = [NAME2]
otherwise
    result = [name1]
```

(ABS signifies absolute value).

The SUBSTITUTE command is used in conjunction with the image modeling commands (i.e. [FIT ELLIPSE](#) command) in order to suppress the stars in the original image. This creates a new image that is better analyzed after a second pass.

There are three steps:

1. Build a rough model of the original image;
2. Apply SUBSTITUTE in order to produce an image that is close to the original, but where the zones that are difficult to model (stars, etc.) are replaced by their equivalent in the calculated model;
3. Calculate a second model from the image determined in the preceding step. This model is generally more satisfactory than the first.

SV0 [FILE NAME]

Run a script file (.lst extension) for develop sequence of RAW DSRL images and compute a full preprocessing (see detailed explanation [here](#) - file survey.pdf, 8.2 Mb) .

SV1 [FILE NAME]

Run a script file (.lst extension) for develop sequence of RAW DSRL images, compute full preprocessing, find the sky background, select reference stars on the images, match with a reference catalogue, correct optical, and finally obtain plate solution via least square fit (see detailed explanation [here](#) - file survey.pdf, 8.2 Mb) .

SV2 [FILE NAME]

Run a script file (.lst extension) for project sequence of astrometric reduced images on a selected cartographic map, correct difference on the magnitude constant between the images, and finally the images are merged on a common mosaic (see detailed explanation [here](#) - file survey.pdf, 8.2 Mb).

SV3 [FILE NAME]

Run a script file (.lst extension) for draw line, circle or points on a cartographic projection (see detailed explanation [here](#) - file survey.pdf, 8.2 Mb).

SYM [CX] [CY]

Copies a part of an image into another part of this image symmetrically with respect to the point ([cx],[cy]). The window to copy has to be drawn first with the mouse.

Symmetry with respect to a point is used to suppress an undesired object in an image. The area containing the object is replaced by a similar area taken from the same image. The duplicated area should not, of course, contain undesirable objects itself. For a deep sky image, make sure that the sky background has the same value in the two zones. The SYM command can be used to erase certain defects in an image (cosmic rays, etc.). It is often used in conjunction with the FIT ELLIPSE command to suppress the bright stars in the object to be modeled.

For example, let's suppress the star in front of the elliptical galaxy UGC 4170 (see [here a tutorial](#)) at the coordinates (50,91). Using the cursor, we find that the center of the galaxy is, to within a pixel, (66, 103). The process is the following:

```
LOAD U4170
VISU 560 370
Drag the star
SYM 66 103
VISU 560 370
```

SYNTHE

Synthesizes an image from polynoms created by the command [POLY](#).

The whole procedure is as follows:

- Load the image to process and visualize it.
- Type [POINTON](#)
- Select hundreds of points avoiding stars and any object in the field.
- Compute the polynoms, e.g. by typing POLY 3
- Synthesize the background by typing: SYNTHE
- Save the synthetic background, e.g. SAVE SKY
- Reload the original and subtract the background (add a constant to make the visualization easier):
SUB SKY 500
- Go back to standard mode: POINTOFF

Click [here](#) for an example.

See also: [SUBSKY](#) that performs all these procedure with a single command.

SYNTHE_SUN [X_CENTER] [Y-CENTER] [RADIUS] [WAVELENGTH] [INTENSITY]

Produce a synthetic image of the sun disk taking into account a realistic the limb darkening. The algorithm is based on the H. Neckel model (see H. Neckel, Solar Physics, 229, 13-33, 2005). The input parameters are:

(x-center, y-center) = the coordinate in pixel (and fraction) of the disk center.

(radius) = the radius (in pixels) of the synthetic disk.

(wavelength) = the wavelength in nanometer (the solar limb darkening is a function of wavelength). The accepted range is between 385 nm and 1100 nm.

(intensity) = the disk center intensity.

Typical application is a dramatic enhancement of faint contrast features on solar images, i.e. after subtraction of an observed image and the synthetic image.

T_ADD [R] [G] [B] [NUMBER]

Addition of the images of each color planes (equivalent [ADD2](#)). Operation carried out:

$(R_1+R_2+\dots+R_n, G_1+G_2+\dots+G_n, B_1+B_2+\dots+B_n) \rightarrow [R], [G], [B]$

For application examples of T-Tools commands, [click here](#).

T_ADD_NORM [R] [G] [B] [NUMBER]

Even operation that T_ADD but standardizes the images on level 32000 with the need if this level is exceeded (equivalent [ADD_NORM](#)).

T_COMPOSIT [R] [G] [B] [SIGMA] [NB ITER] [FLAG MAX] [NUMBER]

Produce three images [R] [G] and [B] by making an optimal addition of the images of the sequences $R_1\dots R_n, G_1\dots G_n, B_1\dots B_n$ (equivalent [COMPOSIT](#)). The procedure is iterative if [NB ITER] is higher than 1. The threshold of rejection of the bad values is adjusted by the variable [SIGMA] (typical real value between 2 and 3). Level 32000 after addition is not exceeded if FLAG MAX = 1 (a normalization of the intensities is done). Limited to 19 input frames.

T_COPY [in R] [in G] [in B] [out R] [out G] [out B] [NUMBER]

Duplicate a trichromatic sequence. Carry out the operation:

$(in R_1\dots in R_n, G_1\dots in G_n, B_1\dots in B_n) \rightarrow (out R_1\dots out R_n, out G_1\dots out G_n, out B_1\dots out B_n)$

T_CREGISTER [THRESHOLD] [NUMBER]

Registration of planetary images by adjusting a circle on level [THRESHOLD] around planet limb (equivalent to [CREGISTER](#)).

T_DIV [R] [G] [B] [NUMBER]

Divide the sequences R1... Rn, G1... Gn, B1... Bn by the images [R], [G] and [B] (equivalent has [DIV](#), but the parameters of standardization is calculated automatically in T_DIV). Carry out the operation:

$(R1/[R]... Rn/[R], G1/[G]... Gn/[G], B1/[B]... Bn/[B]) \rightarrow (R1... Rn, G1... Gn, B1... Bn)$

T_GAUSS [SIGMA]

Convolution by Gaussian of the trichromatic image defined by the file R, B and B. Equivalent to command [GAUSS2](#).

T_MULT [coef R] [coef G] [coef B] [NUMBER]

Multiply each image of the sequences R1... Rn, G1... Gn, B1... Bn by constants (equivalent with [MULT2](#)). Carry out the operation:

$(R1*[coef R]... Rn*[coef R], G1*[coef G]... Gn*[coef G], B1*[coef B]... Bn*[coef B]) \rightarrow (R1... RN, G1... Gn, B1... Bn)$

T_NGAIN [NORM] [NUMBER]

Multiply each images of the 3 sequences by a constant calculated by Iris in manner what the median level of each image is equal to [NORM] (equivalent with [NGAIN2](#)). This command is in particular used for stack flat-field images before median composite.

T_NOFFSET [NORM] [NUMBER]

Add (or subtract) to each images of the three sequences a constant calculated by Iris in manner what the median level of each image is equal to [STANDARD] (equivalent [NOFFSET2](#)). Useful to bring at the same the level the sky background on deep-sky images.

T_OFFSET [offset R] [offset G] [offset B] [NUMBER]

Add a constant to each images of the sequences R1... Rn, G1... Gn, B1... Bn (equivalent with [#OFFSET2](#)). The constants can have negative values. Carry out the operation:

$(R1+[offset R]... +.Rn+[offset R], G1+[offset G]+... +Gn+[offset G], B1+[offset B]+... +Bn+[offset B]) \rightarrow (R1... RN, G1... Gn, B1... Bn)$

T_PREGISTER [SIZE] [NUMBER]

Equivalent with PREGISTER for the registration of the planetary images. Registration is calculated on the sequence G1... Gn then is the parameters of translation are applied to the sequences R1... Rn, B1... Bn. It is thus supposed that it is the green component of the three-colour process which presents the best details and contrasts.

T_PREREGISTER [NUMBER]

Equivalent with command [PREREGISTER](#).

T_REGISTER [NUMBER]

Equivalent with command [REGISTER](#). Ideal for the deep-sky images (uses the position of a reference star to be selected in the first images of one of the series, image G1.FIT for example).

T_RESTORE

Carry out the opposite operation of T_STORE : restore in the files image R, G and B the contents of file # R, # G and # B.

T_SCALE [OPTION] [FX] [FY]

Change the scale of a trichromatic image defined by the files R, G and B. Same parameters as command [SCALE](#).

T_SELECT

Simultaneous sort by decreasing quality the images in the red, green and blue planes (equivalent to [SELECT](#)). It is necessary to have run before command [BESTOF](#) on one of the components trichromatic (the green one for example).

T_SMEDIAN [R] [G] [B] [NUMBER]

Median stack of the sequences R1... Rn, G1... Gn, B1... Bn by producing the images [R] [G] and [B] (equivalent with [SMEDIAN](#)). Algorithm fast but limited to 19 images.

T_SMEDIAN2 [R] [G] [B] [NUMBER]

Even function that T_SMEDIAN, slightly slower but the number of images is unlimited (equivalent to [SMEDIAN2](#)).

T_STORE

Copy the three images having for name R, G and B respectively in files # R, # G and # B.

T_SUB [R] [G] [B] [NUMBER]

Subtract the images [R], [G] and [B] to the sequences R1... Rn, G1... Gn, B1... Bn (equivalent with [SUB2](#) or [SUB](#)). Carry out the operation:

$$(R1-[R]... Rn-[R], G1+[G]... Gn+[G], B1+[B]... Bn+[B]) -> (R1... Rn, G1... Gn, B1... Bn)$$

T_TRICHRO or T_TR

Display a color image color from the files images R, G and B.

T_UNSHARP [SIGMA] [COEF] [FLAG]

Display a color image starting from the files images R, G and B, but applies a unsharp masking filter with each components as a preliminary. Same parameters as command [UNSHARP](#).

T_UNSHARP2 [SIGMA] [COEF] [FLAG] [NUMBER]

Calculate the unsharp masking of each images of the three sequences (equivalent with UNSHARP2).

TCL [SCRIPT] [PARAMETER₁] [PARAMETER₂] ... [PARAMETER_N]

Execute a Tcl script. [SCRIPT] is the name of the scripting file in the disk. [PARAMETER₁], [PARAMETER₂], etc is a variable number of parameters for the script. For details about the powerfull TCL command see the [ASTP protocol Web page](#).

TEXT [TEXT] [X] [Y] [INTENSITY]

Allows to write a text in the image. This function modifies the intensity of the pixels in the 16-bits image. You can retrogress while using the button "undo" tools bar.

[TEXT] is the contents of the text.

[X] and [Y] are the coordinates in pixels of the position of the beginning of the text.

[INTENSITY] is the intensity of the text, a number ranging between 0 and 32767.

Example:

```
Text Zeta_Tau_____April_2002 30 5 32000
```

Note the use of the character " _ " to write white.

TH_CUT [IN] [OUT] [HIGH LEVEL] [LOW LEVEL] [NUMBER]

Adjusts thresholds of visualization [HIGH LEVEL] [LOW LEVEL] for a sequence of images having the generic name [IN]. The generic name of the output images is [OUT]. [See here](#) an application example.

TIFF2PIC [IN] [OUT] [NUMBER]

Convert a sequence of TIFF file to PIC or FITS sequence.

TILT [X0] [ALPHA]

Rectify a spectrum whose axis of dispersion forms an angle [ALPHA] compared to the horizontal axis of CCD sensor. Calculation is done by vertically shifting each column of the adequate fraction of pixel. The pivot of rotation is located at the horizontal coordinate [X0] counted in pixels. The angle is in degrees and can be signed. [Click here](#) for an application.

TIME

Return the actual hour.

TRACK [NAME] [NUMBER]

Analyze a star selected in a sequence of images and produces files DX.DAT, DY.DAT, and STAT.DAT allowing to observe the drift of a telescope according to time.

The content of file STAT.DAT is column by column:

The image index
The X-shift relative to the first image of the sequence
The Y-shift relative to the first image of the sequence
The absolute X coordinate of the selected object
The absolute Y coordinate of the selected object
The FWHM along X-axis
The FWHM along Y-axis
The integral of the stellar PSF
The local sky-background value
See application example [here](#).

TRAIL [Y0] [Y1] [Y2]

Align the points of drift star trace or a spectrum. [Click](#) to see an application.

TRAIL2

Interactive version of TRAIL, requiring only two clicks of the mouse upper and downer of a star trail or a spectrum to obtain a straight trail or a straight spectrum.

TRANS [DX] [DY]

Translates the current image by [DX] along the X axis and by [DY] along the Y axis. The calculation is performed using bilinear interpolation. Example:

```
TRANS -12.3 4.02
```

Translates the image by -12.3 pixels along the X axis and by 4.02 along the Y axis.

Translation is a fundamental tool that is often used to center a set of images with respect to each other so that they can easily be compared and processed (for example, summation of a set of images).

In the following example, translation is used to produce two images which are slightly shifted from each other, starting from the same original. The difference of these two images gives a characteristic bas-relief effect (or gradient effect):

```
LOAD M51  
TRANS 1 0  
SUB M51 100  
VISU 150 50
```

TRANS2 [IN] [OUT] [DX (PIX./HOUR)] [DY (PIX./HOUR)] [NUMBER]

Transform a sequence of image into another sequence by making a translation of a certain number of pixels depending on the hour of acquisition of the images and the shift in X and Y specified in parameters (in pixels per hour). The typical use is the centering of a sequence on the movement of a comet or of an asteroid in such a way that this object appears fixed after stacking. One generally proceeds in two times: registration on a star of the field ([REGISTER](#) command for example), then,

application of the command TRANS2 command. Supposing that the ephemeris (or a direct measurement in the image) teach us that mobile object moves 0.230 pixel/hour in X and of -0.763 pixel / hour in Y in the sequence I1, I2, I3... I20. One obtains a new sequence J1, J2.... J20 where the movement of the object is cancelled while making:

```
TRANS2 I J 0.230 -0.763 20
```

[Click here](#) for an exemple of the use of TRANS2.

TRICHRO [R] [G] [B]

Load R, G & B 16 bits componants of a tri-color image and vizualise the 24-bits results. Example:

```
TRICHRO M57R M57G M57B
```

UNSHARP [SIGMA] [COEF] [FLAG]

The UNSHARP command performs filtering by unsharp masking on the current image.

This type of filtering is high pass: it tries to eliminate the low frequencies in the image, accentuate the high frequencies and then add them, with a weighting factor, to the original image. The process is:

- Convolve the image to be processed by a gaussian whose width is in the parameter [sigma] (see the [GAUSS](#) and [GAUSS2](#) commands).
- Subtract the result of this convolution from the original image. The result is an image with an average level close to zero, and whose low frequencies (slow variations in the image) have been strongly attenuated. At this stage, a positivity constraint can be applied (this sets all the negative values to zero). If [FLAG]=0, the constraint is not applied. This option should be used for processing planetary images. If [FLAG]=1, the constraint is applied. This option should be used for processing deep sky images.
- Multiply the result of the preceding step by the constant whose value is in the variable [coef], then add it to the original image. The result is the final image.

Unsharp masking is a very simple, but nevertheless powerful tool for enhancing the contrast of an image. It is one of the basic tools for planetary image processing.

With Iris, unsharp masking can easily be performed with the [GAUSS](#) (or [GAUSS2](#)), [SUB](#), [MULT](#), and [ADD](#) commands. The UNSHARP command simply puts all these operations into one command.

The values of the variables [SIGMA] and [COEF] need to be adjusted by trial and error. As a general rule, a small [SIGMA] (<1) and a large coefficient enhance the finest details, but then the noise may become overwhelming.

UNSHARP2 [IN] [OUT] [SIGMA] [COEF] [FLAG] [NUMBER]

Same as command [UNSHARP](#) but for a sequence of images.

UNSHARP3 [SIGMA] [COEF] [EDGE TUNING] [FLAG]

Has a similar effect to the **Unsharp Masking...** dialog box in the **Processing** menu. [Click here](#) for details.

UNSHARP_TRICHRO [R] [G] [B] [SIGMA] [COEF] [FLAG]

Carry out an operation of filtering of unsharp masking type on the three components of a trichromy image at the same time and display the result.

Syntax is similar to command [UNSHARP](#) but it is necessary to provide the name of the three images correspondents to the red, green and blue channel. For example for a planetary image one will do something which resembles:

```
UNSHARP_TRICHRO R G B 1.8 4 1
```

VANCITTERT [FWHM] [#ITER]

Restores an image with the Van-Cittert method. [#ITER] gives the number of iterations to be performed (typically between 5 & 20), whereas [FWHM] is the characteristic FWHM of the stars in the image to restore.

Before running the command, lower the sky background to a level close to zero (use the OFFSET command for example). Example:

```
LOAD M51  
OFFSET -100  
VANCITTERT 1.8 5
```

VIDEO [X1] [X2] [INTEGRATION TIME] [SIZE OF A BLOCK] [BLOCK NUMBER]

Acquisition in VIDEO mode with the Audine camera. [Click here](#) for more details.

VIDEO_GRID [SIZE]

Display in the image a horizontal grid with a step in pixel equal to the value of the parameter size]. This grid is a help to position at the good place objects for the VIDEO mode acquisition (Audine CCD camera). You can also reveal this grid by typing with the keyboard simultaneously the combination of key <Ctrl><F6> (you must have click in the image before).

VIEW [NAMZ] [HIGH] [LOW] [NUMBER]

Display a sequence of images of generic name [NAME] by using the visualization thresholds [HIGH] and [LOW]. See also the command TH_CUT (which modifies the thresholds in the header of the images).

VISU [HIGH] [LOW]

Display an image with HIGH as the high threshold and LOW as the low threshold.

WAVELET [OUT1] [OUT2] [SCALE]

The WAVELET command performs a [wavelet transform](#) on an image. This analysis decomposes the current image into images that each show details of increasing scales. This amounts to [multiresolution analysis](#) of the initial image.

The algorithm used in Iris is called "à trous" ("with holes"). It calculates an approximation to the input image by considering only the pixels on the crossings of a mesh whose step varies by a factor of 2 between two scales. In a way, as the scale increases, you see the objects as they would look if you moved away from them by a factor of 2 from one decomposition to the next.

Points that are between the mesh crossings are approximated with an interpolation function - the wavelet. The interpolation is done with a 3x3 matrix. Many classes of wavelets can be defined, but they all have common characteristics (in particular, they are functions with a zero average). Wavelet analysis is a new method for interpreting the contents of images. It studies structures of different sizes in the image, and analyzes their relations. It is called analyzing the hierarchy of structures of the objects in the image.

The decomposition of the image into structures with distinct scales allows the reconstruction of the initial image so that only the pertinent details remain (the algorithm programmed in Iris permits this reconstruction). This yields a very precise filtering of the image. Note also that wavelets are at the core of some image compression algorithms.

The parameter [OUT1] contains the generic name of the approximated images with increasing scales. The number of scales is contained in the variable [scale]. The image with the smallest scale has the index 1, the following 2, and so on.

The parameter [OUT2] contains the generic name of the images corresponding to the difference between two successive approximations (namely the *wavelet coefficients*). These images contain the details that disappear from one scale to the next (the image with index 1 contains the details from scale 1, the image with index 2 those from scale 2, the image with index 3 those from scale 4, the image with index 4 those from scale 8, and so on).

The number of scales analyzed is in [SCALE]. Typically scale=3 to 5.

Let's perform wavelet analysis on the image M51:

```
LOAD M51
VISU 800 40
```

Wavelet analysis will allow us to study the relationship between structures with different scales (groups, arms, nucleus, etc.). We will also attempt to enhance the appearance of the groups by reconstructing the image.

Perform the transform:

```
WAVELET I J 6
```

The images I1...I6 contain the successive approximations of the image in increasing scales. The images J1...J6 are the wavelet coefficients for the successive scales 1, 2, 4, 8, 16, and 32.

Let's examine the wavelet coefficients for each of the scales:

```
LOAD J1
VISU 100 -100
```

It is difficult to recognize the galaxy on this image. In fact, at the scale 1, the image contains mostly noise, which is why it is so uncorrelated with the input image.

```
LOAD J2
VISU 100 -100
```

At this scale, the nodules in the arms are brought out.

```
LOAD J3
```

```
VISU 100 -100
```

The arms start to be continuous. Note the strong hierarchical relationship of the details between this scale and the previous one.

```
LOAD J4  
VISU 100 -100
```

The large scale structures of the galaxy are becoming evident...

```
LOAD J5  
VISU 200 -200
```

This trend continues...

```
LOAD J6  
VISU 300 -300
```

At this last scale, only the massive central part of the galaxy is visible.

You can, of course, examine the corresponding approximations (images I1.PIC, I2.PIC, etc.). The last one is special since it is the residual of the transform. To understand the contents of this images, imagine how the galaxy would look if you moved away from it while you were observing it through a telescope with constant resolution.

It is possible to reconstruct the initial image by adding the set of wavelet coefficients and the residual:

```
LOAD J1  
ADD J2  
ADD J3  
ADD J4  
ADD J5  
ADD J6  
ADD I6  
VISU 800 40  
or
```

```
ADD2 J 6  
ADD I6
```

However, since we have seen that the coefficients of the first scale only correspond to noise, it is wise to eliminate the details of this scale from the reconstruction. Also, we want to enhance the contrast of the stellar groups. To do this, we will assign a weight greater than 1 to the coefficients corresponding to the details of scale 2 and 4 (the weighting factors of 2 and 1.5 that we have used are arbitrary; it requires several trials to estimate the best values for a given application):

```
LOAD J2  
MULT 2  
SAVE K  
LOAD J3  
MULT 1.5  
ADD K  
ADD J4  
ADD J5  
ADD J6  
ADD I6  
VISU 800 20
```

The noise has been noticeably reduced and the contrast increased.

You have probably noticed that the previous process is very similar to traditional unsharp masking. However, one of the fundamental differences is that the unsharp mask is performed with only one

scale while the WAVELET command offers a multiscale analysis that acts more finely on the contents of the final result. [Click here](#) for some example.

WAVELET2 [OUT1] [OUT2] [SCALE]

Same command [WAVELET](#) but uses 5x5 wavelets.

WAVELET_FILTER [NOISE] [COEF] [NUMBER]

Apply a filter to the current image for noise suppression. For this, WAVELET_FILTER use an evolved procedure that limit resolution degradation. [NOISE] parameter is the RMS noise in the background of the image (it can be measured with the command Statistics from the contextual menu. [COEF] is a rejection noise factor. Typicaly [COEF] value is between 2 et 4. [NUMBER] is the number of wavelet plane (see [WAVELET](#) command). Typicaly [NUMBER] = 5.

Example for M51 image:

```
LOAD M51
WAVELET_FILTER 7.8 3 5
```

WDATE

Write the acquisition date in the image. The same effect is obtained while making: Ctrl+F8. For memory, the combination of Ctrl+F9 keys copies the image in the clipboard.

WHITE

To restore just colors of tri-color images it is some time necessary to the balance the white. IRIS integrates two commands which make it possible to carry out this operation with precision and speed. The second command, WHITE, makes the adjustment of the white itself. The three colors planes are treated simultaneously (as opposed to what made [SCALECOLOR2](#) command). One selects a reputed white area in the image with the mouse (Iris calculates the median intensity in the window). In the case of the planet Mars the polar cap is ideal for that (but attention, one should not have saturated the image at this place due for example to a too long exposure time). Iris turns return the coefficients by which it has to multiply components RGB to adjust the levels in the selected zone.

Note that commands [BLACK](#) and WHITE must be executed in the order given hereafter.

See also the [BLACK](#) command.

WHITE2

Harmonize the three layers of a color image (48-bits) by equalizing the intensity of the same star in these layers (multiplication by suitable coefficient). The program carries out a Gaussian adjustment of star. The selected star must be surrounded by a small rectangle before run the command ([click here](#) for a typical application). See also the command [WHITE](#) which uses the median value of a zone selected with the mouse and the [BLACK](#) command for adjust the background level ([click here](#) for another example).

WIENER [K-PARAMETER]

Wiener inverse filter. The form of the filter is

$$\text{Wiener filter} = \frac{P^*}{|P|^2 + k}$$

where P is the Fourier transform of the PSF, P^* is its conjugate value and k is a constant. The constant k fix the degree of low frequency in the restored image (and the importance of the noise). If $k=0$, a pure inverse filter is applied, but the amplification of the noise can be considerable. Choose k between 1 and 0.0001.

WIENER2 [ITERATION #] [K-PARAMETER]

ITERATION # parameter is the number of iteration of the process. K-PARAMETER is the standard Wiener noise parameter.

WIN

Crop an image interactively. Click with the mouse two points around the area to isolate.

WINDOW [X1] [Y1] [X2] [Y2]

The WINDOW command creates the output image from a window defined in the input image. The window is here defined with the 2 points $([x1],[y1])$, $([x2],[y2])$.

Example:

```
WINDOW 23 45 450 640
```

The WINDOW command allows you to unify the formats of images. This is important when you want to process images coming from different sources.

WINDOW2 [IN] [OU] [X1] [Y1] [X2] [Y2] [NUMBER]

Same command as [WINDOW](#), but applies to a sequence of [number] images having the generic name [IN]. The generic name of the output images is [OUT].

WINDOW3 [SIZE]

The WINDOW3 command allows you to isolate a square area of size [size] in an image. You have to define first the center of the window by drawing a small rectangle around it with the mouse. The WINDOW3 command is useful to prepare images for which size has to be a power of 2

See also command: [PREGISTER](#).

WINDOW4 [IN] [OUT] [SIZE] [NUMBER]

Same function that WINDOW3, but applying to a sequence of images.

WINDOW5 [X-SIZE] [Y-SIZE]

Crop area of size (x-size) x (y-size) centered on the current selection rectangle (use the mouse pointer, see also **WINDOW3** command).

WIN_WEBCAM [X1] [Y1] [X2] [Y2]

Defined coordinates of a window in the images resulting from a webcam source and acquired with the command **Images acquisition of Webcam** menu. Let us suppose for example that the format of the images is 320x240 pixels (**Size of the images...** from **Webcam** menu. If before launching acquisition you type in the console:

```
WIN_WEBCAM 100 1 120 240
```

then, all the acquired images (including in sequence mode of course) will have a size of 20x240 pixels, isolating in the full format image a sub-images delimited by the coordinates (100,120)-(1-240). To reset the full format you must in this example type in the console:

```
WIN_WEBCAM 1 1 320 240
```

(the effect is similar if you leave, then enter the program).

The interest of WIN_WEBCAM is a substantial saving in place on the disc if the object observed is of small size compared to the format of the image. The speed of acquisition is also increased. Another typical application is the acquisition of large number of images of a spectral line of the Sun whereas the disc of this one travels on the input slit of the spectrograph. It is in this manner possible to reconstitute a monochromatic image of the Sun.

See also command: [SCAN2PIC](#).

WORK [PATH]

Definition of the working path from the console. Example

```
>WORK C:\MYIMAGES\SESSION21
```

