Middle East Technical University

Computer Engineering Department

Photokan User's Guide

By Okan Group

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1. What is Photokan?

Photokan is a photogrametry suite with which you can create mosaics, orthophotos, perform basic image processing operations on these items. It also provides basic geographic information system capabilities and lets you observe the world coordinates on the images according to the associated world files. Photokan also produces world files as outputs after orthophoto generation or mosaicking operation.

Photokan provides a flexible interface to the user. If the user wants to enhance the capabilities of Photokan, she can write new plugins that perform new algorithms. The projects in Photokan are stored as XML files that can be parsed efficiently during runtime.

One of the most important capabilities of Photokan that put it ahead of its competitors is its cross platform support. Photokan runs on both Linux and Windows platforms with all of its features enabled.
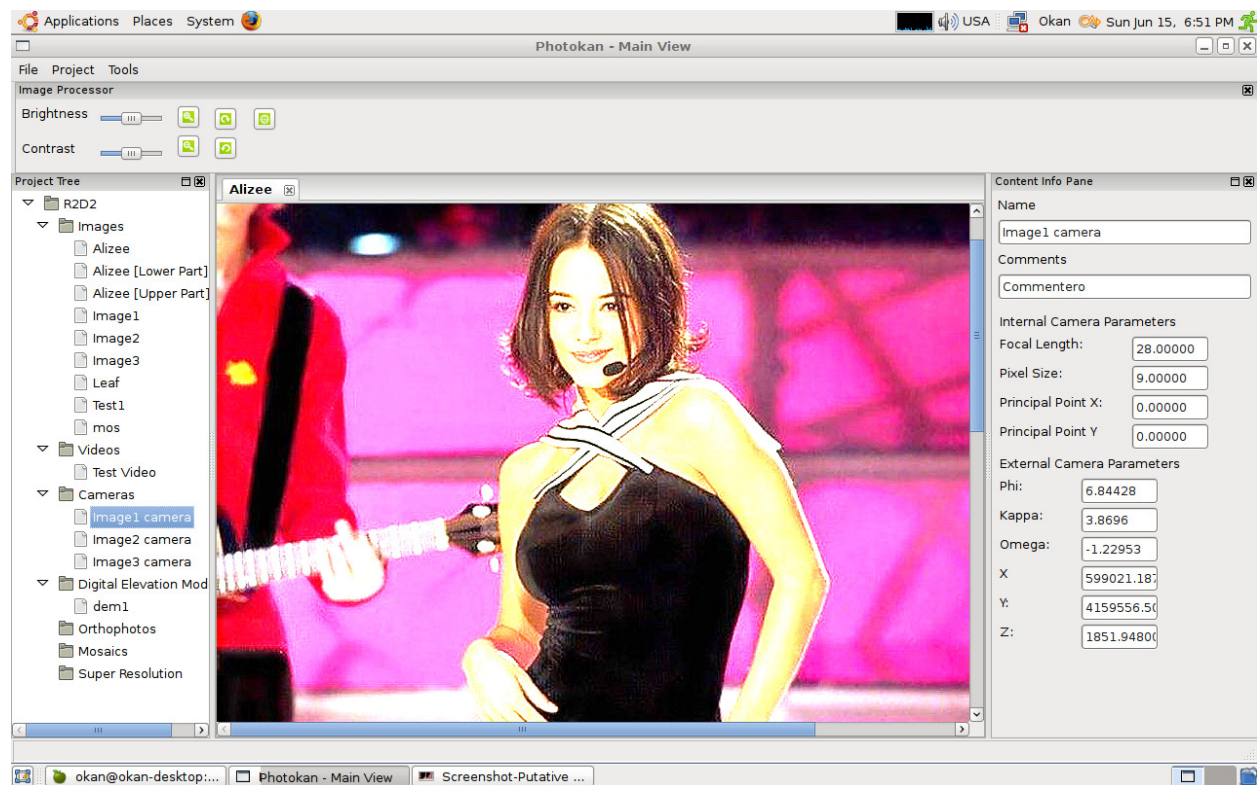
Figure 1 A general view of photokan

2. File Menu Items

File menu consists of items that lets the user to create new projects, load existing projects and save the current project.

Figure 2 File menu elements

2.1 New Project

When the user presses New Project menu, a dialog box prompting the basic information about the project appears (belowFigure 3 Create a new project dialog box). As the project path, you should supply an existing directory address. The format of the address depends on the platform Photokan is run.
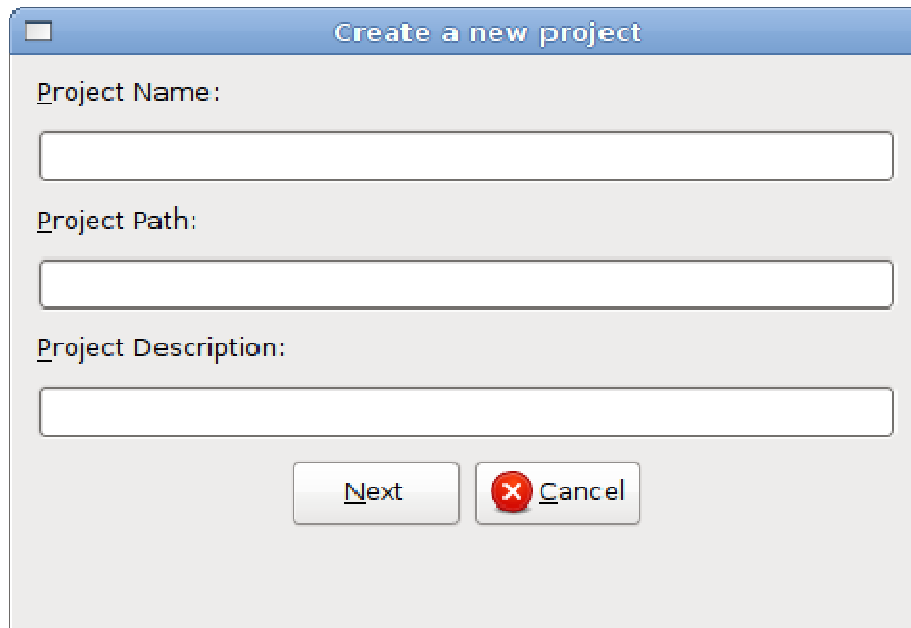
Figure 3 Create a new project dialog box

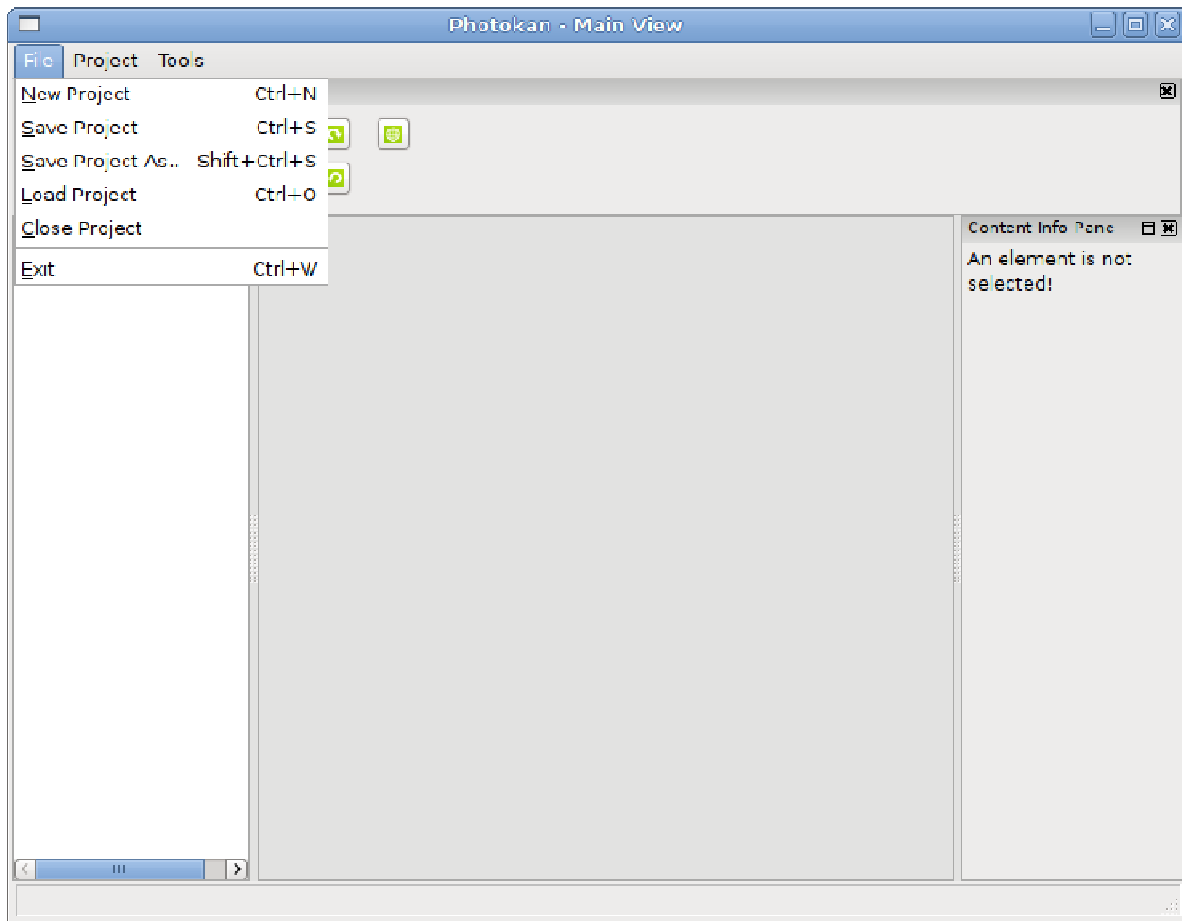After you click next, another dialog box will appear (Figure 4 Import elements dialog box). This dialog box lets you import existing images into the newly created project workspace. If you want, you can copy the files to the new workspace.

Figure 4 Import elements dialog box

2.2 Save Project

Save Project item lets you save the currently loaded project. All outputs and modifications on the images are saved in the project directory.

2.3 Save Project As

When you click on Save Project As, a file dialog box (Figure 5 Save As Dialog) appears, you should select the new project directory and the project name on the dialog. A copy of the current project will be saved in the new workspace.
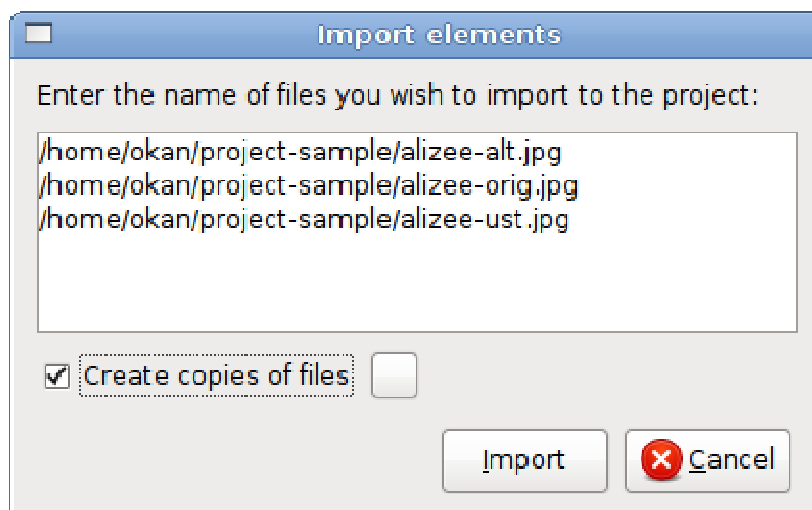
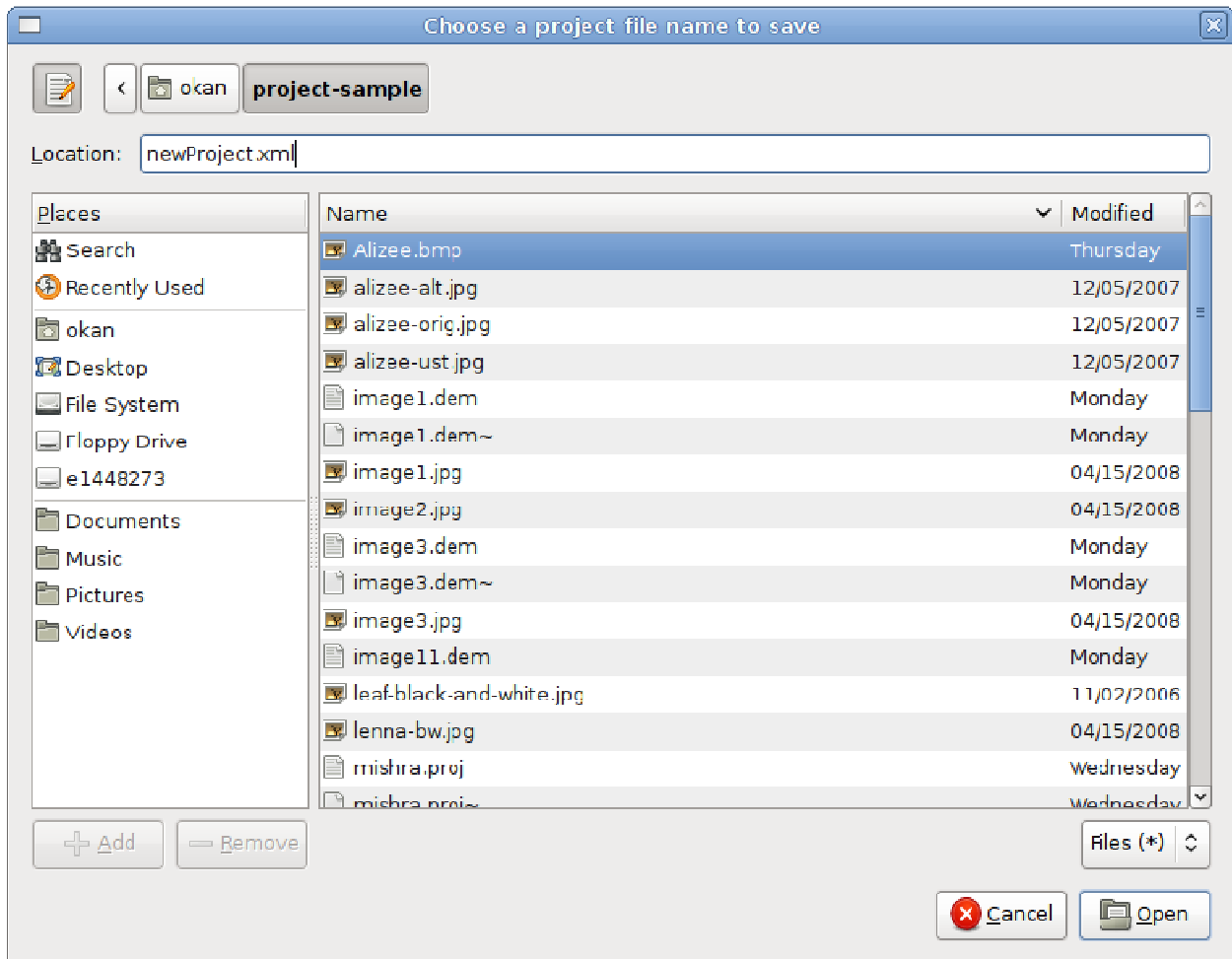After you save the project, the currently opened project in the workspace will not change.

Figure 5 Save As Dialog

2.4 Load Project

When you click on Load Project, a dialog box (Figure 6 Project File dialog) prompting for the project file will appear. When you select an project file, the selected project will be loaded into the workspace.
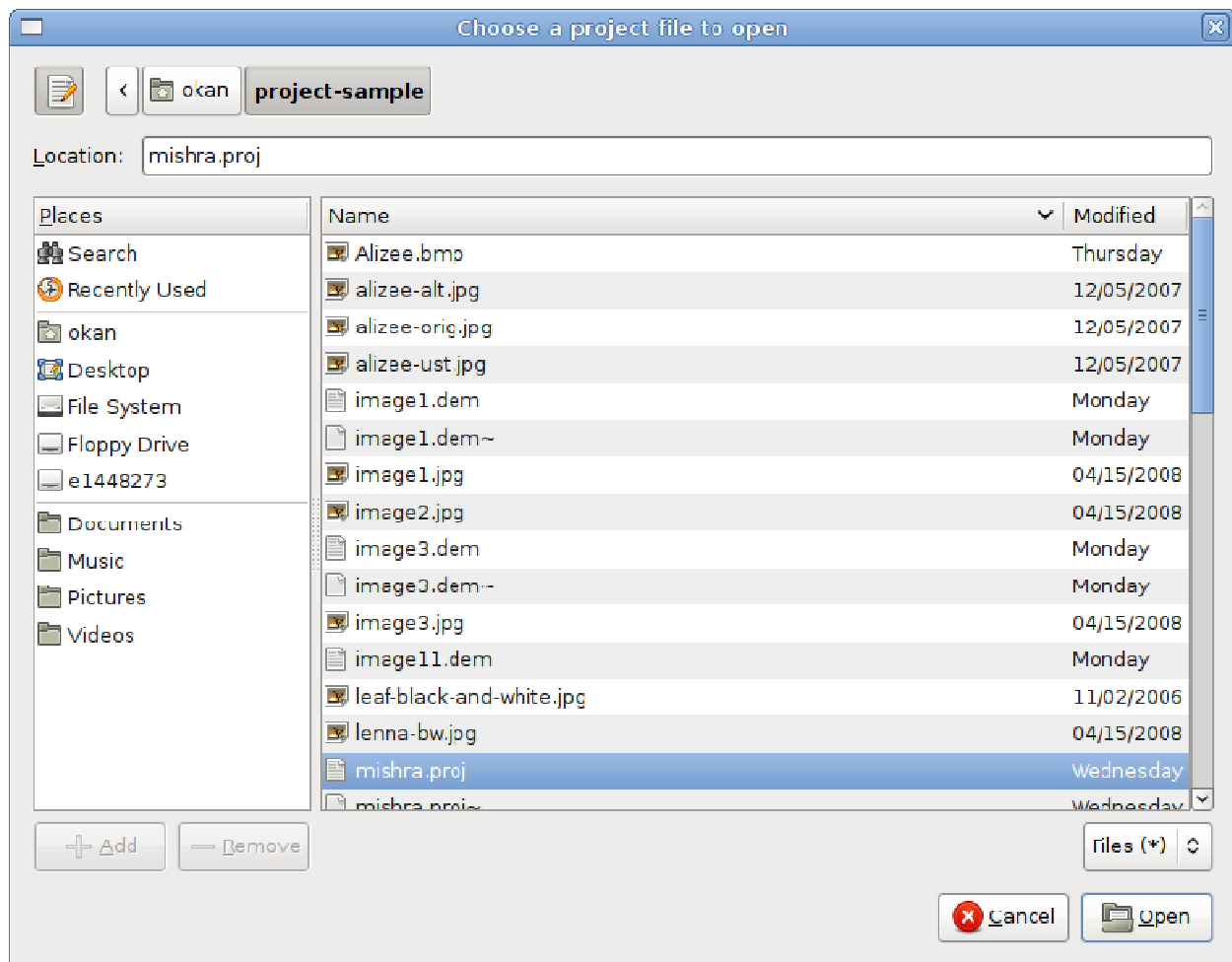
Figure 6 Project File dialog

2.5 Close Project

When you click, you will be prompted whether you want to save the modified project items. After that all files belonging to the project will be closed.

2.5 Exit

When you click on exit, Photokan will be closed. If you have made any modifications to the currently loaded project, you will be prompted whether you want to save the modified items.

3. Project Menu Items

Project Menu (Figure 7 Project Menu Items) items let you import existing images and new cameras into the project workspace.
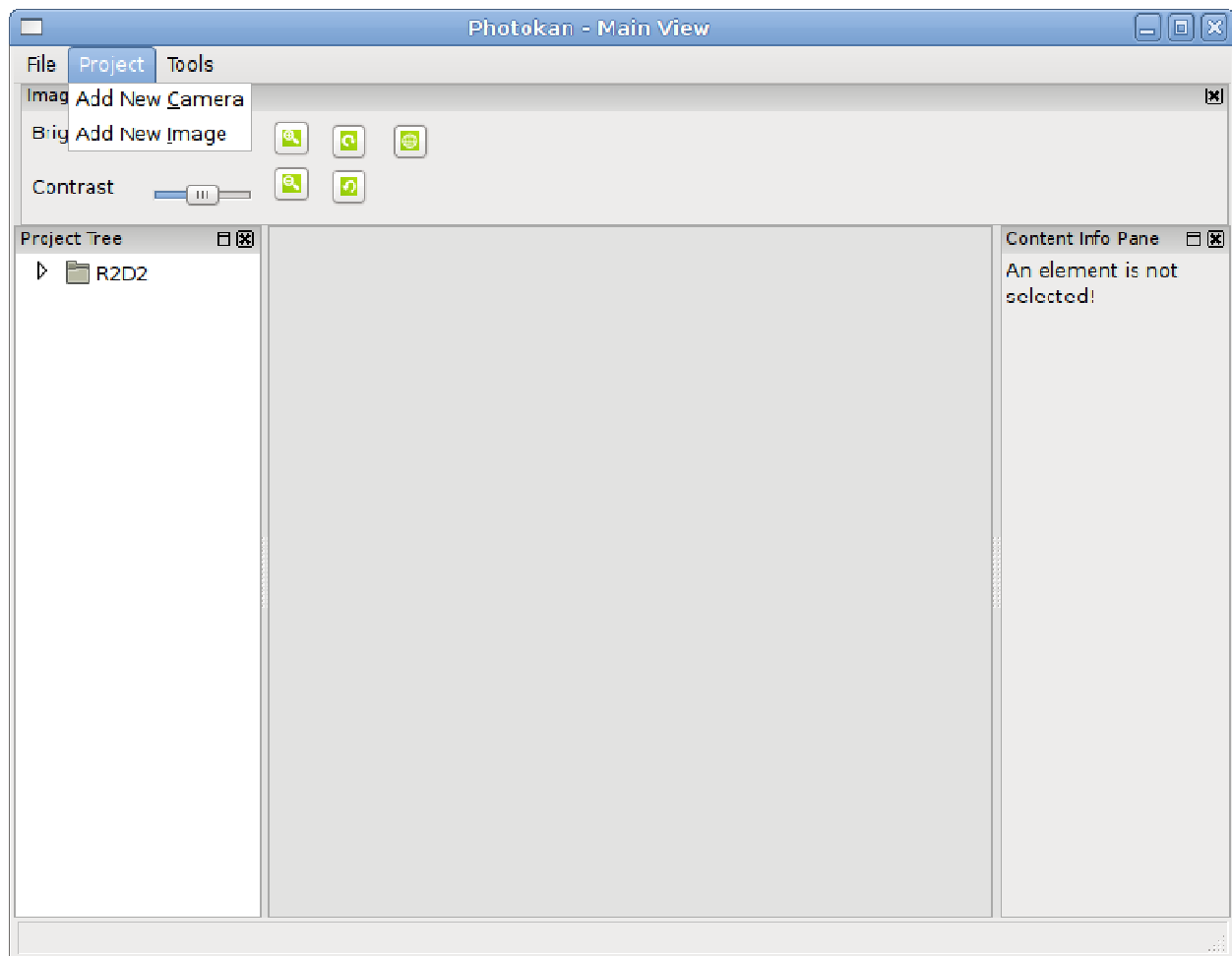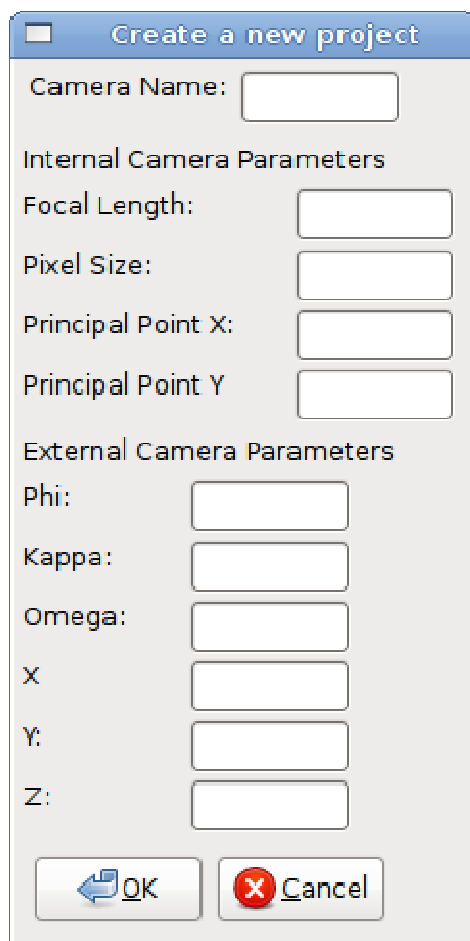
Figure 7 Project Menu Items

3.1 Add New Camera

When you click on Add New Camera, a dialog box (Figure 8 Add New Camera dialog) prompting for the internal and external camera parameters will appear. You should also give the camera a unique name as all elements in Photokan should have.

If you want to associate the newly added camera with an existing image in the project workspace, right click on an image, use "Set Camera" menu. Existing dems can also be associated with the context menu. A list of available dems and cameras will be shown in the menu.

Figure 8 Add New Camera dialog

3.2 Add New Image

When you click on Add New Image, a file dialog box will appear. When you select an image from the hard disc, the image will be copied to the project workspace and it will be shown in the project items tree.

4. Tools Menu Items

Tools menu (Figure 9 Tools Menu Items) lets you access the mosaicker and orthophoto generation modules. These modules are stored as dynamic loadable libraries that reside in the same address as Photokan binary. If you want to extend the current set of tools, you should consult the developer's guide.
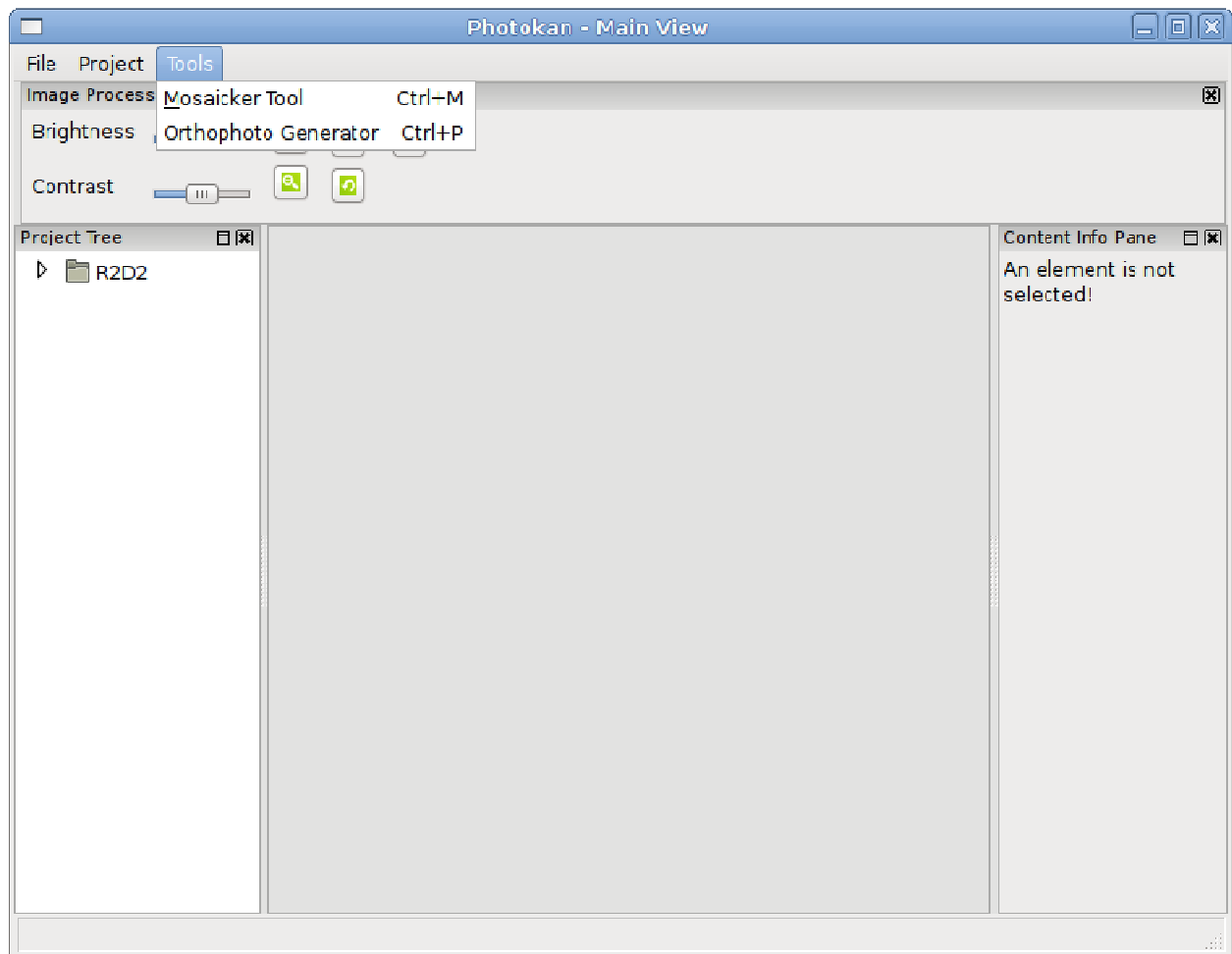
Figure 9 Tools Menu Items

4.1 Mosaicker Tool

The mosaicker (Figure 10 Mosaicker Tool) lets you load a mosaicker library. The requirements of a mosaicker library are described in the developer's guide. The panel in the middle is filled by the selected library. When you select a library, you should press Load Library button. After that you should use the panel to control the mosaicker library.

4.2 Orthophoto Tool

The Orthophoto Tool item loads a container interface for the orthophoto generation library as does the mosaicker tool. Its usage is same as the mosaicker module. See Figure 10 Mosaicker Tool
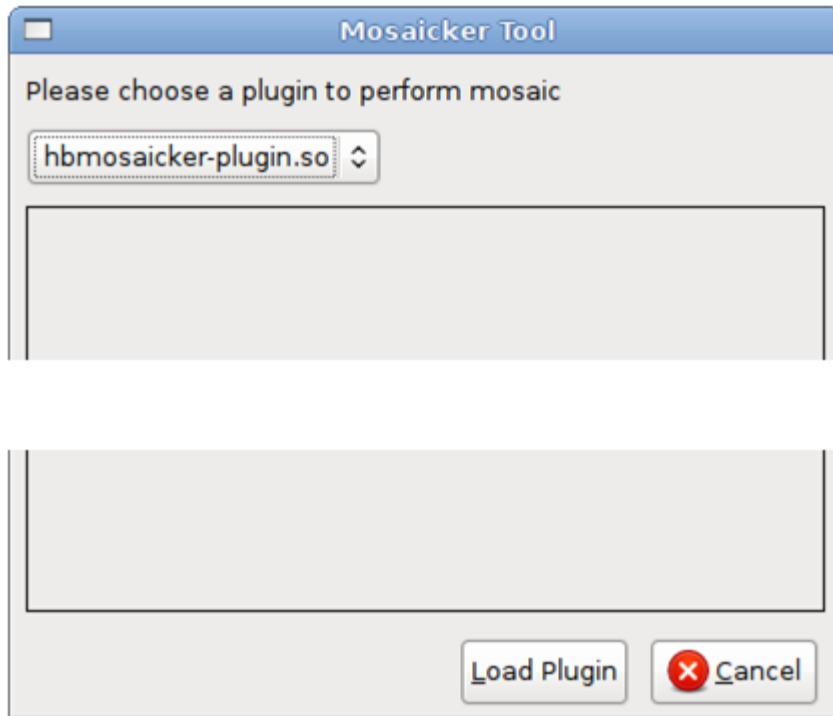
5. Mosaicker Libraries

Photokan provides two mosaicker libraries. The first one is hbmosaicker-plugin which provides homography based registration capability. It supports linear illumination model and can modify the sensed image to match the reference images illumination model. Hbmosaicker-plugin provides 3 interpolation choices to the user. It also supports masked images.

The second mosaicker library is wfmosaicker-plugin. It provides mosaicking images which have associated world files. Unlike the hbmosaicker-plugin, the reference and sensed images need not intersect in order to produce a mosaick.

5.1 Homography Based Mosaicker Plugin

It's interface can be seen on Figure 11 hbmosaicker-plugin user interface.

The listbox contains the images, mosaicks and orthophotos of the project that can be used to produce mosaicks. You should select at least two images to generate a mosaick.

The lower part of the panel consists of 3 parts: Harris corner detection parameters, putative match descriptor selection parameters, and ransac algorithm parameters. These are the three stages of homography based mosaicking. The texts of parameters are descriptive. These parameters should be tuned to output a good mosaick.

You should note that homography based mosaicker plugin does not guarantee the output of a mosaick even when it seems highly plausible. If you think that Photokan should generate a mosaick, please run plugin again. Since RANSAC algorithm (a randomized algorithm) is used, this plugin's flow is nondeterministic and may not always yield a mosaick successfully.

Mosaicker Tool

Please choose a plugin to perform mosaic

hbmosaicker-plugin.so

Alizee	Image2 mos
Alizee [Lower Part]	Image3
Alizee [Upper Part]	Leaf
Image1	Test1

Bicubic Interpolation

# of Corners	128
Quality Level Threshold	0.00000
Min Dist. Between Corners	0.00000
Block Size	10.00000
Aperture Size	5.00000

Putative Match Descriptors

Corner Window Size	10.00000
Max Dist. Between Matches	1000.00000
Threshold Value	0.00000

RANSAC Parameters

# of Iterations	32
Error Tolerance	1.00000

Mosaic

Load Plugin   ❌ Cancel

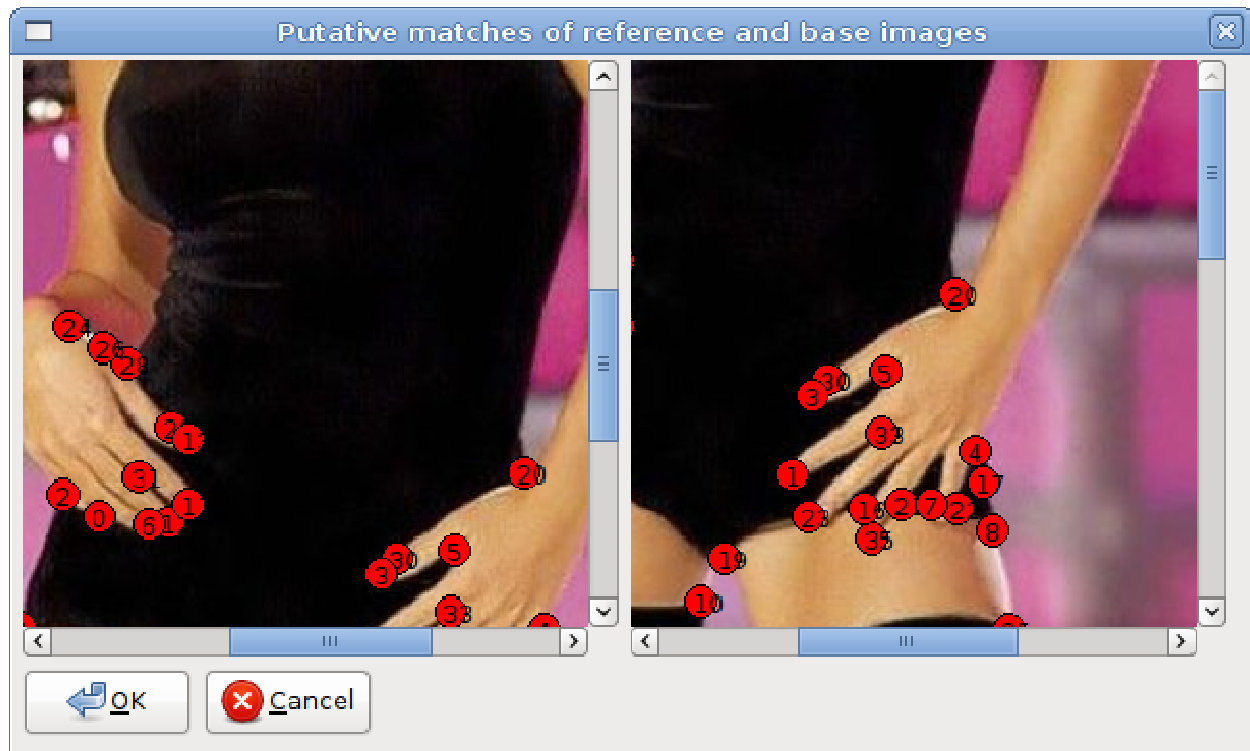**Figure 11 hbmosaicker-plugin user interface**

Figure 12 Putative Matches Modification Dialog

The homography based mosaicking plugin also provides the ability to manually correct the putative matches. The corresponding matches have the same numbers. If the user wants to delete a match, she can do so by double clicking on the match. If the user wants to add a new match, she can do so by double clicking on matched areas successively in both images.

5.2 World File Mosaicker Plugin

In the listbox of world file mosaicker plugin, only project items that have associated world files are listed. It is possible to output mosaicks having resolutions differing from the originals.
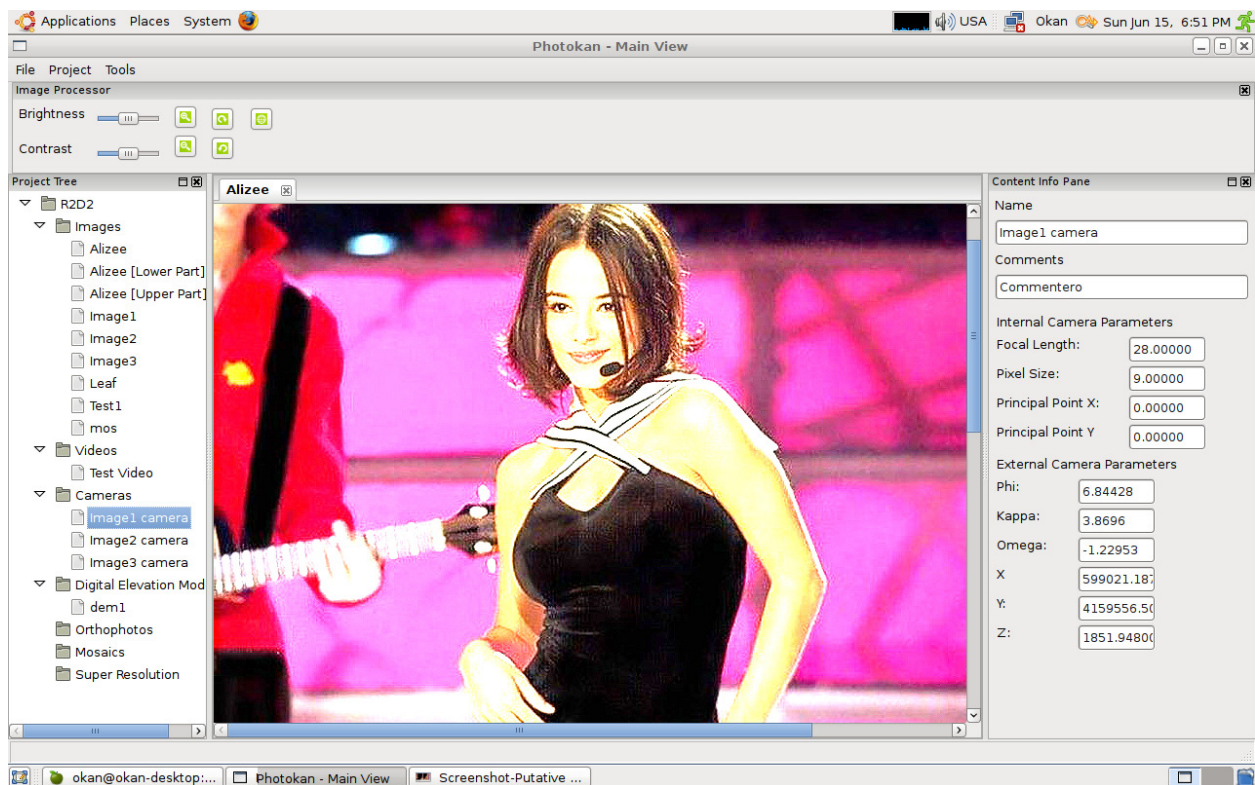
6. Orthophoto Generation Libraries

Photokan provides one orthophoto generation library. This library provides the create orthophotos from images having associated cameras. The user can also generate anaglyphs that can be viewed with 3d glasses to have a sense of depth.

6.1 Orthophoto Generation Library

The orthophoto generation library can produce orthophotos with world files, anaglyphs and mosaicks of orthophotos. In order to produce an orthophoto, the user should select images that have associated cameras with them. See Figure 13 Orthophoto generation library interface

The listbox contains the images from the project workspace. If the images have associated digital elevation models, the user can check "Use associated dems" otherwise she should enter the average height of the terrain photographed.

If the user wants to output an anaglyph, she should check "Produce anaglyph" and select exactly two images from the listbox.

The user can also specify a region of interest from the selected images if it is needed.
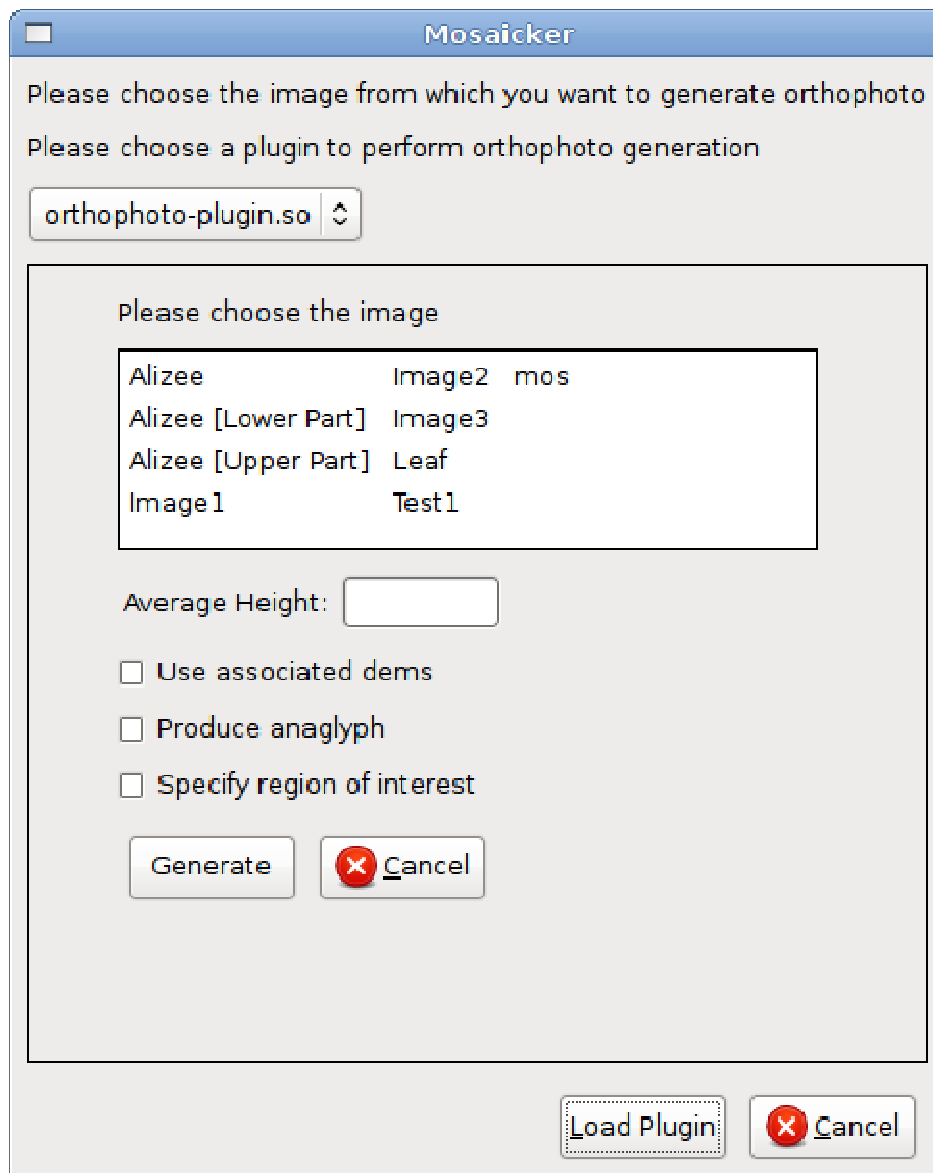
Figure 13 Orthophoto generation library interface

7. Image Processor Module

The image processor module provides the user with the ability to preprocess images, mosaicks and orthophotos with basic image processing facilities. Also the viewing experience can be enhanced with zoom and rotation facilities. Refer to Figure 7 Project Menu Items for image processing module. The upper pane has corresponding buttons and sliders.

7.1   Brightness Adjustment

The brightness adjustment slider lets you increase or decrease the images brightness. This facility saves the original image so that additional changes do not cause an accumulation destroying the ability to revert to the images original save.

7.2   Contrast Adjustment

Contrast adjustment slider lets you to increase or decrease the contrast of the selected element.

7.3   Zoom In/Out

You can zoom in or out the selected project element to enhance the viewing experience. This feature does not modify the original image.

7.4   Rotate Left/Right

With rotate left/right features, the project elements can be rotated by multiples of 90 degrees. This feature does not modify the original image.

7.5   Convolution Tool

The convolution filter lets the user to convolute the image with a 3x3 matrix. Photokan offers 4 presets that provides basic operators.

7.5.1   Light Blur Operator

The light blur operator softens the texture of the image by decreasing the sharpness.

7.5.2   Horizontal Sobel Operator

The horizontal sobel operator can be used to detect horizontally aligned edges.

7.5.3   Vertical Sobel Operator

The vertical sobel operator can be used to detect vertically aligned edges.

7.5.4   High Boost Filter

High boost filter sharpens the image while boosting the levels.