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RGB CORRECTION GUI V1.0:

FAST USER MANUAL

Getting started

RGB Image Correction GUI can be easily installed in few steps:

1. Unzip the folder “RGBImageCorrectionGUI”.
2. Open MATLAB, add the folder “RGBcorrection_GUI_v1.0” to the MATLAB path (File -> Set path -> Add Folder).
3. To get started, type RGBcorrection_GUI in the MATLAB command window. The main window of RGB Image Correction GUI will be displayed and ready to use!!

For any question, problem or technical assistance don’t hesitate to send us an e-mail at chimslab.unimore@gmail.com.

Software Presentation

The GUI written in Matlab language includes three algorithms for the standardization of images:

- “**Mean**” and “**Median**” are basic correction methods useful to quickly reduce slight differences between the images;

- “**Calibration**” is an advanced correction method suitable to standardize the images by computing the appropriate regression model, verified case-by-case.

All three methods are based on the following procedure: an image is chosen as *master* image, then each other *slave* image is corrected by comparing the RGB values of standard colours references included in the image scene.

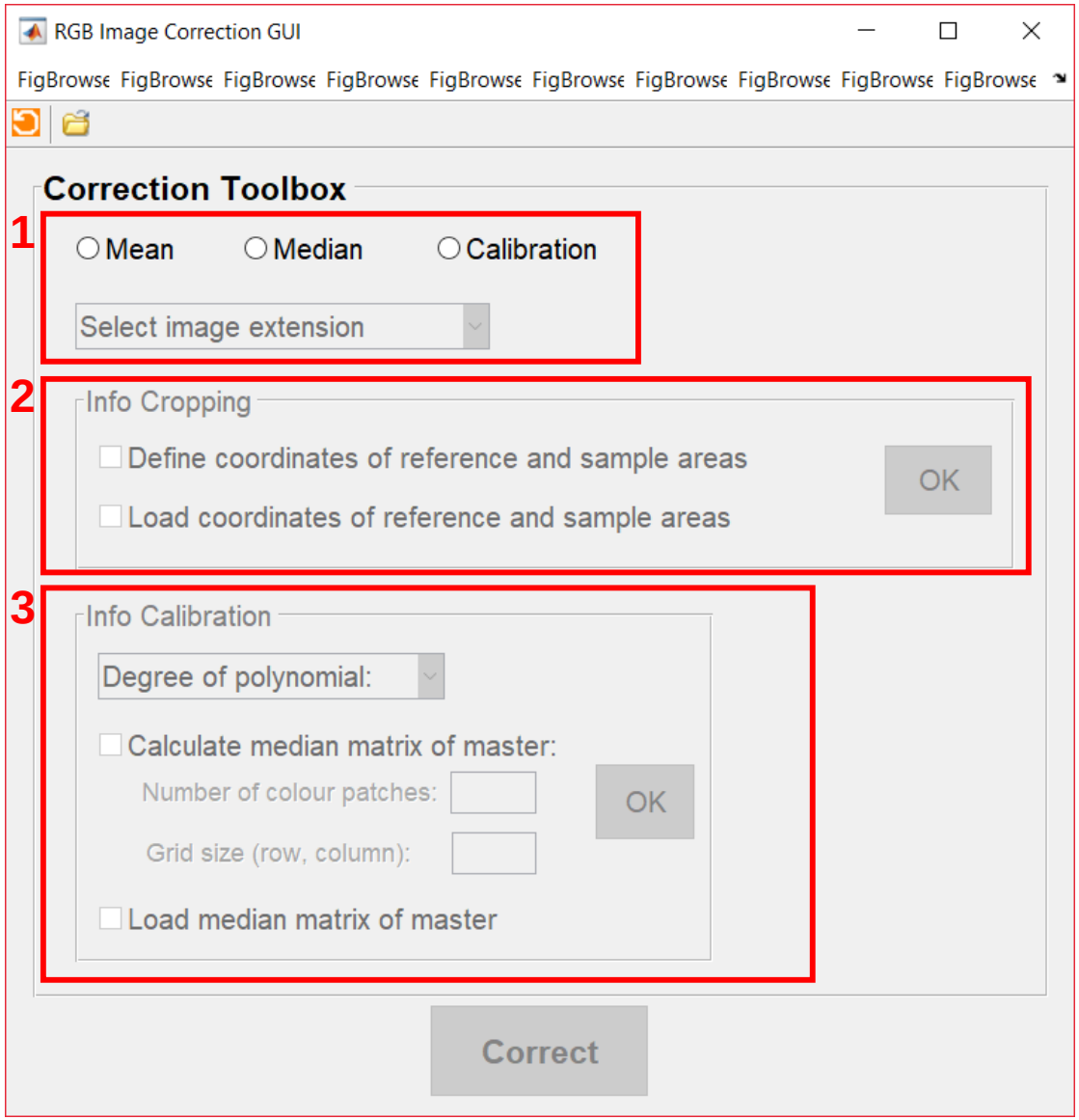
Brief introduction to the algorithms

1. “**Mean**” correction method: the *slave* images are corrected by subtracting to each of them the **difference** computed between the mean of the RGB values of reference area of *master* image and the mean of RGB values of the reference area of the *slave* image to be corrected.

2. “**Median**” correction method: the same procedure described above is followed by computing the median value instead of the mean.

3. “**Calibration**” correction method: the *m* colour patches included in the reference area are selected and each selected colour patch is divided into *n* groups of pixels according to the dimensions established by means of a grid (the default is 2 rows x 2 coloumns = 4 groups). For each pixel group, the corresponding median value of each channel (R, G and B) is calculated and then included in a matrix composed of {(*n* median values × *m* colour patches), 3 channels}.
The calibration step is carried out by computing a **regression model** between the median vector of the *master* image (Y) and the median vector of each one of the *slave* image (X), channel-by-channel.
The significant coefficients of the regression model are used to correct the corresponding sample image.

The RGB Image Correction GUI main window



The main window of the GUI has been subdivided in three subsequent sections reflecting the operating procedure required for computing each one of the correction method:

1. choose the correction method and the image file format;
2. crop the images according to the reference and sample areas;
3. define the information needed for calculating the regression model (section enabled only for calibration correction method).

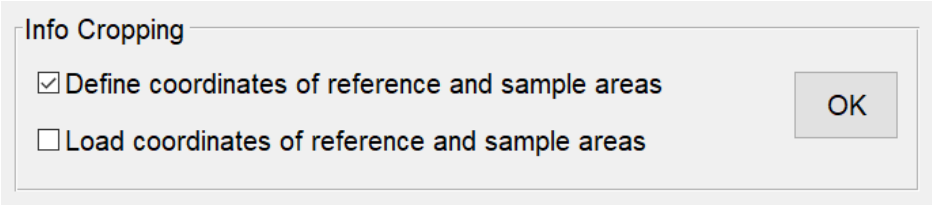
Toolbar – RGB Image Correction GUI

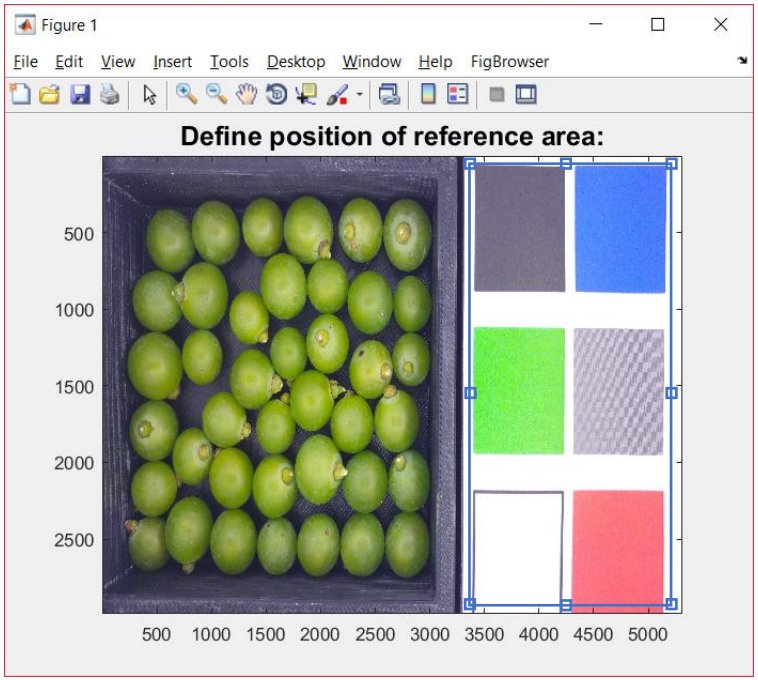
1. Restart: by clicking the button, it is possible to start a new session.

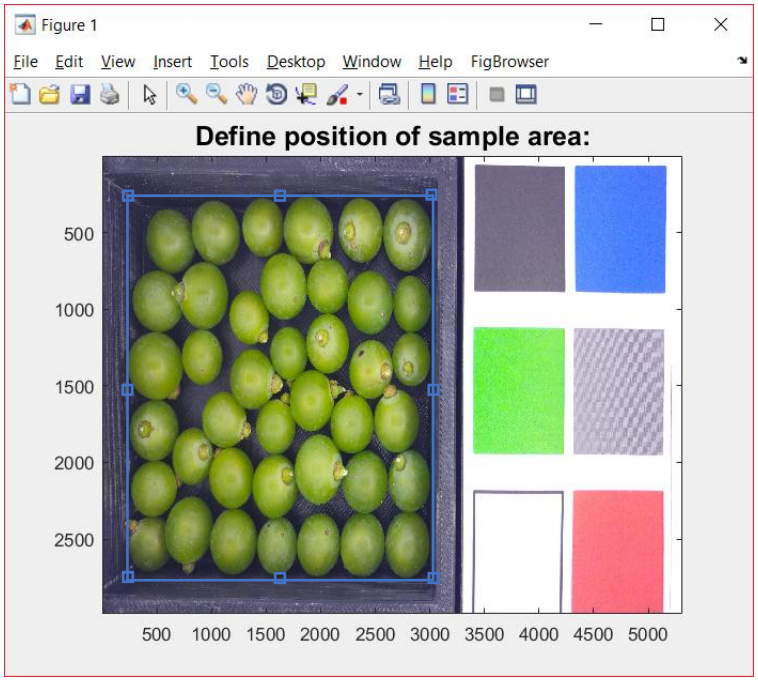
2. Select folder: by clicking on the icon, the user selects the folder containing the images to be standardize. Once the current directory is selected, the corresponding path will be displayed in the toolbar.

Info Cropping: Define coordinates

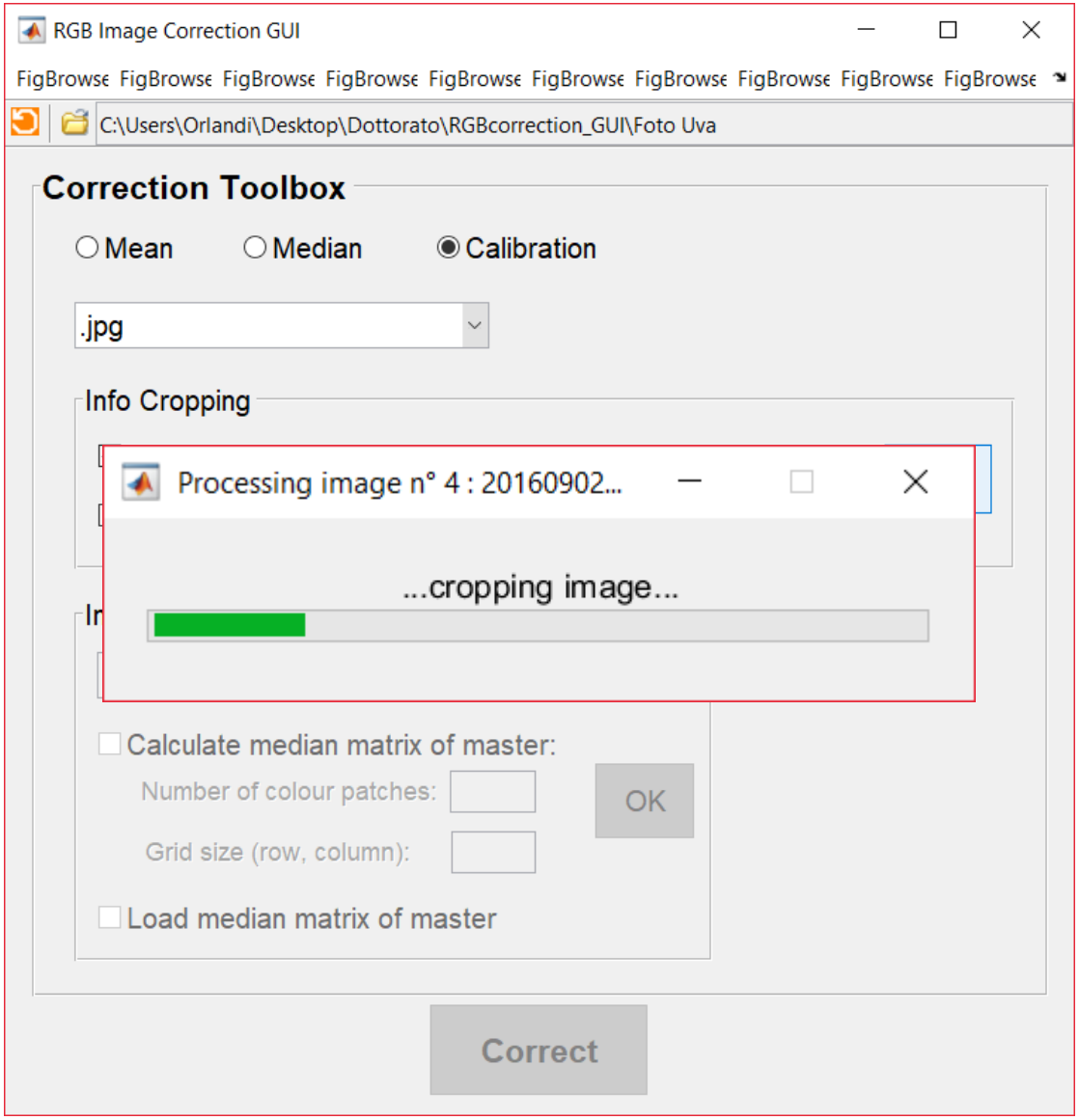
By checking the box “Define coordinates of reference and sample areas” and then clicking the push button “OK”, an interactive Figure displaying the first image contained in the current folder (which is automatically selected as the *master* image) appears. The user can move and resize the rectangle over the image and perform the crop operation interactively using the mouse. Firstly, the user is required to define the position of reference area and then the position of sample area.





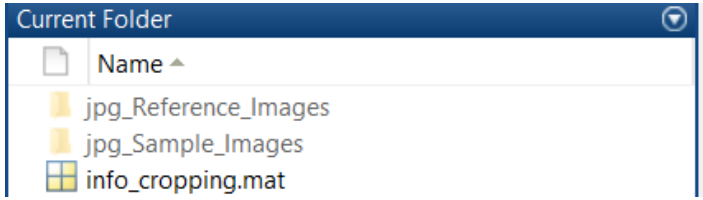


Info Cropping: Define coordinates



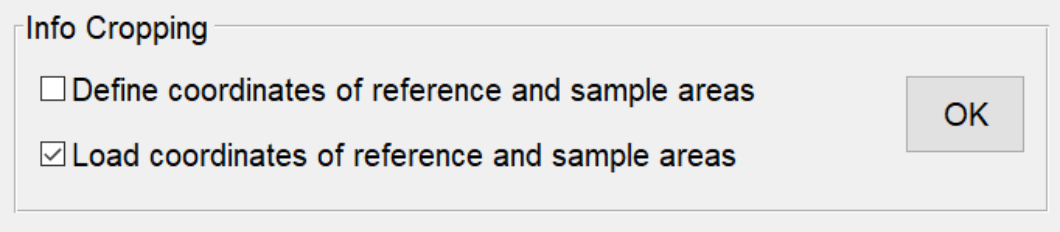
The algorithm automatically applies this selection to crop all the remainder *slave* images contained in the folder.

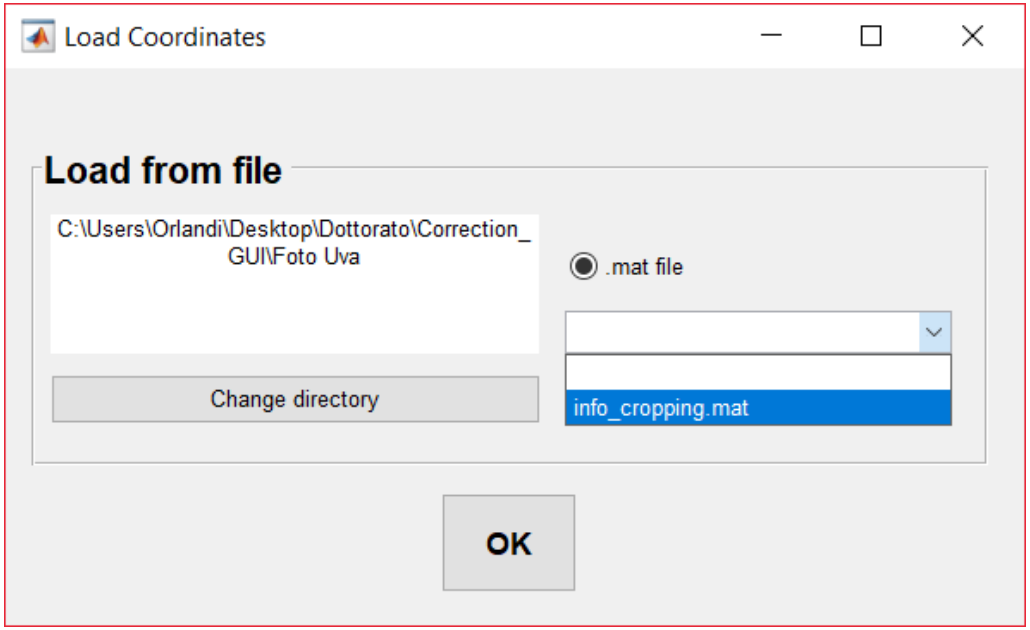
At the end of cropping, the references and samples images are separately saved. A .mat file named “info_cropping” is also saved, which contains the coordinates of reference and sample areas to be used for any subsequent images corrections using the same cropping.



Info Cropping: Load coordinates

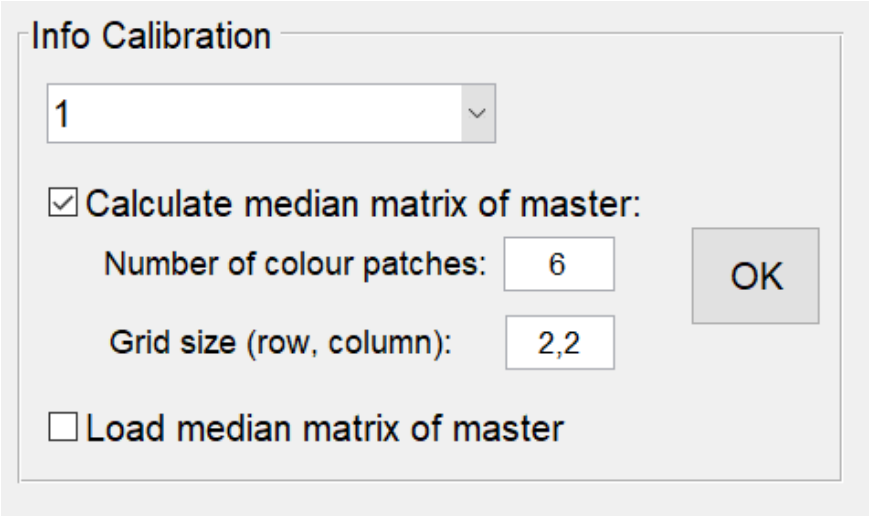
By checking the box “Load coordinates of reference and sample areas” and then clicking the push button “OK”, a window appears and the user has to select the .mat file which contains the previously selected coordinates of reference and sample areas. In this case, the cropping procedure is skipped.





Info Calibration: Calculate median matrix of master

Firstly, the degree of the polynomial can be defined using the corresponding pop-up menu. Subsequently, the user is required to choose between calculating the median matrix of the *master* image or loading a saved .mat file, which contains the previously calculated information concerning the *master* image and the coordinates to automatically select the colour patches of *slave* images.



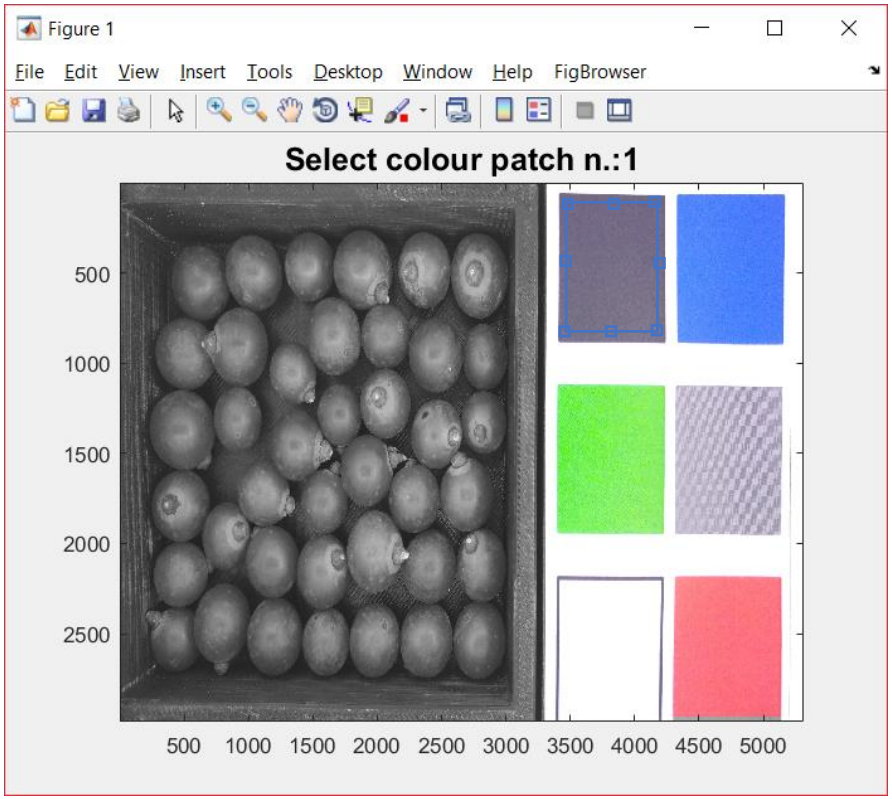
By checking the box “Calculate median matrix of master”, the user is required to writte in the corresponding text boxes:

1. the number of colour patches included in the reference area;

2. the dimensions of the grid that is used to divide each colour patch into different groups of pixels (the default grid size is 2 rows × 2 coloumns = 4 groups). For each group of pixels, the corresponding median value is calculated.

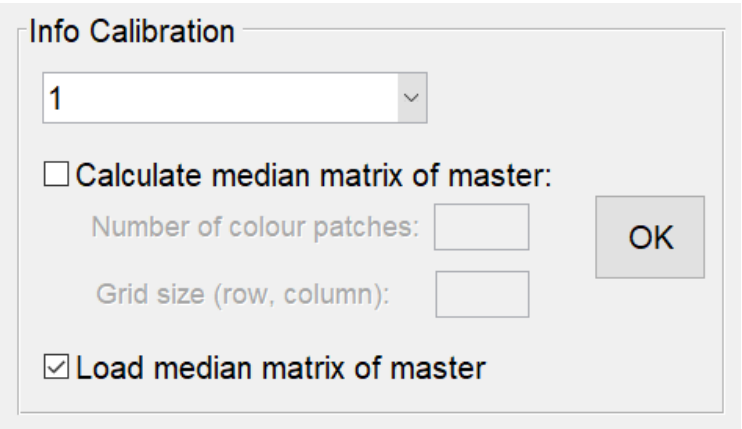
Info Calibration: Calculate median matrix of master

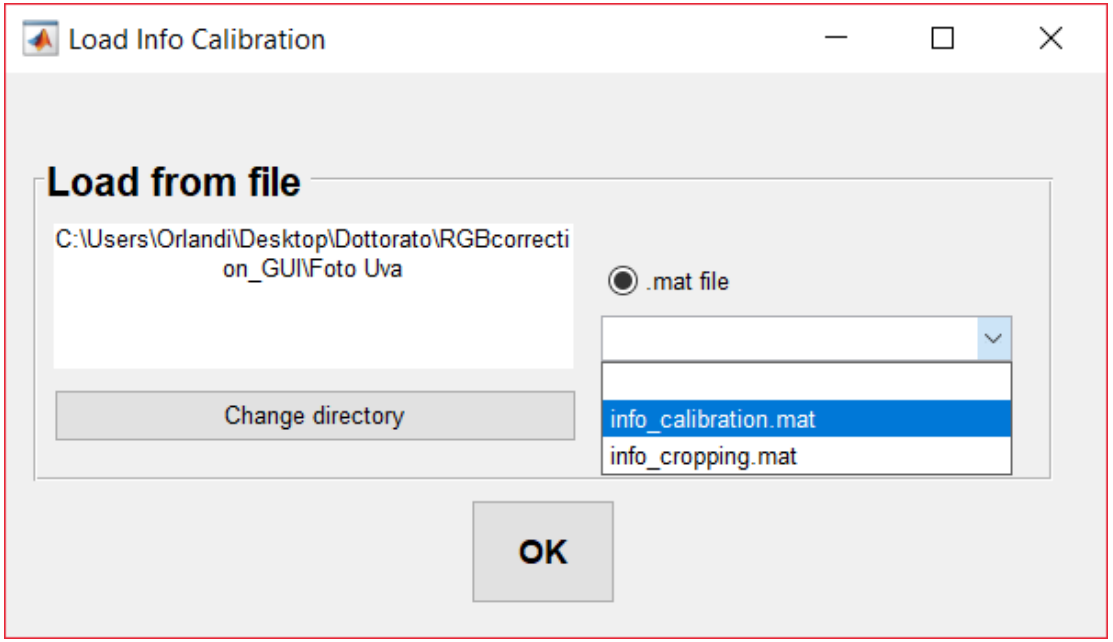
Then clicking the push button “OK”, an interactive Figure displaying the *master* image appears. For each one of the colour patches included in the reference area, the user can move and resize the rectangle over the image and perform the selection operation interactively using the mouse. The algorithm automatically applies this selection to all remainder *slave* images contained in the folder. In this case, a .mat file named “info_calibration” is saved in the main folder. This .mat file can be used to calculate any subsequent regression model keeping the same median matrix of *master* (Y) and the same selection of colour patches.



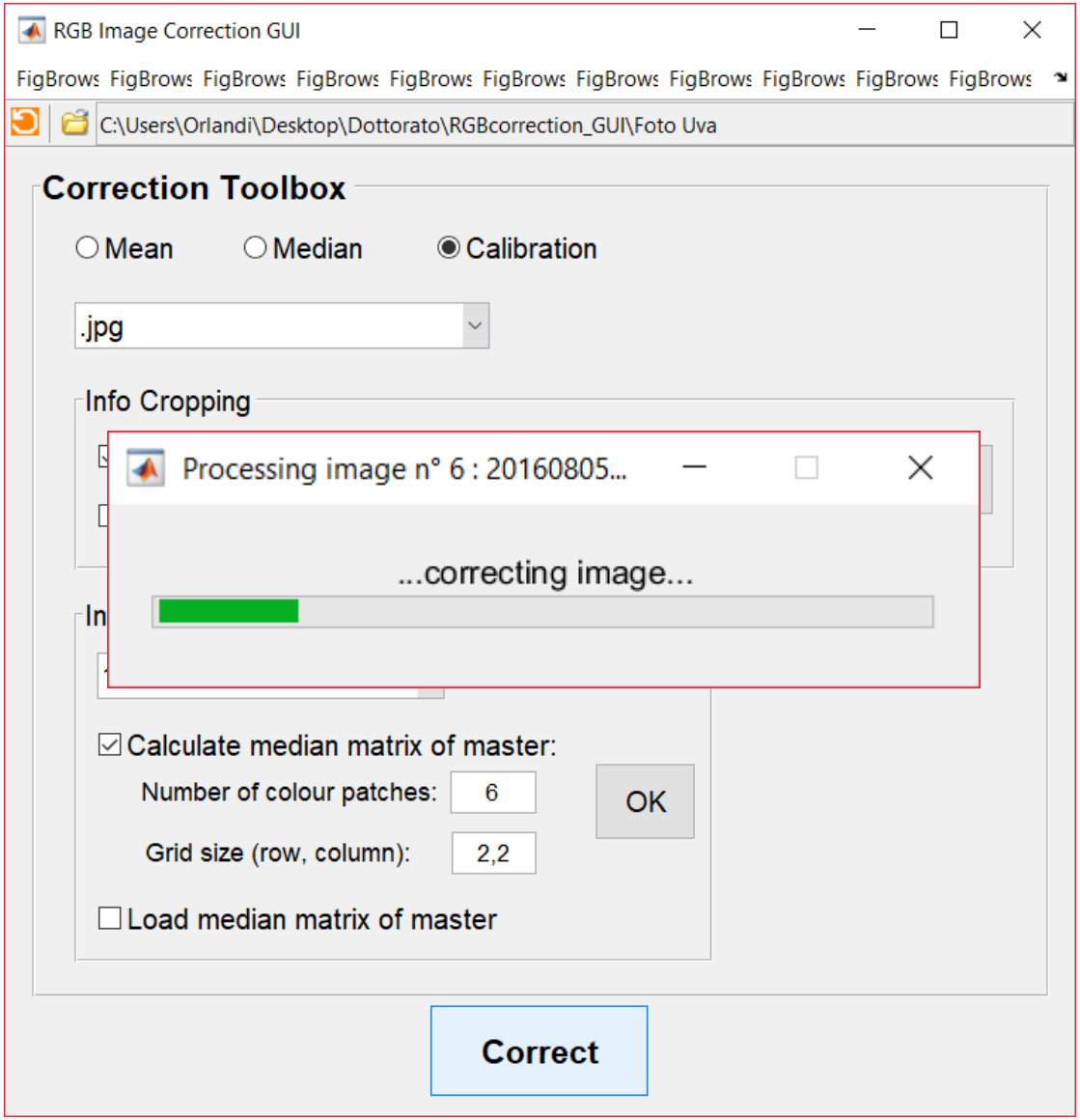
Info Calibration: Load median matrix of master

By checking the box “Load median matrix of master” and then clicking the push button “OK”, a window appears and the user has to select the .mat file which contains the previously calculated information concerning the *master* image and the coordinates to automatically select the colour patches of *slave* images. In this case, the selection procedure of each colour patch is skipped.



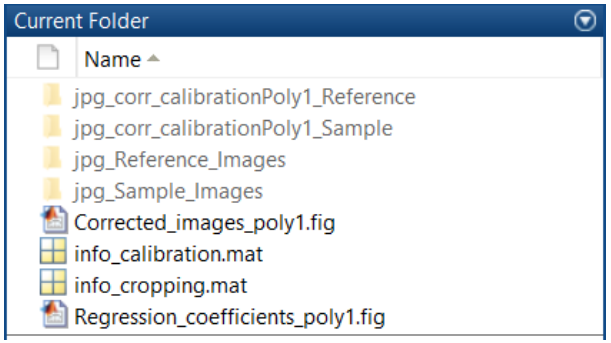


Correction step



Once the information of RGB Image Correction GUI is established, its possible to click the push button “Correct” to ultimate the correction procedure.

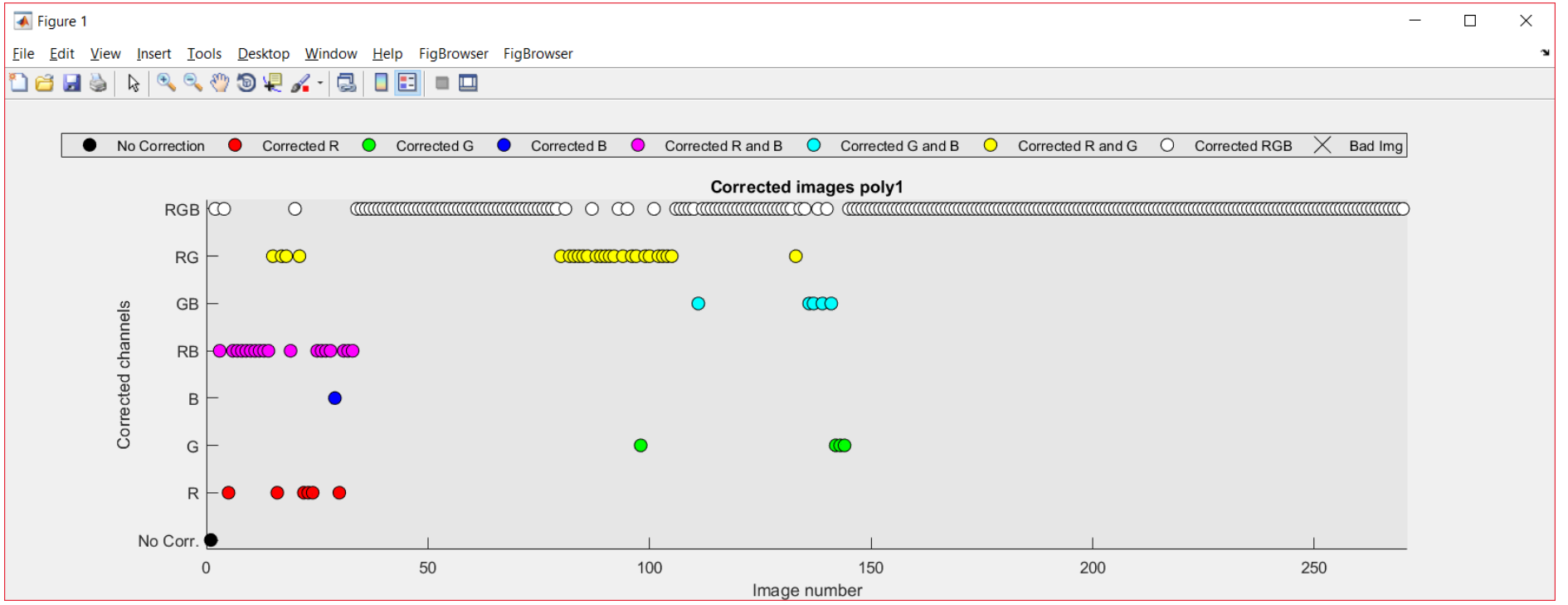
During the correction of images, a wait bar is displayed showing which image is processed at the moment. The corrected references and samples images are separately saved in two folders named according to the format file of images and the selected correction method.



Figures of the calibration results

If the user has selected the calibration method, at the end of the correction two figures are displayed and saved in the main folder in order to evaluate the results.

The first figure, named “Corrected_images” followed by the user-defined polynomial degree, shows for each image how many channels have been corrected on the basis of the statistically significant coefficients (by means of backward elimination, P =95%).



Figures of the calibration results

The second figure, named “Regression_coefficients” followed by the selected polynomial degree, shows for each channel the regression coefficients of each image coloured according to their significance: blue circle is significant coefficient, red cross is non-significant coefficient and green circle means that the correction is unnecessary because the *slave* image is like the *master* image.