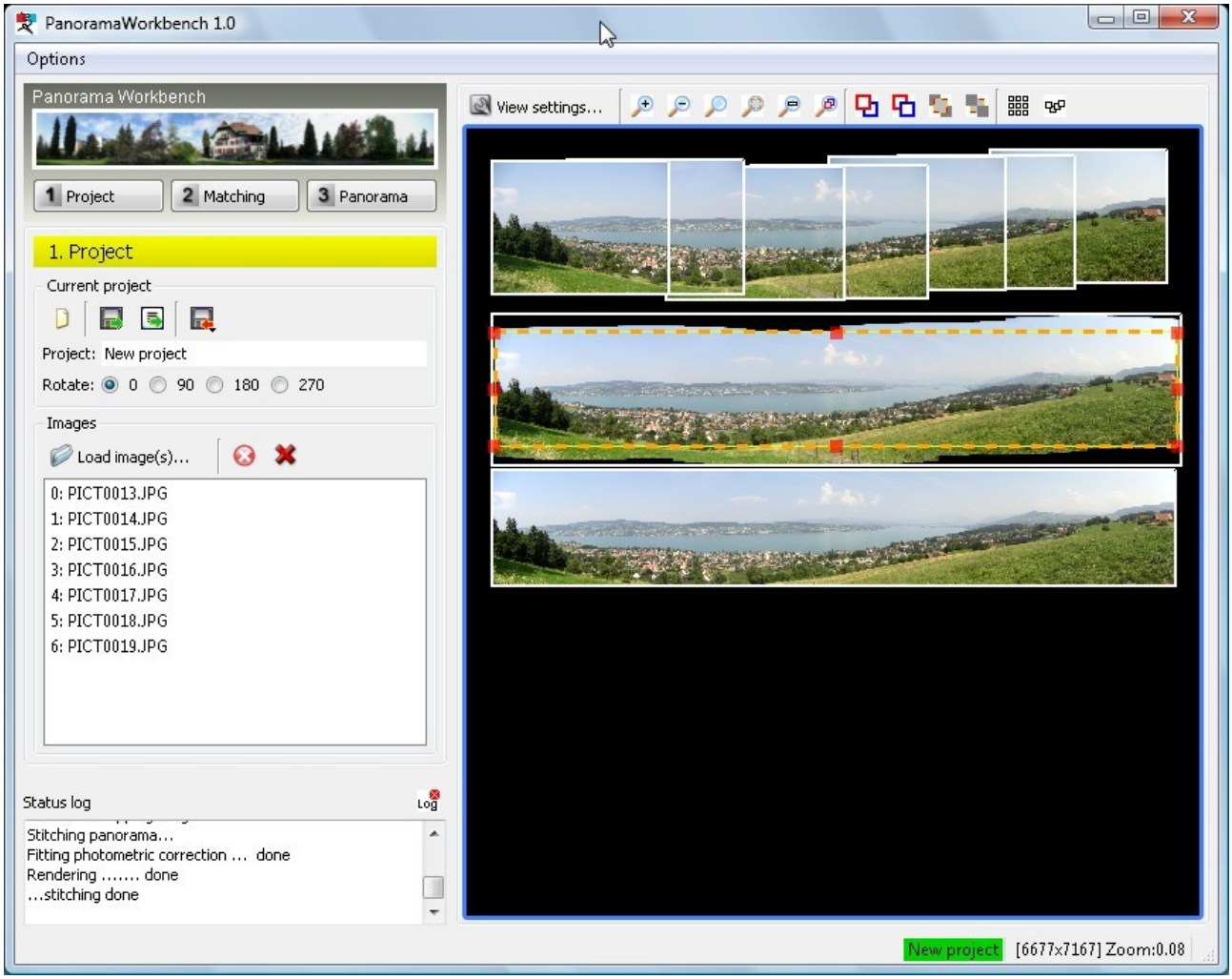
Panorama Workbench 1.02

User Guide



www.panoramaworkbench.com

2. July 2009, Erich Maechler

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1 Introduction

1.1 Limitation of the evaluation version

You can use the evaluation version without limitations for 30 days. After this time you can buy a product key at www.panoramaworkbench.com, to unlock the limitation that you can't save the final panorama.

1.2 How to take Photographs for a Panorama

- Hold the camera horizontal or vertical.
- Don't move, just rotate the camera horizontally or vertically.
- Use the auto focus, but don't change the zoom factor.
- Use the camera's panorama assitent, if it has one.
- Take a photograph and then rotate the camera so that the next photograph overlaps approximately 30%.

1.3 Three steps to make a Panorama

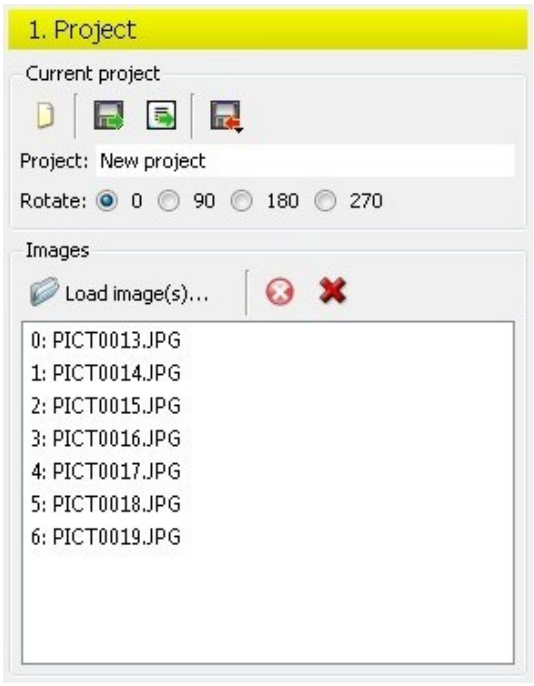
In order to make a panorama, most of the time only a few user interactions are needed:

1. Go to the Project dialog and click on  to load the photographs.
2. Go to the Matching dialog and click on 'Automatic matching'.
3. Go to the Panorama dialog, adjust the image size and click on 'Final Stitch'.

If everything has worked, you can save the final panorama with a click on 'Save cropped panorama image...'.

For difficult cases, sometimes you need to adjust some parameters or you must match some of the overlapping images manually. Hopefully this user guide can help you to get also for these cases good results.

2 Projects



A project in PanoramaWorkbench can be described as a list of photographs with a set of parameters for the matching and stitching and with the corresponding points for each overlapping image pair. Projects can be saved to a read only XML file and the file should have a .pwb extension. The final panorama is not saved as a part of the project. It is possible to load a project from a list of projects or with the use of the file select dialog. Under Windows you can start the application and load the project at the same time, if you double click a saved project file in the explorer.

2.1 The current project

You can use the following buttons to manage the current project:

	Creates a new empty project
	Saves the current project
	Opens a file select dialog to load a project
	Shows a list of projects to load a project

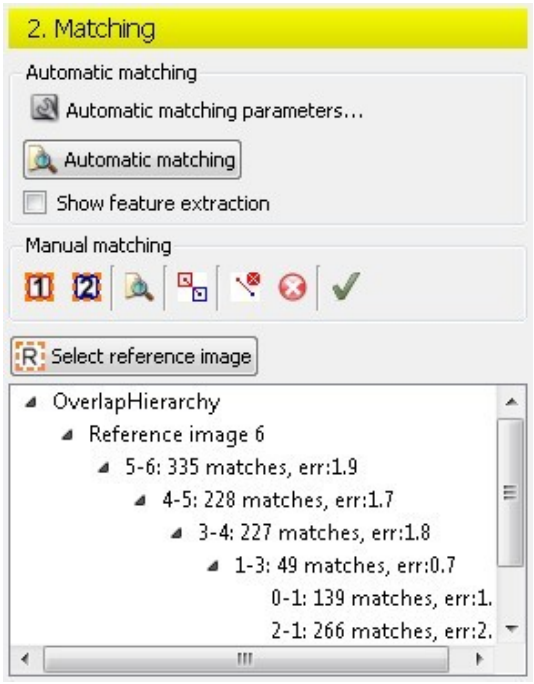
2.2 Loading photographs

To load one ore more photographs into the current project, click on  to open a file select dialog. Navigate to your directory and and select the photograph(s) to load. The photographs should not be loaded from a slow medium, because PanoramaWorkbench frequently reloads them. Supported formats are .jpg, .jpeg, .bmp, .png, .tif or .tiff files.

The  button removes all images from the the current project and the  Button removes only the selected image from the current project.

The loaded photographs should represent a horizontal panorama. Click on one of the 'Rotate' radio buttons, if that is not the case.

3 Finding the overlapping photographs



PanoramaWorkbench uses a feature based method to find the overlapping photographs. Therefore salient feature points are extracted from the photographs and for each possible image pair it is tested, if between the points of two images the mathematical model of a rotating camera can be found. The points of the two images which describe this model are called the corresponding points. The corresponding points can be searched automatically or they can be placed manually, where at least four points are needed.

3.1 Automatic matching

3.1.1 Automatic matching of all photographs

To find all overlapping photographs automatically, click on 'Automatic Matching'. After an automatic matching, it is possible to show the extracted feature points, if you select 'Show feature extraction'. To visualize the corresponding points, click on a entry in the overlap hierarchy or select a image pair.

3.1.2 Automatic matching parameters

A click on  opens the the dialog with the parameters for the automatic matching. The influence of the parameters can be watched, if you visualize the extracted feature points. If the overlapping region is small, it can be helpful if you lower the matching radius and/or increase the size of the extraction image. If the overlap region is big enough, then you can try to make the size of the extraction image smaller, which can give better results for some panoramas. The point spacing determines the minimal distance of feature points and influences the distribution of the points. If only a small scene in a photograph has useful information for the feature extraction (like i.e. a distant coast with mostly only water and sky), then it can help to make the point spacing smaller. But if the most points lie on one spot of the photograph, the you can try to make the point spacing bigger or increase the maximal amount of points. The RANSAC threshold is used when the camera rotation is adjusted. The corresponding points should describe motion of camera that is only rotating and not translating and the threshold defines how much the point can deviate from such a idalized model.

3.2 Manual matching

If the automatic matching does not find all overlapping photographs, you have to match a image pair manually by placing at least four points in both of the images. You can also select a image pair and match the image pair automatically with different parameters. For an existing image pair you can manipulate the corresponding points, insert more points or delete them.

3.2.1 Image pair selection

To select a image pair, select a photograph and click on  (Shortcut: Ctrl+1) and then select a other photograph and click on  (Shortcut: Ctrl+2). With the  button (Shortcut: End key) you can show a image pair with maximal size. Click on  to deselect the image pair and to apply the changes.

3.2.2 Manipulation of corresponding points

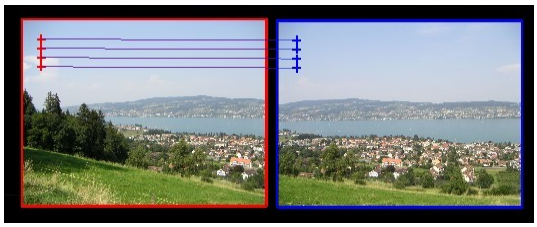
Click on  to insert a corresponding point into a selected image pair. If no points exist, then four points are inserted, later only one point is inserted. Click on  to delete a selected point. To select a corresponding point, you have to click on a red or green cross. Click on  to delete all corresponding points of a image pair. If the image pair is overlapping arranged, then click on  (Shortcut: 1) or  (Shortcut: 2) to make the red crosses in the first image or blue crosses in the second image of the corresponding points visible.

3.2.3 Automatic matching of a single image pair

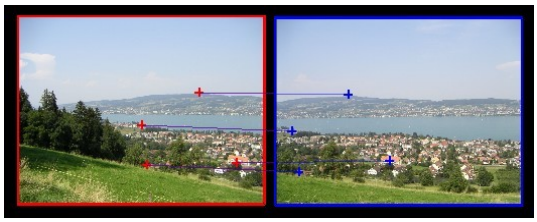
Select a image pair and click on  to find the corresponding points automatically. Also here, as in the matching for all images, with a click on  , you can adjust the parameters for the automatic matching.

3.2.4 A manual matching example

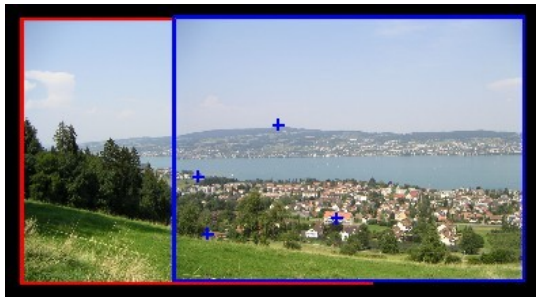
Load your photographs, click on  and find visually a image pair. Arrange the image pair, so that the images are next to each other. Now select the first photograph and click on  (or press Ctrl+1 on the keyboard). The photograph has now a red frame. Then select the second photograph and click on  (or Ctrl+1 on the keyboard). The photograph has now a blue frame. Click on  and four corresponding points get inserted into the selected image pair. If you click  again, only a single corresponding points gets inserted, but for now we only need four.



Click on  to show the image pair with maximum size and place the points at corresponding positions in the photographs. To move the points, click with the left mouse key on a red or blue cross and move the points with the mouse while holding the left mouse button.



To place the points a accurate as possible, arrange the two photographs of the image pair overlapping and zoom in on a point. If you now click on  or  , you can switch between the two photographs. With the use of the shortcuts (1 or 2 on the keyboard), you can can better concentrate on the placing of the points. Zoom in and out, move the view (with the right mouse button) or click on  again (you also can use Home and End on the keyboard). You can adjust the size of the markers by clicking on  . Make sure that the four points don't lie on a line and distribute them over the whole overlapping region.



Now you can click on  and the image view gets arranged overlapped and the overlap hierarchy is updated. Go to the Panorama dialog and click on  'Preview stitch' to check, if stitching with the just placed points looks good. If the result of the stitching does not look good or has failed, then select the image pair again and find a better position for the corresponding points or insert more points by clicking on  . You can delete points by clicking on  (but at least 4 points are needed). Since all photographs are just aranged, you can always move them. Find visually an other image pair and repeat the previous steps. Usually the automatic matching should find most of the image paris and you have to match only the reaming ones manually.

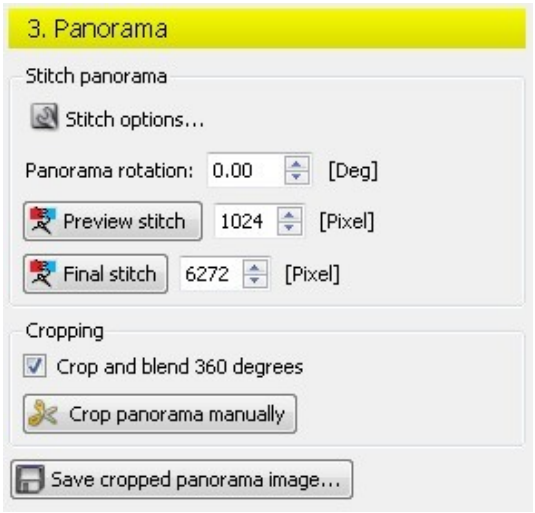
3.3 The overlapping hierarchy

The overlap hierarchy of all photographs is shown with a tree view in the Matching dialog, or more correct the photographs that have been matched successfully. If you select on a entry in the overlap hierarchy tree, the related image pair gets selected. If you click on the entry 'OverlapHierarchy' or on  , the image pair gets deselected. It is possible to break up the hierarchy (and therefore to get more then one group of overlapping images), by deleting the corresponding points of on ore more image pairs.

3.4 The reference image

By clicking on  , the selected photograph is set as the reference image. If there exists more then one group of overlapping photographs, then the reference image defines which group is used when the panorama is stitched. The reference image has also some impact on the quality of the final panorama since it defines the order in which the photographs are stitched. For 360 degrees, the reference image is near the middle of the stitched panorama.

4 Panorama stitching



4.1 Preview stitch

A click on 'Preview Stitch' is stitching the panorama without photometric correction and without blending.

4.2 Final stitch

A click on 'Final Stitch' is stitching the panorama seamlessly and crops the panorama automatically. For a large panorama image size, it is possible the that there is not enough memory to complete the stitch. In that case please lower the size for the stitching.

4.3 Stitch options

With a click on the  button, you can change the options for the stitching.

For small camera rotations you can use the option 'Planar projection'. Planar projection has the advantage that lines also stay lines in the final panorama. With an angle for the vertical camera rotation you can influence the effect of the projective distortion.

For larger camera rotations you have to use the option 'Cylindrical projection' of 'Spherical projection'.

The photometric correction adjusts the intensity changes between the photographs. Should that not work well, then try to lower the correction limit or turn the photometric correction off. If it works well, then you can try to increase the correction limit and/or try the color correction, to see if the result get even better.

With the gamma correction you can make the final panorama darker or brighter.

4.4 Cropping

4.4.1 Manual cropping

After a final stitch, the crop rectangle is automatically placed and cropped. You can select the crop rectangle and change the position and size manually. With a click on 'Crop panorama manually' the panorama gets cropped at the new position.

4.4.2 Cropping of a 360 degrees panorama

If a 360 degrees panorama is detected, the part that is larger that 360 degrees is indicated by a red rectangle. If 'Crop and blend 360 degrees' is selected, then only the 360 degrees part is cropped and the content of the red rectangle is blended on the left end of the cropped panorama. Then it is still possible to select the rectangle and to change the size and position and therefore to change the range of the blending of the 360 degrees transition. If 'Crop and blend 360 degrees' is not selected, then the whole rectangle is cropped and no blending of the 360 degree transitions is done.

4.5 Saving the final panorama to a file

After a final stitch, the cropped panorama can be saved, by clicking on 'Save cropped panorama image...'. In the file select dialog you can define the image format by giving the filename a .jpg, .jpeg, .bmp, .png, .tif or .tiff extension.

5 Image view

5.1 Single photograph selection

A single photograph can be selected by clicking on it in the image view with the left mouse key or by selecting the name of the photograph in the Project dialog. The selected photograph gets a dashed orange frame.

5.2 Image pair selection

To select a image pair, first select a photograph and click on  (Shortcut: Ctrl+1) in the Matching dialog. Then select an other photograph and click on  (Shortcut: Ctrl+2).

5.3 Zooming and panning

If the image view has the focus (indicated with a blue frame), then it is possible to zoom and pan the contents of the image view with the use the the keyboard. With the mouse wheel the image gets zoomed at the current mouse position, while all other zoom methods have the top left corner of the image view as fix point.

	Zoom in	Zoom out	Show all	Show selection	Show image pair	Show panorama	Panning
Mouse	Mouse wheel or 	Mouse wheel or 					Moving the mouse while holding the left mouse button down
Keyboard	Page up	Page down	Home	End	End		← ↑ → ↓

5.4 Photograph stacking order

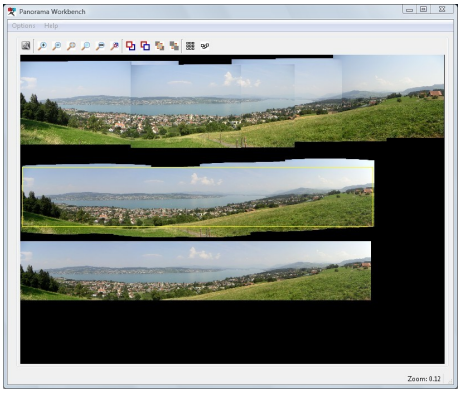
If a photograph is (partially) hidden by other photographs, then it can be made fully visible by selecting it and then bringing it to the foreground by clicking on  . The  button can be used to send a selected photograph behind all other photographs. If a image pair is selected, then with a click on  or  , the first or the second image is sent to the foreground.

5.5 Arranging photographs

Every single photograph can be moved freely, by selecting it with the left mouse button and holding down the left mouse button while moving the mouse. With a click on  , all photographs get arranged in a grid. If the  button is clicked, all photographs get arranged according to their overlapping. Sorted from the top to the bottom, first the groups of overlapping photographs are shown, then the not overlapping photographs in a grid and finally the panorama and the cropped panorama.

5.6 Image view settings

With a click on the  'View settings' button, the sizes for the textures and the size of the markers (the crosses of the corresponding points) can be adjusted. As long as you can select and move the photographs without lag, you can try to increase the texture sizes to improve display quality. PanoramaWorkbench uses memory on the graphics hardware



(textures) to display photographs. Depending on the graphics hardware, there is a limit for the size of the textures and how fast they can be displayed. Should the image view to slow, try first a smaller texture size for the original photographs. The texture size for the selected image pair should not be too small in order to see the fine details needed for manual matching. You can change the size of the corresponding point markers, if they are hard to see. Also the texture size for the cropped panorama should not be to small (but to see the true resolution of the final panorama you need to save the panorama and use an external viewer). The maximal texture sizes are typical 2048 oder 4096 pixels.

5.7 Image view maximization

You can maximize the size of the image view, if you move the slider between the user dialog and the image view over it's stop all to the left. The the user dialog gets then hidden and to make visible again, just move the slider back to the right.

6 Status log

The status log is used to show the progress of some actions like the automatic matching. With a slider, the size of the status log can be adjusted of it can be hidden. If the status log is hidden, the sider is still there, just move the slider until the status log gets visible again. You can delete the content of the status log with a click on the Log button.

7 Quicktime VR Movies

In order to view or create Quicktime VR movies on Windows systems, you need to have Quicktime installed.

You can download Quicktime at http://www.apple.com/quicktime/download/

Panorama Workbench can only create cylindrical Quicktime VR movies.

7.1 Quicktime VR movie creation steps

1. You need to stitch a panorama with the option “cylindrical projection” and save it to an image file.
2. Open the movie dialog from the menu “Movie->Quicktime VR”.
3. Adjust the movie creations settings.

4. Click on “Create movie from saved panrama image file” and select the panorama in the file select dialog.
5. Wait until the movie is created and the file select dialog pops up again, then enter the movie file name (a .mov file extension atomatically added) and save the movie.

7.2 Embedding a Quicktime VR Movie into a Web-page

A simple web page html example:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html4/loose.dtd">
<html>
   <head>
      <meta http-equiv="Content-Type" content="text/html;charset=UTF-8"/>
   </head>
   <body>
      <p>
         <embed src="MyMovie.mov" width="640" height="480" bgcolor="#0080ff"
            scale="tofit" controller="true" pluginspage="http://www.apple.com/quicktime/download/" />
      </p>
   </body>
</html>
```

You can find more information at http://www.apple.com/quicktime/tutorials/embed.html

8 Version History

8.1 Changes from Version 1.0 to 1.01

- Fixed 2 bugs that crashed PanoramaWorkbench.
- Fixed a bug that prevented the stitching of a loaded project.
- Added tiff file format support for image load and save.
- Improved automatic matching speed on Intel hardware.

8.2 Changes from Version 1.01 to 1.02

- Fixed the bug with not working file paths that contain ä,ö,ü etc.
- Cylindrical Quicktime VR movie creation from an image file.