

FCARTA™ USER MANUAL

Version 3



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1 Introduction

1.1 *About fCarta*

fCarta is used to register a sequence of photographs with reference marks in the scene manually. It is designed for 3D lenticular prints but can be used for other applications too.

Although its user interface is minimal, fCarta is fully functional and versatile.

fCarta is provided free of charge under the GNU general public license ver. 3 (GPL 3, <https://www.fsf.org/>).

1.2 *The algorithm*

fCarta uses projective transformations to register photographs based on static registration marks in the scene and a reference photograph. The registration marks are identified and measured manually (with mouse clicks) by the user. This method has exceptionally high accuracy and, if used correctly, never fails.

1.3 *fCarta package contents*

The fCarta package contains the following files:

1. fCarta.exe
2. This manual
3. The license
4. Three folders: 'original,' 'registered,' and 'cropped.' The 'original' folder contains a sequence of three raw photographs which can be used for practice and experimentation (courtesy of Oren Or Kobi). The photograph '2.jpg' is used as a reference. The other two folders are empty and are provided for convenience in the experiments with the demo images.
5. fCarta icon, 'icon.ico'

1.4 *Requirements*

fCarta runs on Windows 64-bit machines. It was tested on Windows 10.

1.5 *Installation*

Create a new folder that will serve as the installation folder. Download the fCarta archive from the Pop3DArt website and extract its contents to this folder. The contents should include fCarta.exe, icon.ico, this manual, demo reference photographs, and license file.

Do not add any other files to the installation folder, as fCarta may delete them.

1.6 *Service files*

fCarta creates two text files in the installation folder: fcarta_paths.txt and fCarta.log. The paths file contains the path of the last folder, which contained the original photographs. fCarta uses this path in the next run to help the user with file navigation. The log file contains information on the last fCarta execution and

errors (if any occurred). If you would like to report an error, please send us the log file.

fCarta will also write a small binary file named 'ref.pkl' in the registered images folder. This file contains the measurements of your reference image. It can be used in future runs to save the effort of re-measuring the same reference image. If you delete this file, you will have to re-measure the reference file.

1.7 Help and contact

You may contact us concerning any issue with fCarta at info@pop3dart.com. We will make our best effort to help.

2 The reference points

fCarta needs four reference points in the scene. These reference points must be visible in all raw photographs.

All four reference points must lie on a vertical plane (the 'reference plane'). No three of them can lie on the same line. In other words, they must be the corners of a quadrilateral planar shape (the 'reference shape').

The reference points in the raw photographs should be visible but at the same time as small as possible. It is convenient to use a cross to mark a reference point, as shown schematically in Figure 1. Such drawing is called 'reference mark'.

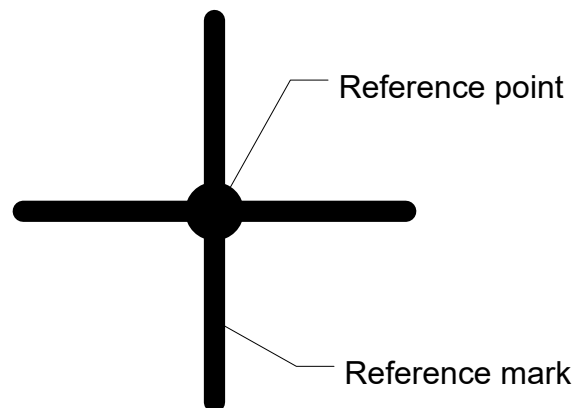


Figure 1: Using a cross to mark a reference point

An example of a photograph with reference marks is shown in Figure 2. This example is a crop from photograph '2.jpg' in the supplied demo sequence. In this example the reference marks are drawn on a rectangular frame which is mounted on the wall behind the model.



Figure 2: A photograph with reference marks

There are twelve enumerated reference marks, six on the frame's left arm and six on the frame's right arm. Any set of two pairs of marks, with one pair chosen from the left arm and the other from the right arm, can be used as a set of reference points. For example, points 3, 4, 8, and 11 are valid set of reference points. However, it is recommended to choose points close to the photograph corners, which in this example are 1, 6, 7, and 12. Following this recommendation increases the registration accuracy and makes the reference shape approximate a rectangle.

3 The reference photograph

The reference photograph is a photograph showing all four reference points and satisfying the following conditions:

1. The photography distance is the same as the photography distance of the sequence,
2. The camera axis is normal to the reference plane,
3. The footprint of the normal from the camera to the reference plane is at the center of the reference rectangle.

In most cases, one of the raw photographs serves as the reference photograph, but it can also be a special photograph not belonging to the raw sequence. By default, fCarta will create a copy of the reference image in the registered folder. If you do not want it to be a part of the registered sequence, you will have to delete it.

Note: the reference photograph must have the exact pixel sizes as the sequence photographs.

4 Reference points measurement

The reference point measurement is done in two stages. In the first stage, the whole photograph is displayed (Figure 4), and the user clicks on the mark of the reference point they want to measure.

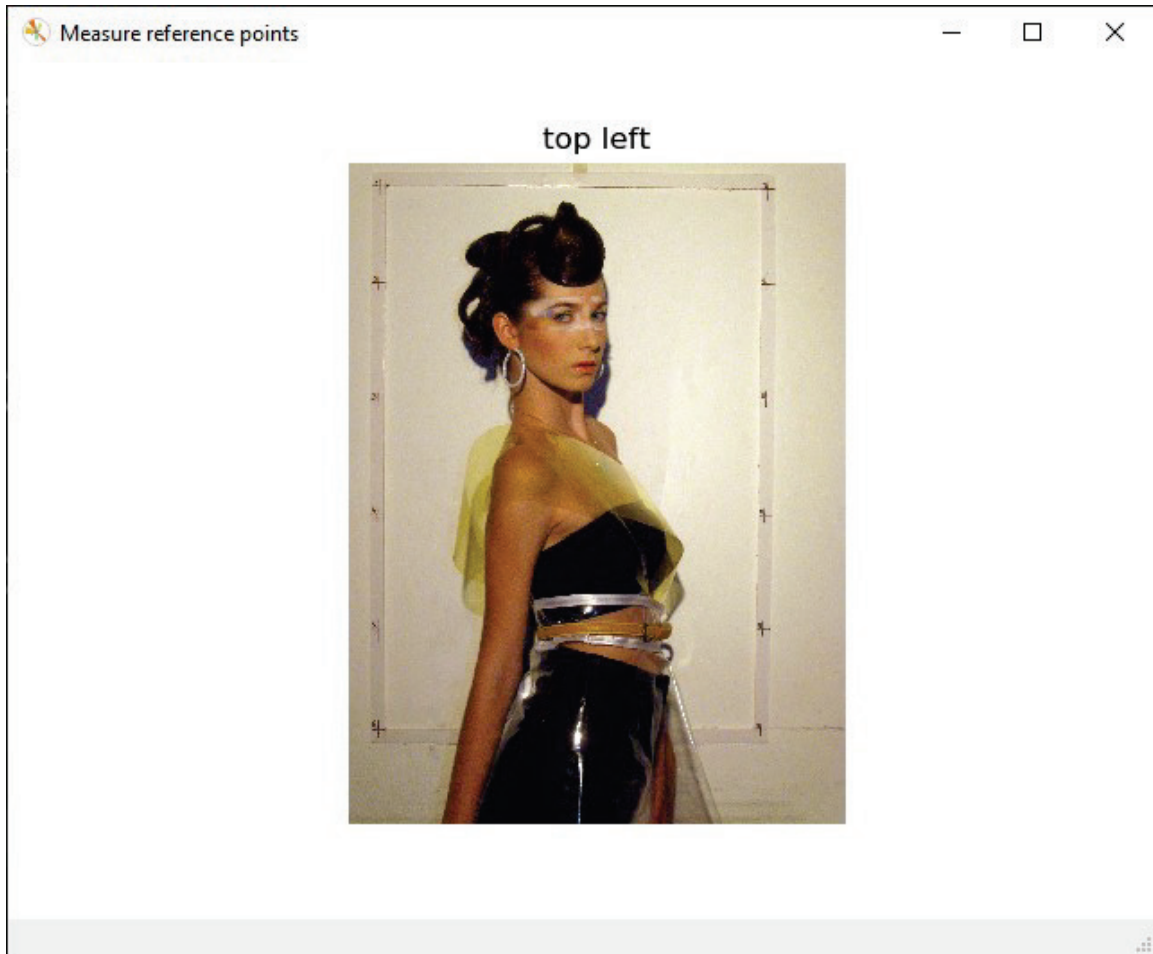


Figure 3: The reference points measurement window

In the second stage, fCarta displays a magnified image of the clicked reference mark (Figure 5). The user clicks now on the reference point itself.

It may happen that in the first stage, the reference mark was clicked too far from the reference point so that it will be outside the scope of the magnified view. In such a case, the measurement should be aborted and fCarta relaunched.

Press the 'q' key anytime during the measurement process to exit the fCarta. Also, there is a time limit of 20 seconds in waiting for a click. If there is no click within the time limit after an image is displayed, the fCarta will exit.

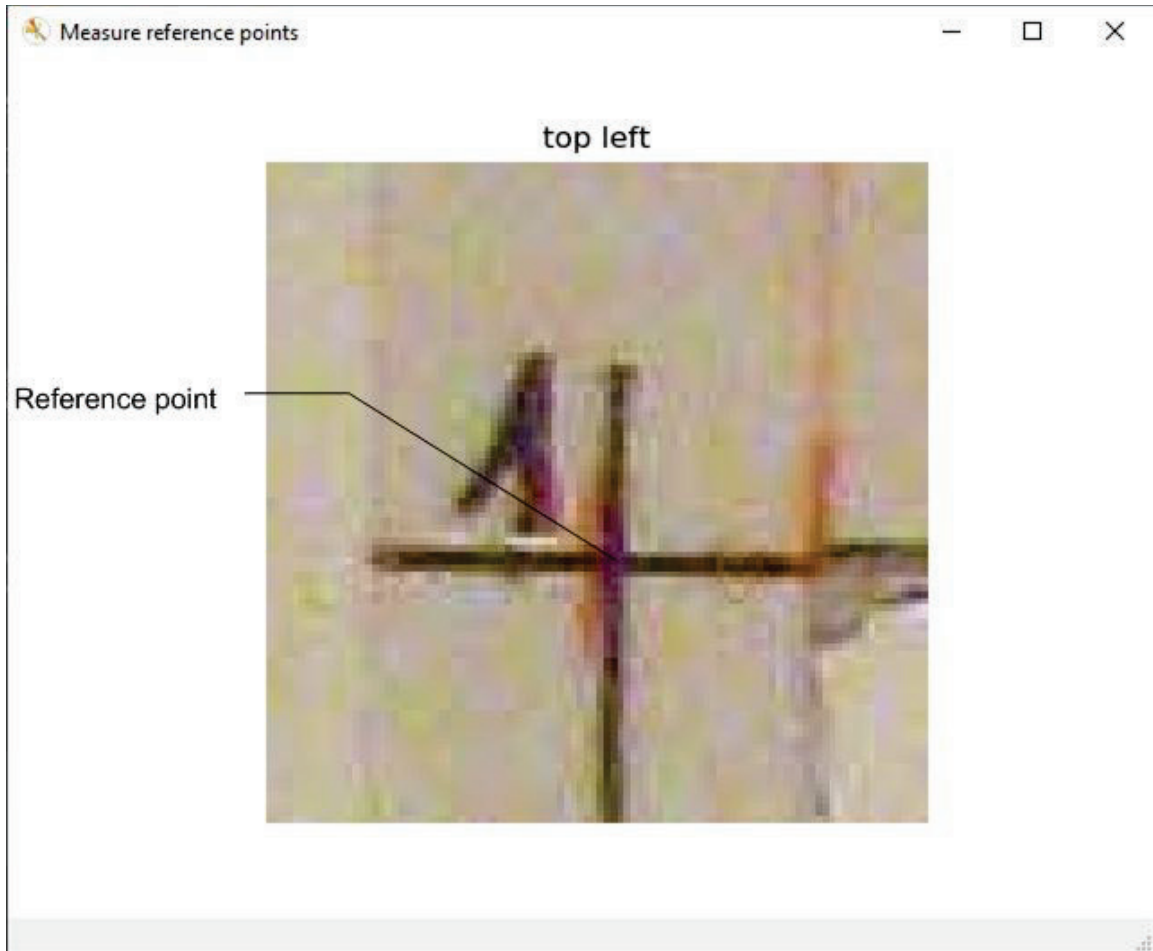


Figure 4: Top left mark magnified

If there are more than four marks (like in Figure 4), the same set of reference points must be used in the whole session. Also, the points must always be measured in the same order.

In most practical cases, the reference shape will approximate a rectangle. In such a case, one can give names to the reference points: 'top left,' 'top right,' etc. They are measured in the order shown in Table 1. To facilitate the keeping of the order, fCarta displays the name of the reference point which is currently being measured.

Table 1: Order of measurement of reference points in fCarta

Point name	Order
top left	1
top right	2
bottom left	3
bottom right	4

5 Workflow

To start the processing, fCarta needs the folder containing the original (raw) photographs and the folder in which the processed (registered) images will be saved. These folders are referred to as 'original' and 'registered' folders, respectively. The first response of fCarta is to ask the user to choose the location of these folders.

fCarta scans the registered folder for an existing measurement of the reference photograph ('ref.pkl' file). If such file exists, fCarta will ask you whether to use the existing measurement:

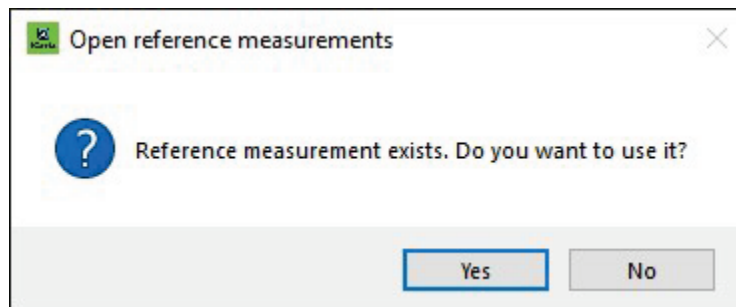


Figure 5: Open reference measurements dialog

If you press 'Yes,' a previously stored measurement of the reference photograph will be used. Otherwise, fCarta will start the measurement procedure for the reference photograph.

Once a reference point is measured, fCarta will ask the user to measure the next reference point. This procedure is repeated until all four reference points are measured. The measurement results are automatically stored in the registered folder for optional future use. Any existing 'ref.pkl' file will be overwritten.

Next, fCarta scans the registered images folder for existing registered images. If such images exist, fCarta asks you whether you want to skip them:

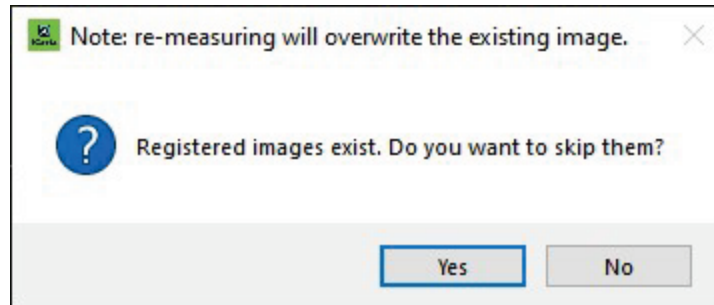


Figure 6: Existing registered images dialog

If you choose to skip the measurement of the already registered photographs, select 'Yes.' If you want to re-measure all photographs, choose 'No.'

fCarta will start now the measurement procedure for all raw photographs which need to be measured. The measurement procedure is identical to the reference photograph measurement described above. Note: fCarta will not ask to re-measure the reference photograph in this stage.

Registered images are stored in the registered folder as soon as they are measured (and processed). Each registered image is stored with the original image's name and a string '_reg' added to its end. Aborting the measurement procedure at any stage does not affect the registered photographs that were already stored.

It may happen that all raw photographs have been measured. In such a case, if the user clicks 'Yes' in the dialog of Figure 4, fCarta will skip the measurement altogether.

Next, fCarta asks whether to crop the registered images:

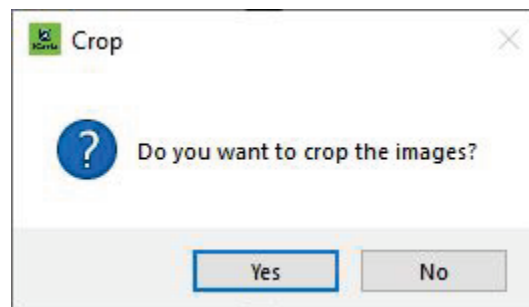


Figure 7: Cropping dialog

If you choose 'No,' the program will exit. If you choose 'Yes,' fCarta will display the reference image, on which you can draw a rectangle using your mouse. Clicking on the image with the left mouse button will define the top left corner of the rectangle. Dragging your mouse with the left button pressed and releasing it at any other point will define the bottom right corner. An illustration of the result is shown in Figure 6.

The cropping rectangle can be adjusted by dragging its handles. Double-click anywhere on the image to exit the cropping definition stage and proceed to the actual cropping.

fCarta asks to choose a folder for storing the cropped images. The cropped images inherit their name from the registered images with the string '_cropped' attached.

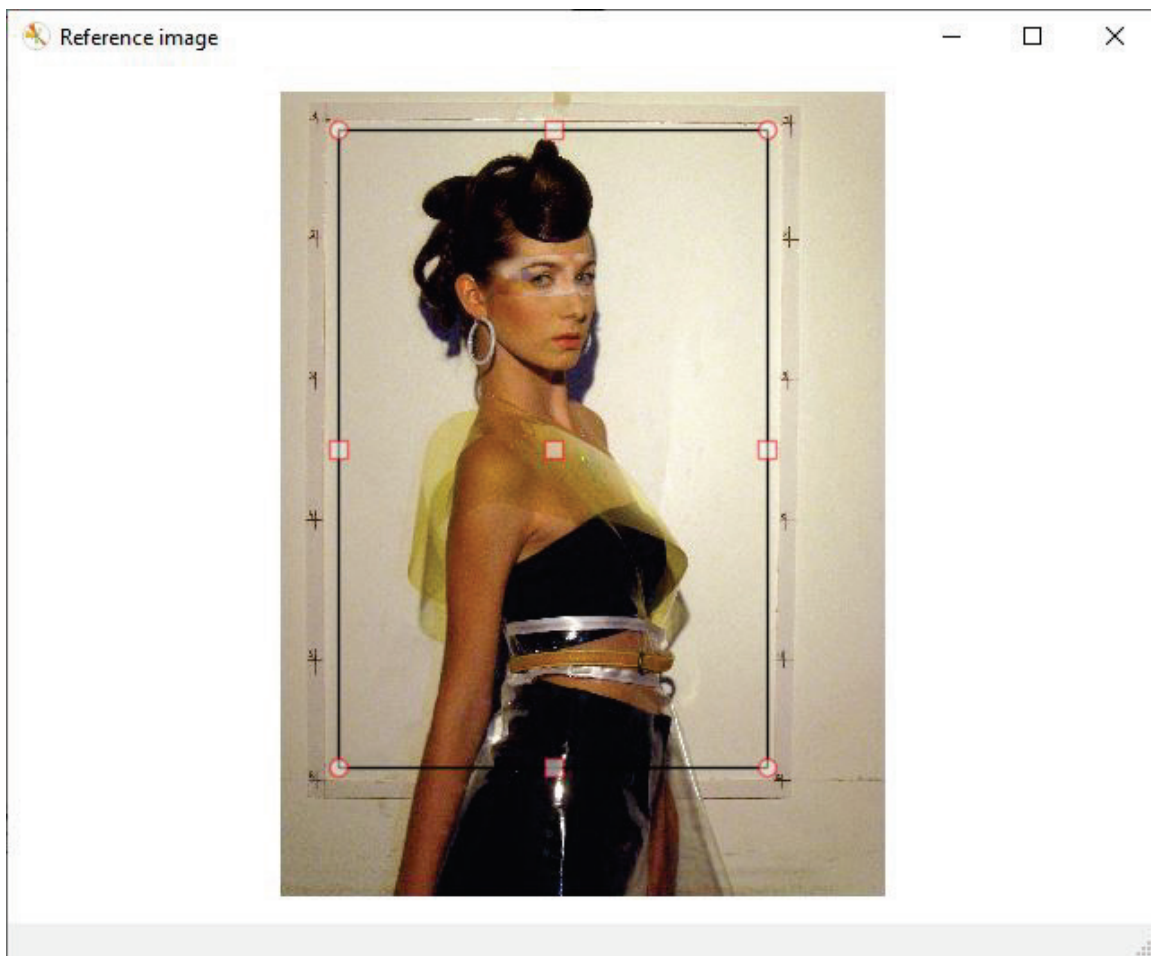


Figure 8: The cropping rectangle

6 Notes and tips

You can choose the registered and the cropped folders to be the same as the original folder. All processed images will be stored in the same folder. However, this will cause confusion if you relaunch fCarta with the same original folder since fCarta will interpret the registered images as raw images and attempt to measure them.

The reference image is stored in the registered images folder without any processing (except adding '_reg' to its name).

fCarta can be used to re-crop the images with a little extra effort. Launch fCarta, and answer 'Yes' to both dialogs. fCarta will proceed directly to the crop dialog without any measurement (if all the registered images still exist).