



The Rio de Janeiro State University - UERJ
Laboratory of Photogrammetry and Remote Sensing
The E-Foto project

Interior Orientation

Authors: Patricia Farias Reolon and Lia de Souza e Simões Figueiredo
Revision: Jorge Luís Nunes e Silva Brito

Introduction

The Interior Orientation is the process whereby one can recover the digital image's coordinate system reference back to photogrammetric camera's metric coordinate system. This is possible through measuring the image's fiducial marks, generally available in those taken with film cameras (analog cameras). For a digitized image, the fiducial marks measurement allows to correlate the pixels' position (column and line) in such image with the millimeters in the camera's Calibration system, where axes cross over the optic ax projection on the image plane (principal point). This tutorial aims helping on the Interior Orientation (I.O.) photogrammetric project stage, guiding its execution in a step-by-step way from a project previously saved in the projects management module.

The Figure 1 shows the start screen of the E-Foto Free Software. On the main menu there are the options: Project, Execute and Help. To execute the Interior Orientation, we must start with an already saved set of data. If you do not know how to create a photogrammetric project in this integrated version of E-Foto, we strongly suggest to read the specific tutorial.

Beginning the example on how to get the Interior Orientation from a previously saved data set, select the data in the menu **Project – Open File** as seen in Figure 1.



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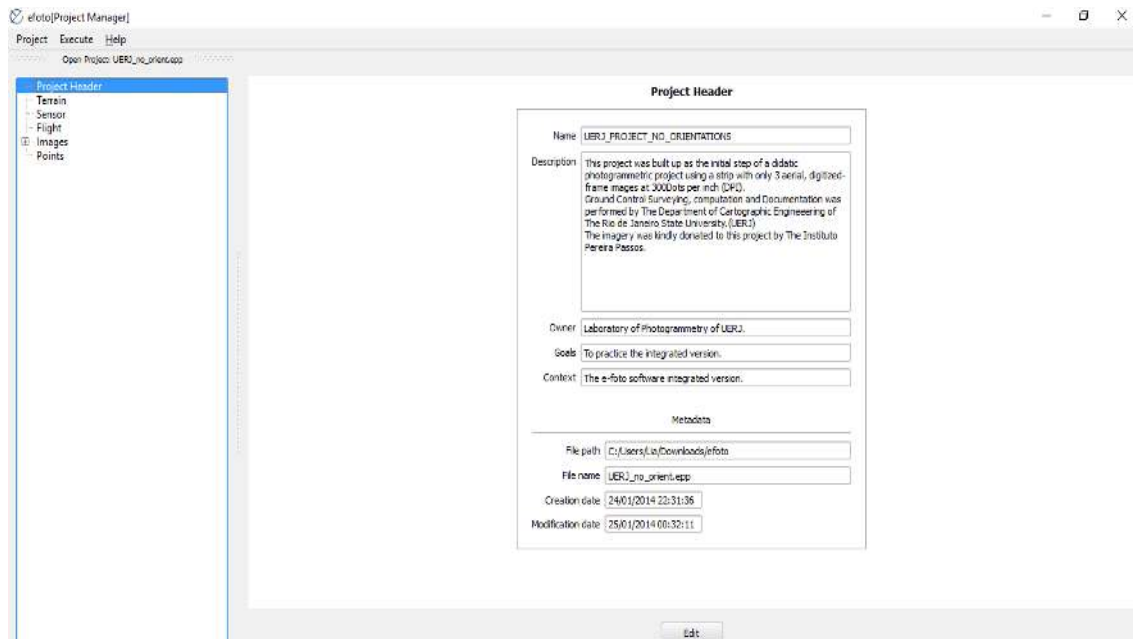


Figure 1 - The Start screen of the e-foto

Interior orientation

With the project already open in e-foto, click in **Execute**, then in **Interior Orientation**, or use the keyboard shortcut **Ctrl + I**.

Note: If there is a warning message informing that image's reference is lost, it's necessary to point to image file's path for them to get referenced again. For doing so, click in Image in Project Header. Click an image once a time and go to the workspace **Image**. Click button Edit then button Select Image will be enabled. It makes possible to navigate by directories and point each image's correct path. Remember to select "OK" to finish the setting.



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When you select Interior Orientation in the menu execute, it will appear a window allowing you to select the image that you want to execute the IO, as shown in the figure below.

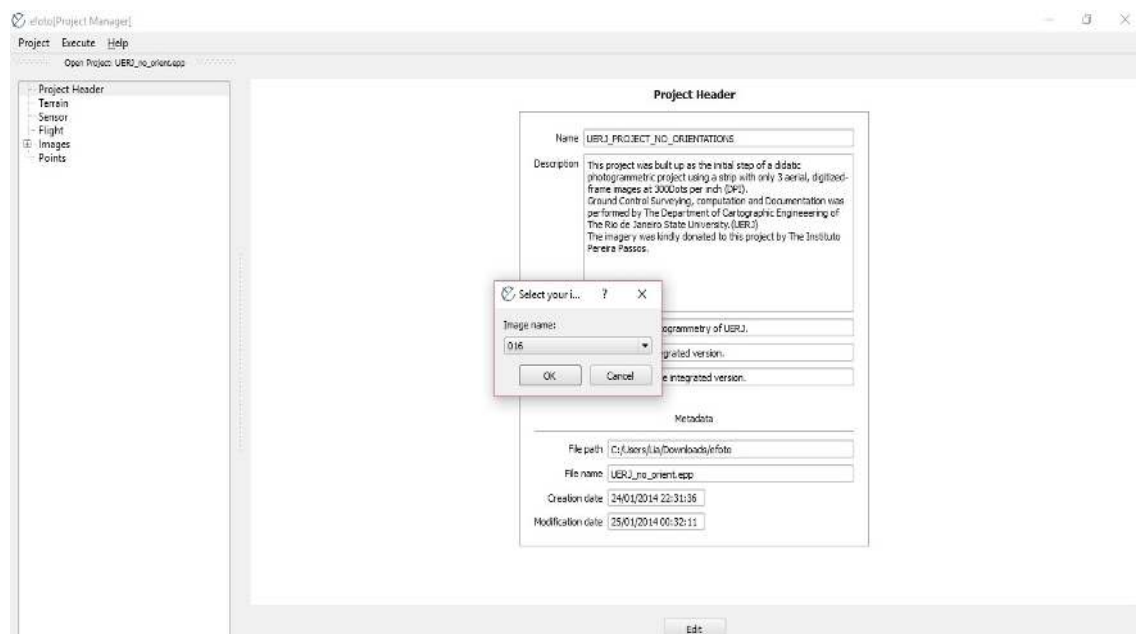


Figure 2 - The Selection of Interior Orientation

I. Images with fiducial marks

When the screen of the IO is open it will show a table with the coordinates “x” and “y” of the fiducial marks. You need to identify the fiducial marks considering the sequence in the Certificate of Calibration. To do the measurement you can use the zoom tool. (Figure 3)



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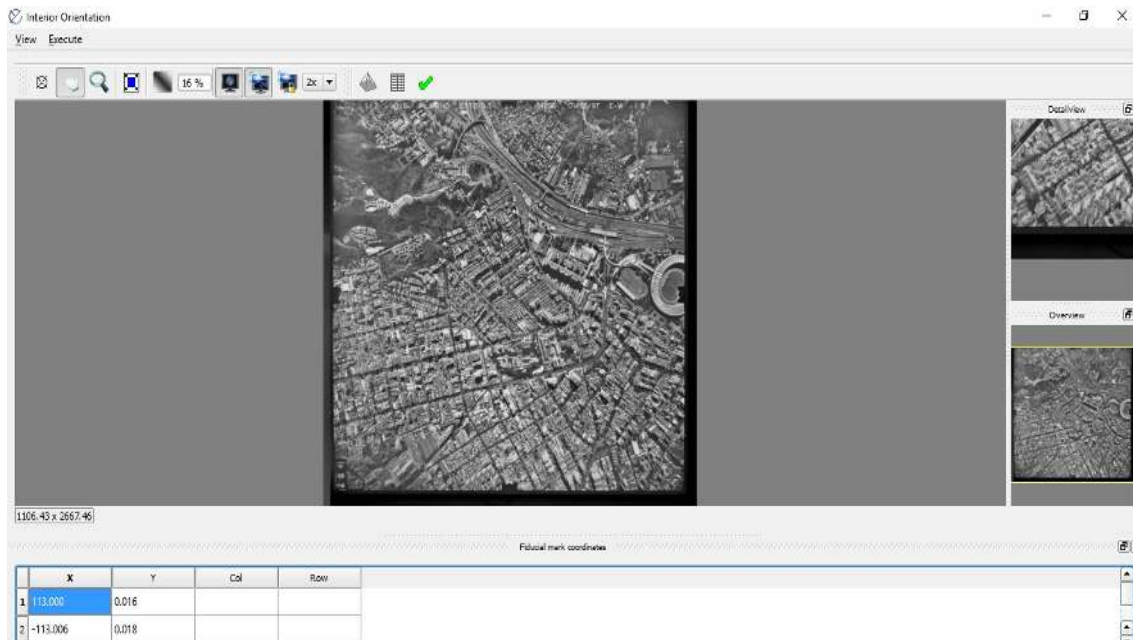


Figure 3 – The start screen of the IO

Note: Observe that on the first line of Fiducial Marks Coordinates table, the values are registered and cursor jumps to the immediate lower line. If measurement needs to be redone, simply get back to the corresponding line and click image in the correct position. The mark will be measured once again and table will be updated.



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To set a mark, click on the button **Measure Mark**, then in the fiducial mark you want to measure. (Figures 4 and 5)

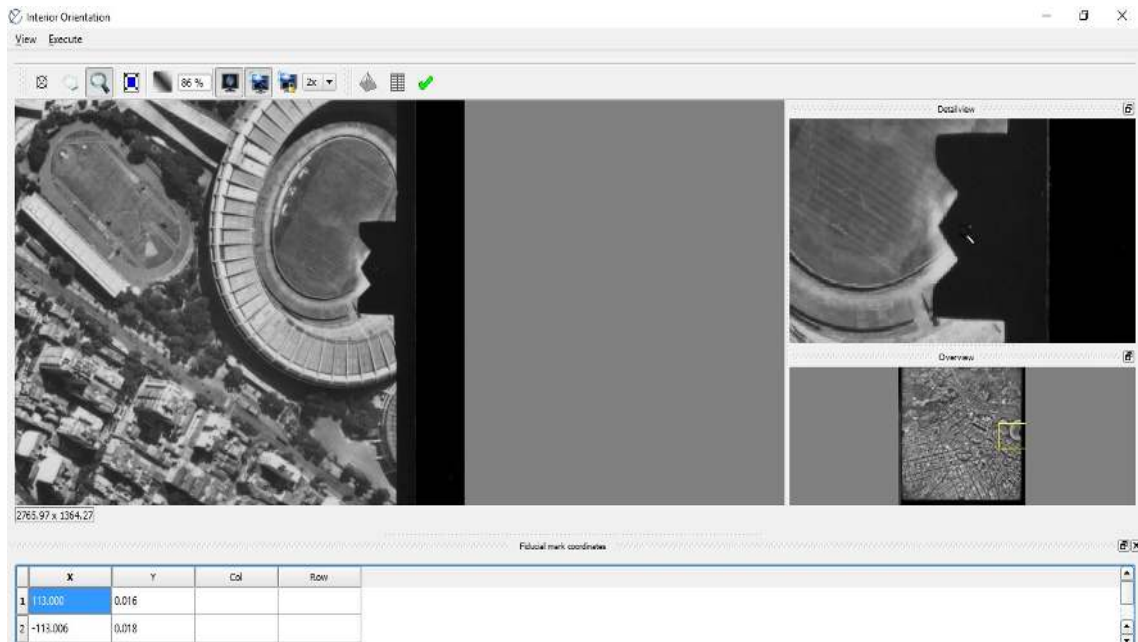


Figure 4 – Zoom in a fiducial mark of the image



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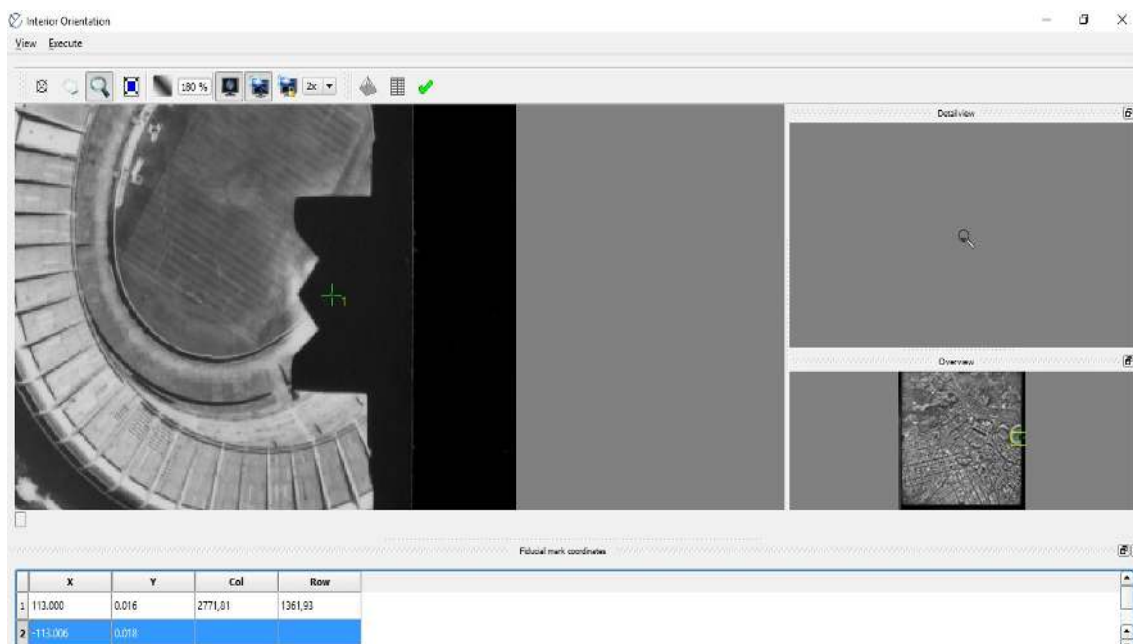


Figure 5 – Measurement of a fiducial mark of the image

Repeat the process for all marks. To get the image back to its original view size, click in the button **FitView**. When the process is finished for all marks in the image, we proceed to execute the interior orientation.

II. Images with sensor dimensions

In images with sensor dimensions, you just need to check if the marks are in the correct position. When you run the IO module, the marks will already be set, as shown in the figure below.



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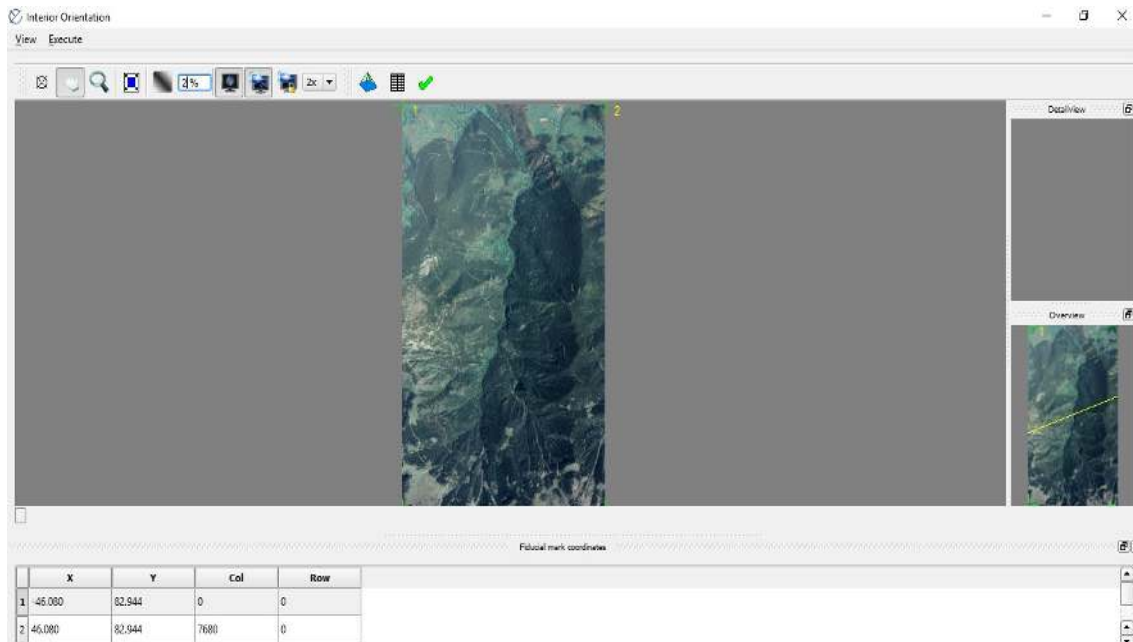


Figure 6 – Digital Image with the marks

If the marks are in the wrong position, you must check the form Sensor in the main workspace to be sure that the dimensions of the sensor are correct.

To execute the interior orientation click on the button **Interior Orientation**, as shown in the picture below.



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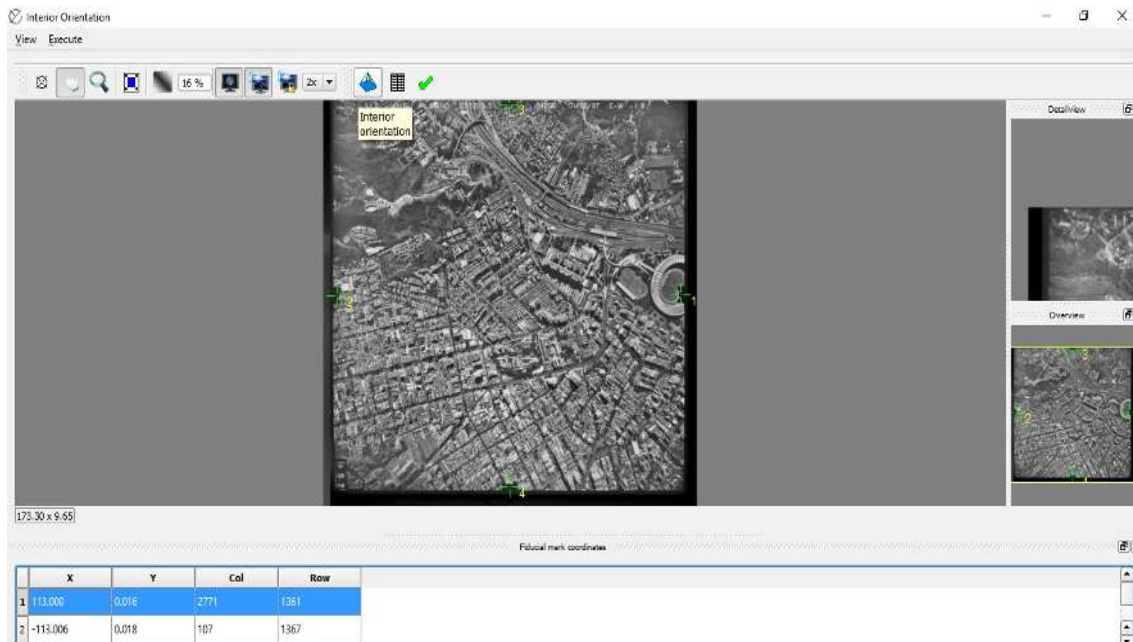


Figure 7 – Button to execute the IO

III. Results of the Interior Orientation

After running, the software will show the following screens with the parameters of the image (Figures 8 to 10):

- Figure 8 shows the vector of adjusted parameters (X_a) and its variance-covariance matrix ($MVC(X_a)$);
- Figure 9 shows the vector of adjusted observations (L_a) and its variance-covariance matrix ($MVC(L_a)$);
- Figure 10 shows the residuals in millimeters.



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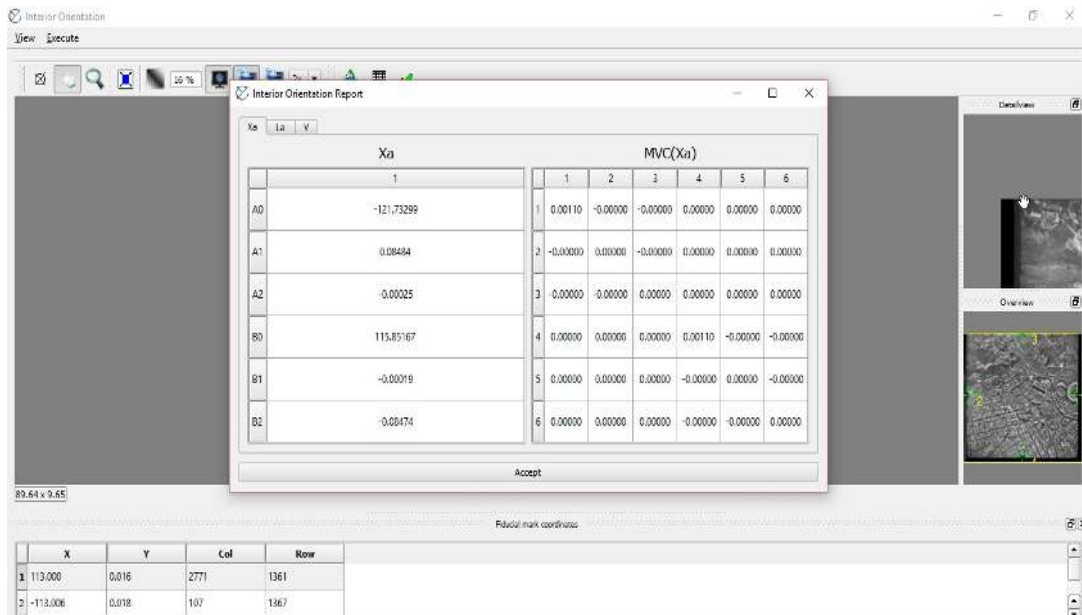


Figure 8 – Results of the IO

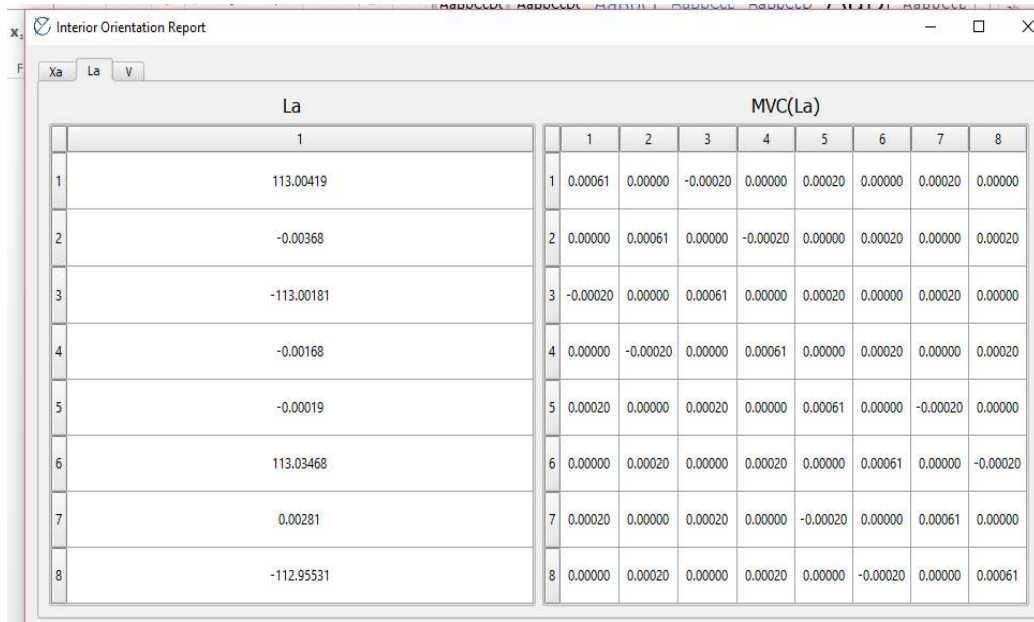


Figure 9 – Results of the IO



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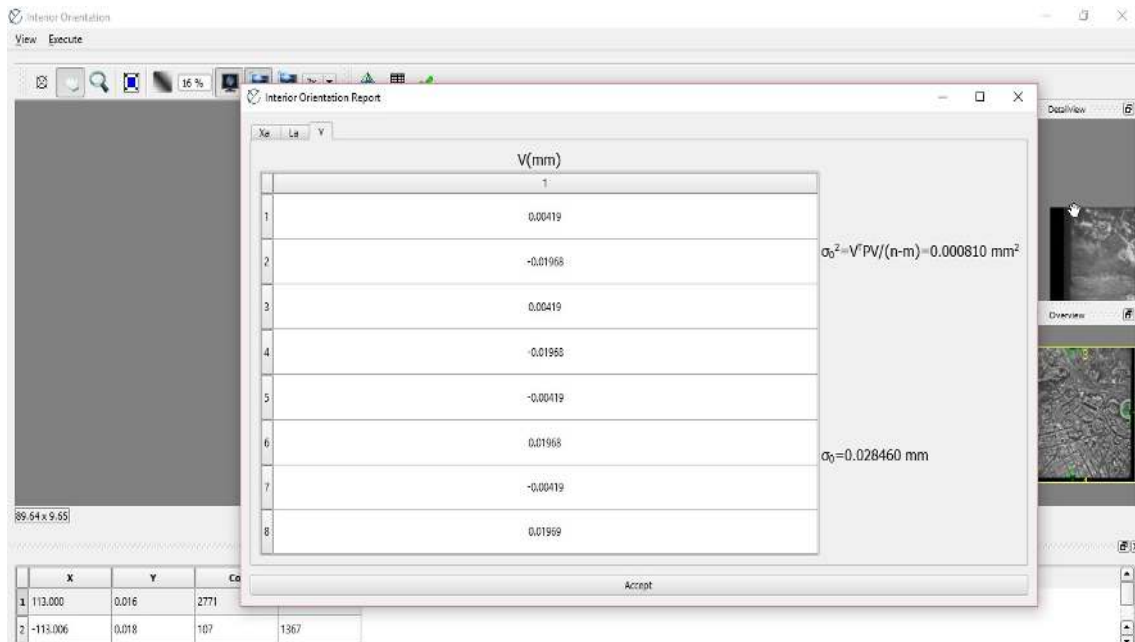


Figure 10 – Results of the IO

After checking the results, we must click on the button **Accept**, and then we can close the IO module and return to main workspace. Now we need to repeat this process to all images contained on the project.

You can verify if the IO is done for all images going to the item Images in the tree structure on the main workspace. On which images the IO is done will appear a check mark, as in figure 11 below.



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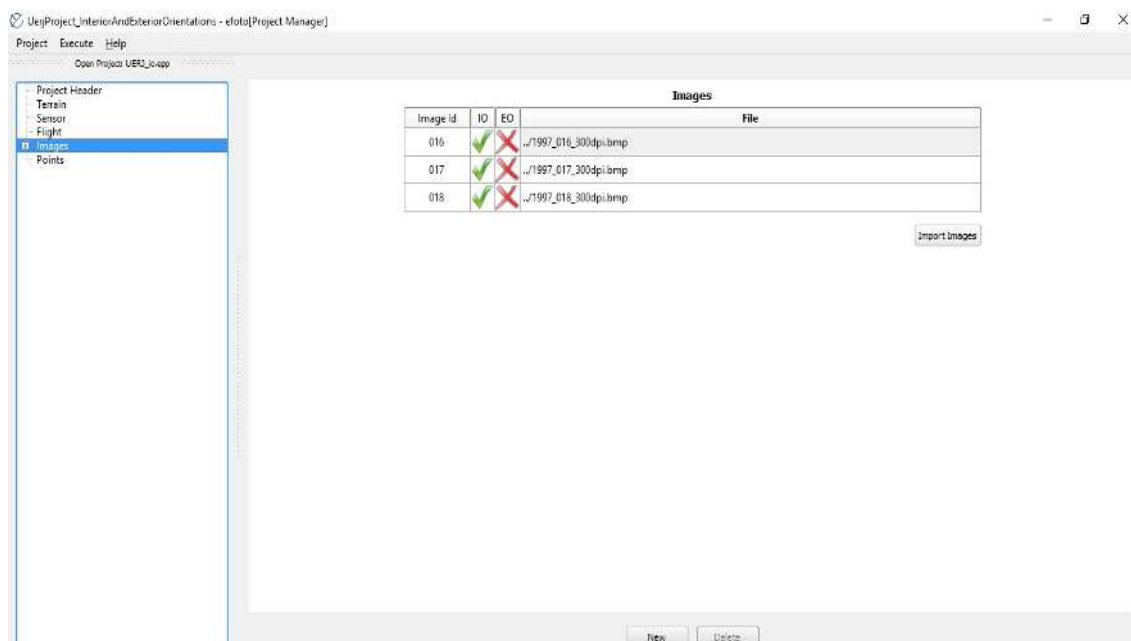


Figure 11 – IO checked in the main workspace of the e-foto

Any contribution for correcting and improving this tutorial is very welcome. Please send your comments and/or suggestions to the e-foto team at <http://www.efoto.eng.uerj.br/forum>

<END OF TUTORIAL>