



# Triaxes® StereoTracer™

VERSION 5.0

## USER GUIDE

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# Introduction

## Preface

Triaxes StereoTracer is designed for rendering multiview images out of one original image or stereo pair by means of *depth map* in order to create stereo (3D) image. StereoTracer generates a number of frames, which all have slightly different viewing angle. This process models shooting of a scene from different points across the horizontal line. Resulting series of frames is used for creating 3D (stereo) image in the 3DMasterKit application or any other program for 3D generating.

The depth map (*disparity image* or *Z-image*) is a gray-scale image which resolution is equal to original image.

Depth map serves to convert original image into a three-dimensional one. Brightness of pixel in depth map shows distance from the same pixel in original image to viewer. The lighter areas in depth map correspond to the areas nearer to the viewer, the darker ones correspond to more distant areas. White pixel in depth map means that the pixel of original image has the smallest distance to viewer (foreground), black pixel in depth map means that the pixel of original has the biggest distance to viewer (background).

A depth map can be created automatically from a stereo pair in StereoTracer or manually out of one original image by means of any graphic editor.

The procedure of multiview series generation includes several operations:

- open source images (original image + depth map or stereo pair)
- create and correct depth map (if necessary)
- generate a frames series
- save generated multiview frames for further encoding or export them to Triaxes 3DMasterKit

## System requirements

Minimum hardware requirements software requirements:

- OS: Windows® XP/Vista/Seven
- 1 GHz CPU
- 1 GB RAM
- About 20 MB free disk space to install StereoTracer application

You may need additional disk space to store your images.

Also, if you need to process large images we recommend installing additional 2Gb RAM or more.

## Licensing and technical support

By installing, copying or otherwise using Triaxes StereoTracer (SOFTWARE PRODUCT) or any UPDATES, you agree to be bound by the terms of the “Triaxes” End-User License Agreement (“EULA”). The EULA is a legal agreement between you (either an individual or a single entity) and Triaxes for the “Triaxes” software product(s) accompanying this EULA which include(s) computer software and may include “online” or electronic documentation, associated media, and printed materials (“SOFTWARE PRODUCT”).

To get technical support, please, contact the distributor you purchased Triaxes StereoTracer from. Besides, you can ask your questions by sending an e-mail message to [support@triaxes.com](mailto:support@triaxes.com). Please, specify your activation user name and program edition, while contacting Triaxes Technical support group.

For sales and licensing information contact Triaxes Sales Department: [info@triaxes.com](mailto:info@triaxes.com).

Welcome to our web-site: <http://www.triaxes.com>.

This site contains news about Triaxes software and here you can download updates for the programs, samples and tutorials. Besides, the site contains useful articles about stereo, lenticular technology and using Triaxes software. Also, there is information about distributors and answers to frequently asked questions (FAQ).

## StereoTracer Demo mode

Triaxes StereoTracer works in Demo mode, until you *activate* it.

Please, note, that in Demo mode all generated frames are covered by logo-text “*Triaxes StereoTracer Demo*”. You may freely use StereoTracer Demo for evaluation, or any other noncommercial purposes. Also you may distribute copies of Triaxes StereoTracer Demo free of charge.

# Getting Started

This section explains how to install and start using Triaxes StereoTracer.

## Installation

1. Download Triaxes StereoTracer installation file from the product's page ([www.triaxes.com](http://www.triaxes.com)) or its mirrors.
2. Launch Triaxes StereoTracer Setup. For that, unzip the StereoTracer and launch the program *setup-StereoTracer-x.x-en.exe* (where x.x is the version number).
3. Triaxes StereoTracer setup window will appear. Read the recommendations and warnings. Click **Next**.
4. The license agreement will appear. Read the agreement and if you accept the terms, checkmark the “*Yes, I agree with the terms of this license agreement*” checkbox. Click **Next**.
5. Select the installation folder for Triaxes StereoTracer application. To select an installation folder, click **Browse** and find the folder to which you would like to install Triaxes StereoTracer. Click **Next**.
6. Select program group. Click **Next**.
7. Select install options. Click **Install**.
8. When setup is finished, and all the necessary files are installed on your computer, Triaxes **StereoTracer has been successfully installed** dialog will appear, and the program is ready to be run. You do not need to reboot your computer.

## Uninstallation

In order to uninstall StereoTracer, please, execute menu command:

**Start -> Programs -> Triaxes -> StereoTracer X.X -> Uninstall StereoTracer.**

Follow further instructions to complete uninstallation.

## Running StereoTracer

You can launch StereoTracer by several ways:

- Execute menu command: **Start -> Programs -> Triaxes -> StereoTracer x.x -> StereoTracer**
- Click **StereoTracer** icon on the desktop.

## Activation

It is necessary to activate StereoTracer in order to use it in full-mode, that allows you to get technical support and information about updates. The program runs in Demo mode, until it is activated.

To activate Triaxes StereoTracer, please, do following steps:

1. Launch Triaxes StereoTracer. **Activation** dialog will appear.
2. Click **Open key** in the **Activation** dialog and then select the file with activation key.
3. Click **Activate** to finish activation process.

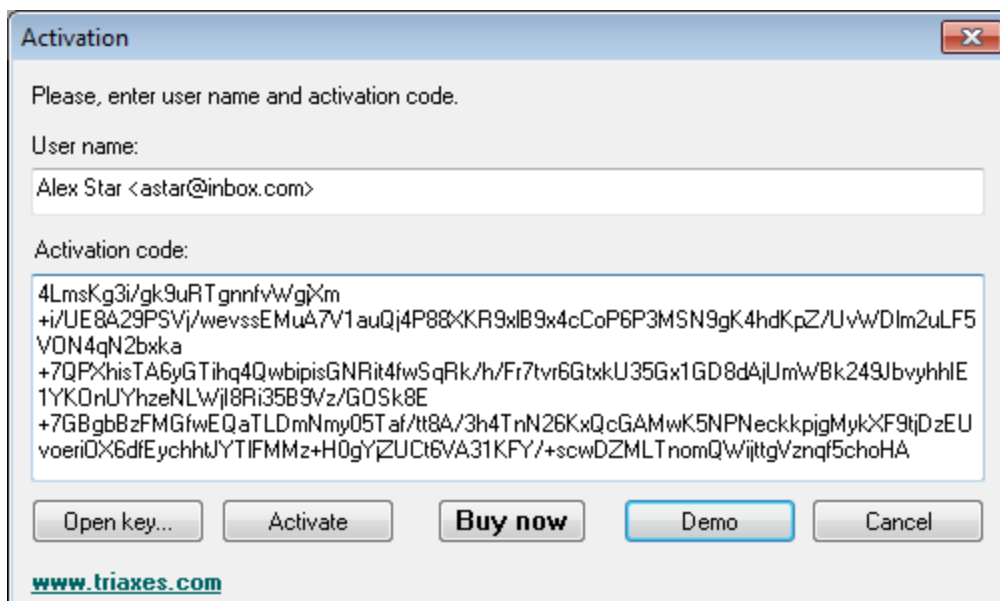


Figure 2.1 **Activation** dialog

After the activation is completed the **About** dialog (**Help | About**) will start displaying the user name (Fig. 2.2).

Please, refer to **Activation guide** for details (C:\Program Files\Triaxes\StereoTracer-x.x\Activation.pdf).



Figure 2.2 **About** dialog

## 1.1 StereoTracer Editions

Triaxes StereoTracer is available in the following editions:

Edition	Features
StereoTracer Home	<ul style="list-style-type: none"> <li>• Multiview rendering from one 2D original image and a depth map, created in an external graphic editor.</li> </ul>
StereoTracer Photo	<ul style="list-style-type: none"> <li>• Multiview rendering from one 2D original image and a depth map, created in an external graphic editor.</li> <li>• Multiview rendering from a stereo pair, based on depth map, calculated for one frame of a pair (left or right is up to you).</li> </ul>
StereoTracer Pro	<ul style="list-style-type: none"> <li>• Multiview rendering from one 2D original image and a depth map, created in an external graphic editor.</li> <li>• Multiview rendering from a stereo pair, based on depth map, calculated for one frame of a pair (left or right is up to you).</li> <li>• Multiview rendering from a stereo pair, based on depth maps, calculated for both frames of the pair. It's possible to get real "look behind" effect due to this feature.</li> </ul>

# Using StereoTracer

This section describes StereoTracer graphic user interface (GUI), its features, and instructions for multiview rendering.

## StereoTracer workspace

The outward appearance of the StereoTracer program workspace:

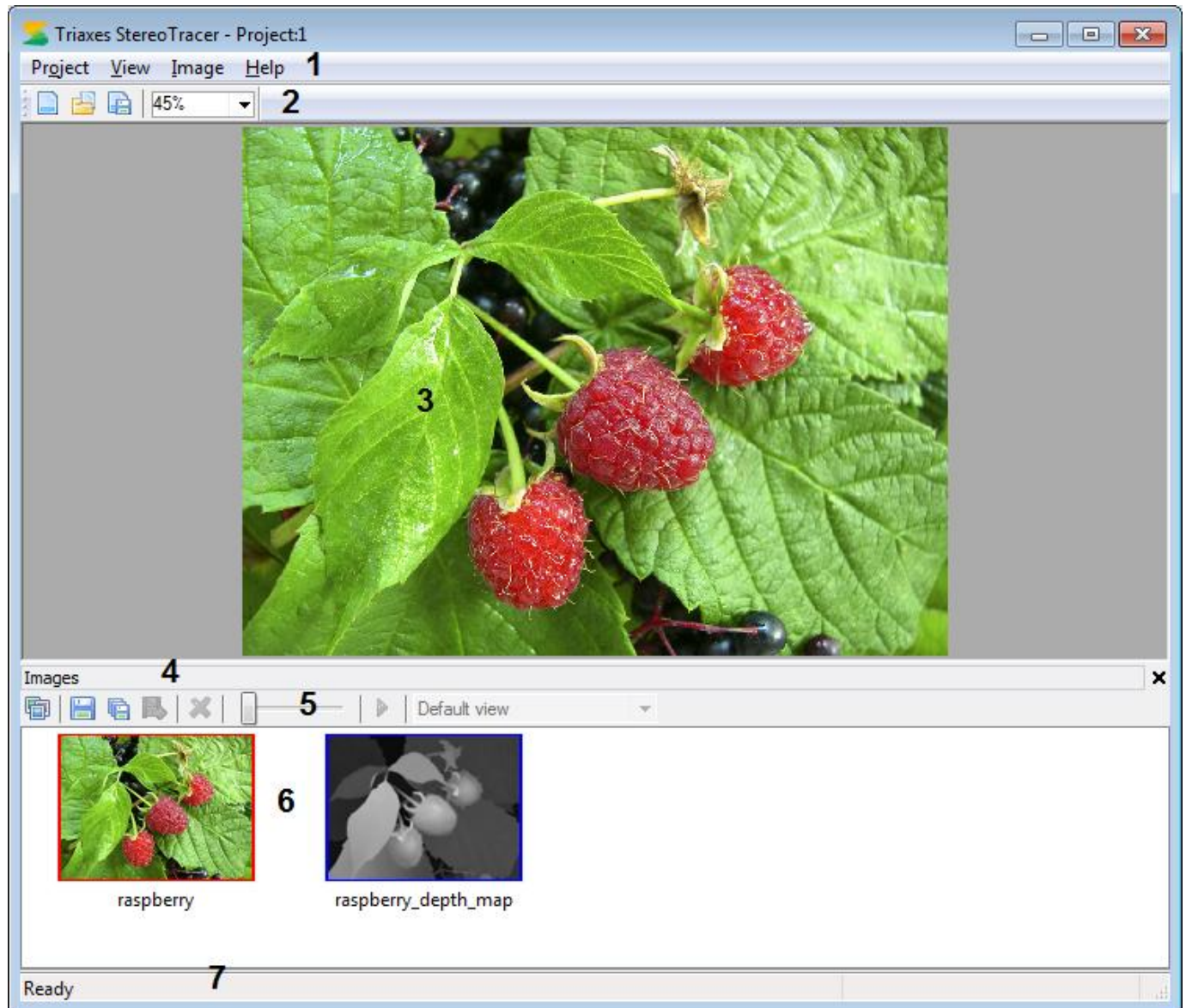


Figure 3.1 General view of the program

Indication:

- 1 – menu line
- 2 – toolbar
- 3 – StereoTracer working area
- 4 – **Images** window

5 – **Images** window toolbar

6 – list of images





7 – status bar

There is detailed description of elements below.

## Toolbar and Status bar

Toolbar is located in the upper part of the screen just below the system menu. It is possible to show or to hide it from the screen executing menu command **View | Toolbar**.

Table 1 StereoTracer Main Toolbar Control Element Description

Control Element	Function	Hot key
	Create a new project	Ctrl+N
	Open a project	Ctrl+O
	Save a project	Ctrl+S
	Scale of the image view	

Status Bar is located in the lower part of the screen. It shows the menu command prompts, and the current state of the generation. It is possible to show or hide it from the screen executing menu command **View | Status bar**.

## Images window

Original image, depth map and generated series are placed into the **Images** window (Fig. 3.2), which is located at the lower part of the main window (Fig. 3.1).

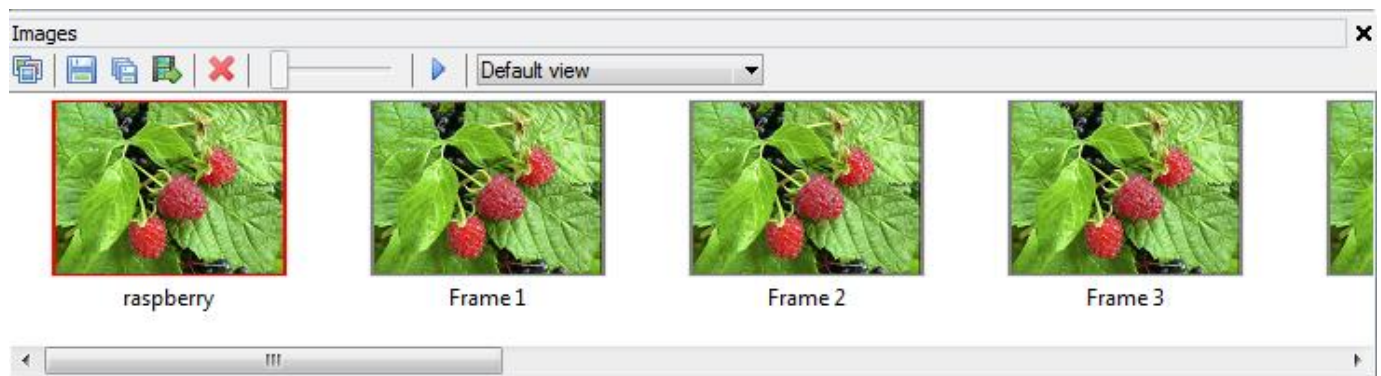









Figure 3.2 **Images** window

**Images** window contains control elements and images. Source images are marked with red (original photo) and blue (depth map) frames. Generated frames are inserted between them.

To show or to hide the **Images** window use the menu command **View | Images window**.

Table 2 *Images* window toolbar description


Control Element	Function	Hot key
	Starts multiview generation	Alt+G
	Saves generated series of frames	Ctrl+Shift+S
	Save current view	
	Delete generated frames from the list	
	Transparency of the right frame in respect to the left one	
	Start animated show of the generated multiview series, second pressing — stop animated show	
	Selector of viewing mode	

# Main operations

Creation of a new project

Menu command: **Project | New**

Hot key: **Ctrl+N**

Toolbar button: 

After executing this menu command, the following **Select source images type** dialog will appear:

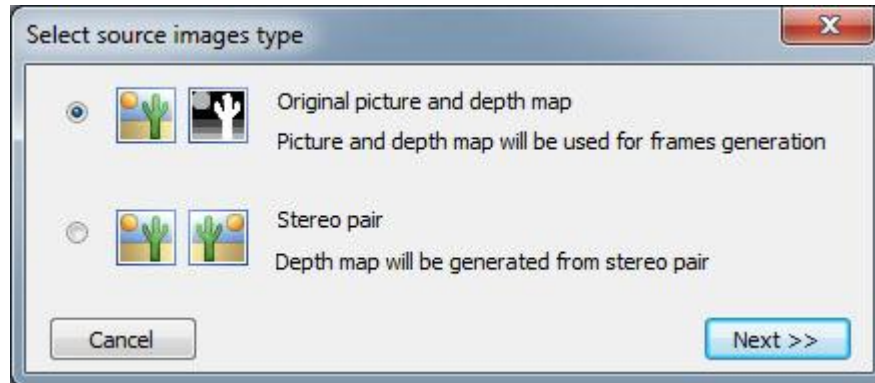


Figure 4.1 **Select source images type** dialog.

There are two source images types, from which it is necessary to choose one:

- 1) **Original picture and depth map** – an original 2D image and a depth map, created in a graphic editor, are opened in the project.
- 2) **Stereo pair** – two images are opened in the project: left and right frames of a stereo pair. A depth map will be created automatically by the Triaxes technology.

After the type of source images is chosen, press **Next** - **Open source images** dialog will appear.

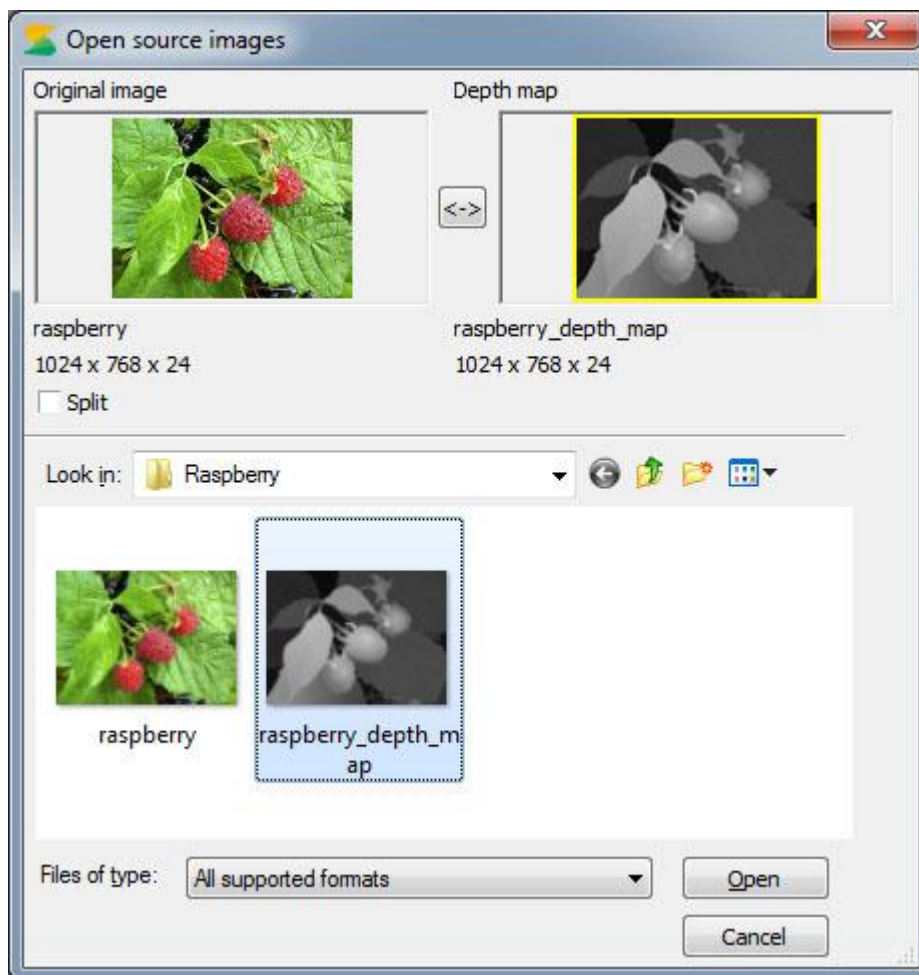


Figure 4.2 **Open source images** dialog

This dialog is for opening original photo and depth map image or stereo pair (depending on the type of the project), which then will be added into the project. In the upper part of the dialog there are two areas for selected images preview: the active area is highlighted with the yellow frame. Below the preview areas there is **Split** checkbox. This checkbox can be used in the case both frames (the left and the right ones) are stored in one image file (the image is split vertically into two parts). If this mode is not active, the original image and depth map image or two frames of a stereo pair will be selected separately. To specify source image or the left frame of a stereo pair, click on the left preview area and select needed file from the list. To specify depth map image or the right frame click on the right preview area. The image will appear in the active preview area.

If the **Split** mode is set, it will be necessary to select only one file with images: the original and depth map images or two frames of a stereo pair, that will be automatically displayed in the corresponding positions.

**Note:** original and depth map images as well as two frames of a stereo pair should have the same pixel resolution and the same color mode (for instance, both in RGB24).


## Supported for opening formats:

Format	Description
bmp	A file format for bitmap images storing without data compression and losses in their quality.
jpeg	A file format for bitmap images storing with some compression and some losses in their quality. The file size is in average 40 times smaller than a bmp file. Quality loss can be expressed in slight color corruption and appearing artifacts peculiar to the jpg compression. The quality level approximately corresponds to 7-8 (Medium-High). It is not recommended to save lenticular encoded images in this format.
gif	A storing file format for graphic images with indexed colour palette.
png	A spread storing format for bitmap graphic information using some compression without losses in quality.
tiff	A file format for bitmap images storing with some compression but without losses in their quality. Tiff file is in average two times smaller than bmp file.
mpo	A file format for bitmap images storing, using in Fuji FinePix REAL 3D W1 3D camera. It contains 2 images in jpg format with special technical information.

## Project saving

Menu command: **Project | Save**

Hot key: **Ctrl+S**


Toolbar button: 

The current project can be saved to the file with extension stp. The work with saved project can be continued later. Using the **Project | Save as** menu command you can save a project with different file name.

## Project opening

Menu command: **Project | Open**

Hot key: **Ctrl+O**


Toolbar button: 

Opening of the saved project of .stp format.

## Generation of the multiview frames series

Menu command: **Image | Generate frames**

Hot key: **Alt+G**

Toolbar button on the **Images** window: 

After executing this menu command, the following **Frames generation options** dialog will appear:

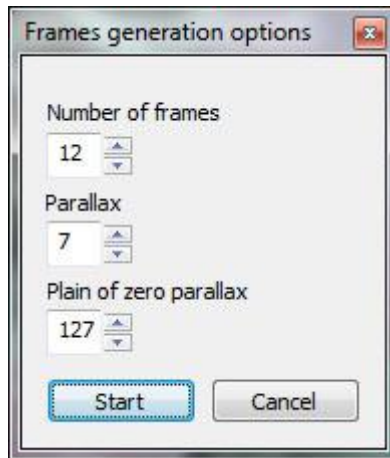


Figure 4.3 **Frames generation options** dialog

It is possible to set the parameters of generation. There are the following parameters in the dialog:

- **Number of frames** is the number of frames, which will be generated.
- **Parallax** is the value, which characterizes the distance of the object's projections on the plane for the left and right eyes (disparity). It's specified in percentage from canvas width.

Available range: from 0 to 25.

Default value: 7.

The bigger value corresponds to the bigger 3D effect, but it should be taken into account that value bigger than 10 often cause artifacts on the generated images. **So, we recommend to use values from 5 to 10.**

- **Plane of zero parallax** – this value characterize the placement of zero parallax plane.

Available range: from 0 to 255.

Default value: 127.


For 255 value the plane of zero parallax (disparity) is situated at the foreground (at the depth map the foreground is colored in white), while the whole image is situated in depth. For 0 value the plane of zero parallax is situated at the background (colored in black), and all of the image's objects seems to be flying above the paper or screen. Usually the best results can be achieved with the values in the 100-160 range.

## Generated frames saving

The generated frames can be saved as separate images in files or in one file with animation (formats GIV and AVI)

Menu command: **Image | Save frames**

Hot key: **Ctrl+Shift+S**

Toolbar button on the **Images** window: 

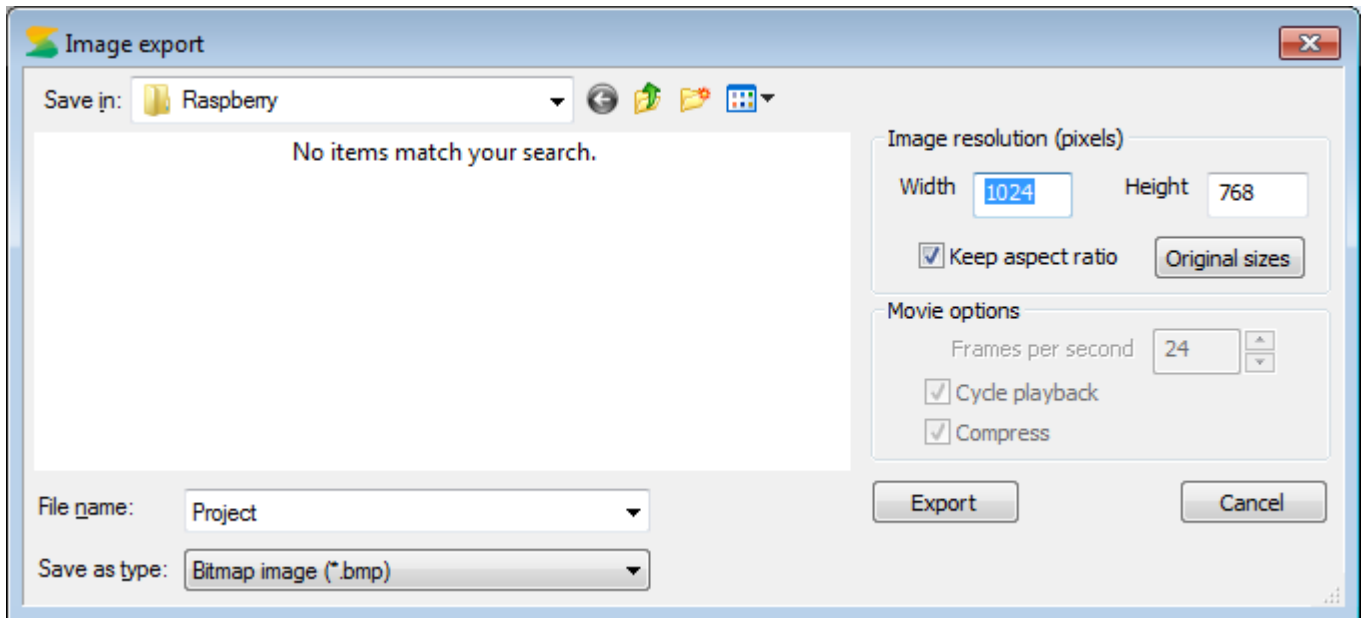


Figure 4.7 **Export images** dialog

Following file formats are supported:

Format	Description
bmp	Saving images without data compression. Images are saved without losses in their quality
jpg	Image data are compressed with some losses in quality. The file is on average 40 times smaller than a bmp file
tiff	Saving images with unnoticeable compression. Images are saved almost without quality loss
psd	Saving images in Photoshop format. Images are saved without losses in their quality
gif	Series of frames is saved in Animated GIF format. Derived file is convenient to arrange on web sites
avi	Series of frames is saved to a movie. Derived file has got better quality than Animated Gif
2dz jpeg	Saving images and depth maps side by side in one jpeg file
j3s	Saving images in Dimenco 3D Digital Photo Frame format

In the **Image resolution** (pixels) field you can change the size of an image (in pixels). The **Keep aspect ratio** checkmark means that, when **Width** or **Height** is changed, resolution automatically re-count in that way to save source relation of width to height. The **Original sizes** button allows you to restore ingoing sizes of images.


In the **Movie options** block you can specify parameters of created movie (active only for **gif** and **avi** file's type): playback speed (frames per second), cycle playback and compress.

When **Cycle playback** is checkmarked, the movie which is comfortably played several times is being created. Such movie contains frames from first to last and back to first. If the **Cycle playback** is not checkmarked – the movie with frames only from first to last is being created (with lesser file's size).

When the **Compress** box is checkmarked (active only for **avi** file's type) compression by standard video-codec is applied.

## Current view saving


Menu command: **Image | Save current view**

Toolbar button on the **Images** window: 

The feature is for saving an image, displayed in the program's working area. It allows you to save anaglyph image, stereo pairs for the parallel and cross eyed view and a frame from the generated series or a depth map, depending on the current viewing mode.

## Export to 3DMasterKit

Menu command: **Image | Export to 3DMasterKit**

Toolbar button on the **Images** window: 


The feature is for quick transfer of the frames generated in StereoTracer to 3DMasterKit for the further 3D image encoding.

When the command **Image | Export to 3DMasterKit** is executed, StereoTracer automatically searches installed 3DMasterKit in the system, opens it and then transfer generated multiview series to it.

The feature is available with installed 3DMasterKit 3.6 or later version.

## Deletion of the generated frames

Menu command: **Image | Delete frames**

Toolbar button on the **Images** window: 

The generated frames is deleted from the project (source frames are not deleted).

## Setting transparency while previewing


To compare the images it is necessary to set the image - depth map transparency with the help of the slider on the **Images** window.




The extreme left position of the slider corresponds to the full transparency of the depth map. Thus, only original image will be displayed on the screen. The extreme right position of the slider corresponds to the full transparency of the image. Thus, only the depth map will be displayed on the screen.


## Playback of the generated sequence of frames (Animation)

Menu command: **View | Animation**

Toolbar button on the **Images** window: 

All generated frames from the frames list will be successively displayed on the screen. To finish the slide-show use the same command **View | Animation** or press up the button  on the **Images** window.

## Setting the image's scale

To zoom in/out the current image preview use drop-down list on Toolbar:  and choose the scale value (in percentage) or enter it manually.

## Anaglyph image creation

Anaglyph (from gr. anaglyphos – relief) – is the method of stereo visualization which consists of coloring two frames of a stereo pair into “supplementary” colors (e.g. one frame is red, another one is cyan). When viewing the image through anaglyph glasses, each eye perceives only one frame. Anaglyph glasses is shown on the following picture (red for the left eye, cyan – for the right).



Figure 4.8. Anaglyph glasses (image from [www.stampex.pl](http://www.stampex.pl))

In StereoTracer there are three modes of the anaglyph image generation: **Grayscale**, **Sub-color**, and **Color**.



The usage of the anaglyph mode is possible only if there are generated frames in the images list. The anaglyph image is created from the first generated frame and one selected frame from the sequence. It is possible to choose the anaglyph mode by choosing the corresponding element of the drop-down list on the **Images** window.

Generated anaglyph image can be saved on disk:

Menu command: **Image | Save current view**

Toolbar button on the **Images** window: 

**Note:** *The quality of anaglyph image depends on original source photo colors. So, in some cases the **Color** anaglyph mode will give the excellent result, but in the case when original photos contains a lot of red or blue colors it would be better to use **Sub-color** or **Grayscale** mode.*

## Creation of a stereo pair for the direct view

Direct view modes – cross eyed and parallel are for evaluating 3D effect directly from the monitor screen, without any additional devices. Gotten 3D images are convenient to be posted on the Internet.



Two images (stereo pair) — a source one and a selected from generated frames series one appear in the main program window when choosing one of that modes from the drop-down list on the Images window.

When using the parallel method, frames of a stereo pair is located before eyes in the order they were taken — from left to right (Fig. 4.9 — a), and changing their places when the cross eyed method is chosen (Fig. 4.9 — b).

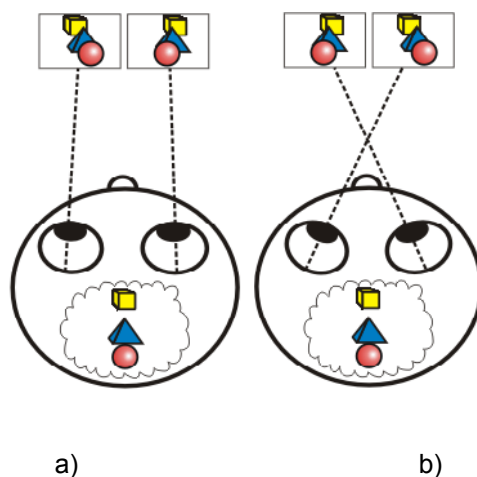


Fig. 4.9 Parallel and cross eyed viewing methods


When parallel method is used, you should look "through" the picture as if you watch an infinitely distant object. The sight lines of your eyes will be almost parallel, while the accommodation should be adjusted to the actual distance to the image.

To be able to see stereo effect in the cross eyed viewing mode, you should look at the picture that way as if there was an imaginary object before the image itself. The sight lines will intersect in this case, accommodation should be adjusted to the actual distance to the image.

More detailed these two modes are described in the «3D Theory» document (C:\Program Files\Triaxes\3DMasterKit Demo-x.x\help).

Generated stereo pair can be saved on disk:

Menu command: **Image | Save current view**

Toolbar button on the **Images** window: 

### Use of the histogram dialog for the depth map correction

You can create or correct depth map using the **Histogram** dialog. Click right mouse button on original image or depth map and choose **Create depth map...** or **Correction...** menu commands in context menu – **Histogram** dialog will appear (Fig. 4.10).

If you choose **Create depth map...** menu command – current depth map will be replaced by a new one, created based on original image.

If you choose **Correction...** menu command – current depth map will be edited by histogram and filters of the dialog.

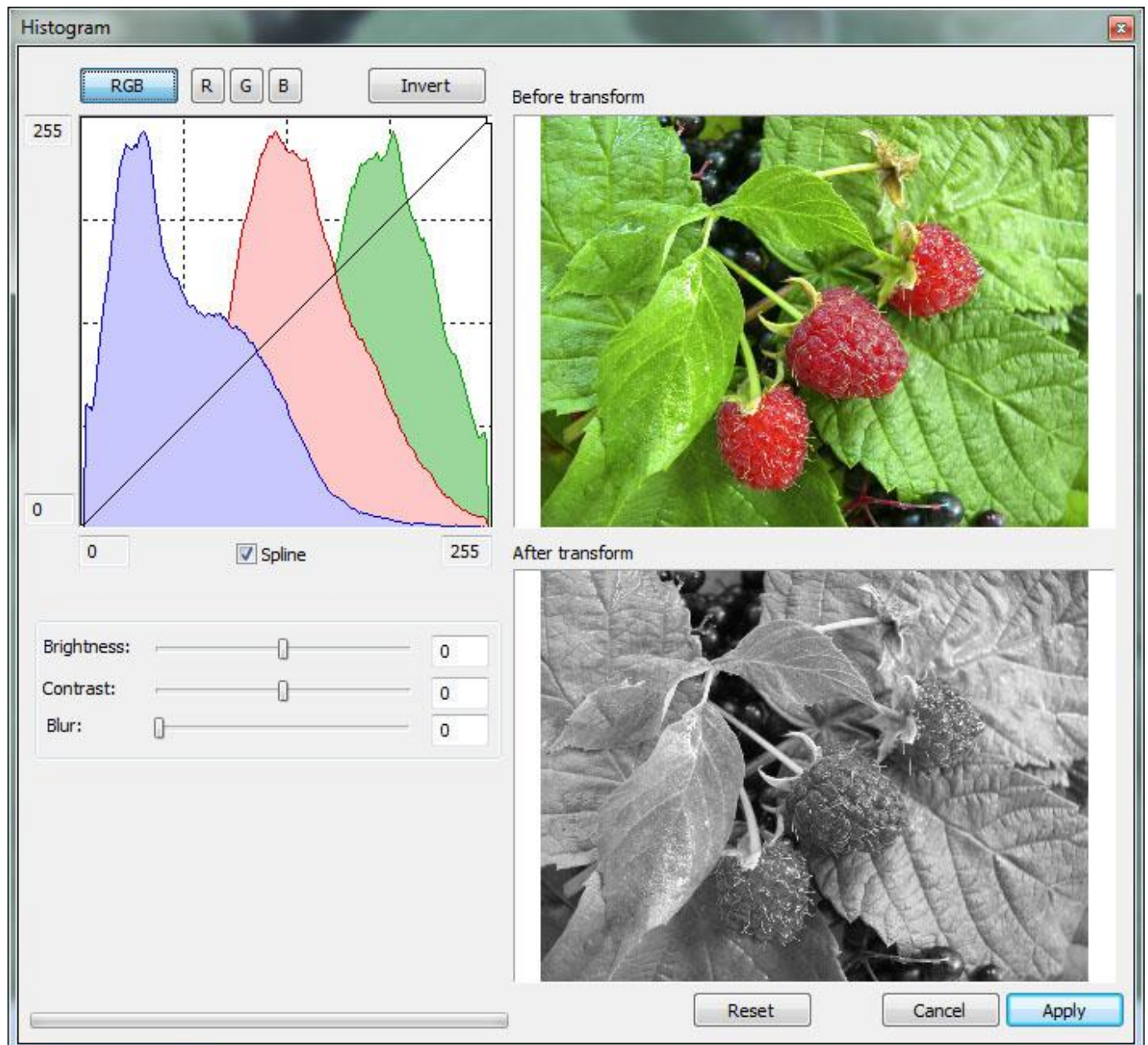


Figure 4.10. Correcting depth map by Histogram

**Histogram** (in the photography) is a graph of the semi-tones allocation that has two axes: the **x** axis represents the brightness, and the **y** axis represents the relative number of pixels with corresponding brightness values.

By the histogram you can find out the main idea of exposition correctness, image contrast and color depth, define the required correction when you take a photo (changing exposition and color balance, light or image composition) and also when processing is started.

Use the buttons above the histogram to correct it by separate color channels: **RGB** – all channels, **R** – red channel, **G** – green channel, **B** – blue channel. By clicking **Reset** button you can go back to source histogram.

Set the control point by a left mouse button clicking. Remove the control point by a right-mouse button clicking. Move the control point by left-mouse clicking on graph and holding the point while you're moving it to the necessary place.

There are two ways to connect controlling points: the spline and the broken line. Use **Spline** flag under the histogram to enable/disable spline mode. Fields by the x and the y axes allow correcting manually the brightness of borders. Besides, they can be moved by left-mouse button clicking on the required border.

Below the histogram there are **Brightness** and **Contrast** sliders to set brightness and image contrast.

You can also apply the **Blur** filter to the image, regulating the extent of blur by **Radius** slider (value of the radius is specified in pixels). This feature is used to tone down sharp details – for better result of the generating a sequence of frames, it is necessary the transition between the objects in the depth map to be more smooth. The **Blur** filter allows to avoid artifacts (imperfections) at the edges of the objects. So, if such defects as the vertical curved line are appeared in the generated images, use that feature.

In the depth map image, the more remote an object, the darker it should be. In case, the foreground objects of the original image are darker then the objects of the background, the feature **Invert** is used. The operation of Inversion will invert the depth map image so that the closer object will be lighter, then remote ones. Press the **Invert** button to apply that operation.

## Depth map editing by means of an external graphic editor

A depth map as well a source image, except by means of the histogram, may be edited with the help of any external bitmap graphic editor. For that, it is necessary to click right mouse button on the image's thumb-nail in the list of thumb-nails and select **Edit in external editor** in the appeared context menu. By the end of editing, save your image without changing file name. As the result, the edited image will be automatically changed in StereoTracer.

You can choose necessary software for editing by means of **Project | Settings** menu command.

**Attention!** Depth map and source images edition is available only before frames generation.

## 4.15 Context menu of the **Images** window

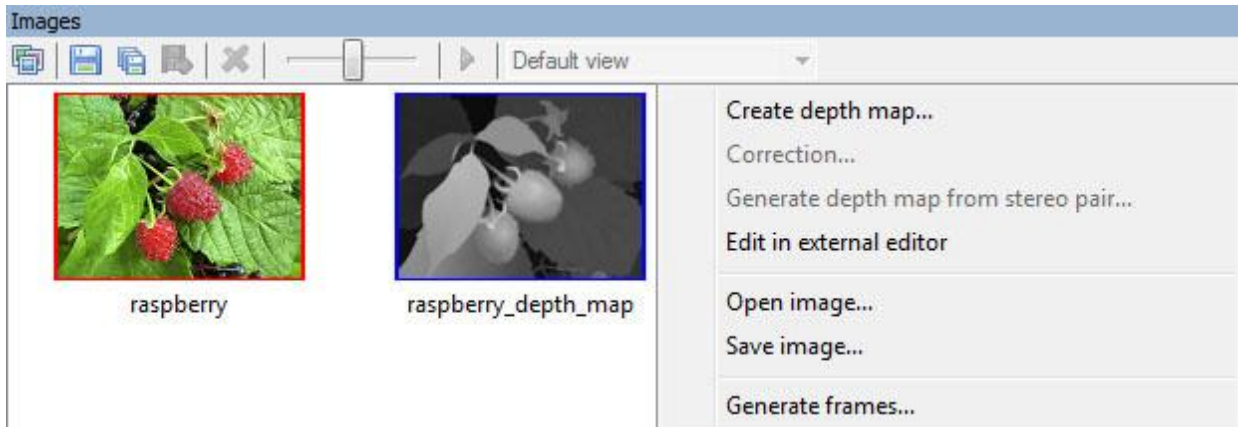


Figure 4.11 Context menu of the **Images** window

Context menu opens by pressing right mouse button on a depth map or original image on the **Images** window. This menu is simplifying access to main operations with source images. Menu is active only in the case frames are not generated yet, i.e. there is only an original image and a depth map on the **Images** window.

Menu commands:

**Create depth map...** – a new depth map is created (just a grayscale variant of the original image) and opened for edition in the **Histogram** dialog. For the detailed description of the depth map creation process see section [Use of the histogram dialog for the depth map correction](#)

- **Correction...** – **Histogram** dialog opens for the current depth map edition. For the detailed description of the edition process see [Use of the histogram dialog for the depth map correction](#).
- **Generate depth map from stereo pair** – Wizard for the second depth map creation from a stereo pair. For the detailed description of the depth map creation from a stereo pair see [3D sequence of frames generation from 2D image and depth map](#).
- **Edit in external editor** – a chosen image is uploaded into an external bitmap graphic editor, chosen in the menu item **Project | Settings**.
- **Open image...** – allows new image to be opened in a project instead of depth map or original image. This menu command is convenient to use in the case it is necessary to open edited depth map from a file on disc.
- **Save image...** – selected image (source one or depth map) is saved in a file on disc. This menu point is convenient to use in the case it is necessary to edit created depth map in an external graphic editor.
- **Generate frames...** – multiview rendering from original image and depth map. For the detailed description of the frames generation process see [Generation of the multiview frames series](#) and [Generated frames saving](#).

# StereoTracer Use

There are methods of StereoTracer use described in this section. The software allows you to operate with a depth map, created in external graphic editor or create depth map in StereoTracer based on a stereo pair (see [Depth map editing by means of an external graphic editor](#)).

## 3D sequence of frames generation from 2D image and depth map

To create a depth map from one source image any external graphic editor can be used. Some of the depth map creation methods are described in [Methods of manual depth map creation](#). For the 3D sequence of frames generation from an 2D image and a depth map do the following:

- 1) Execute **Project | New (Ctrl+N)** command and select first project type in the appeared dialog. Press **Next >>**.

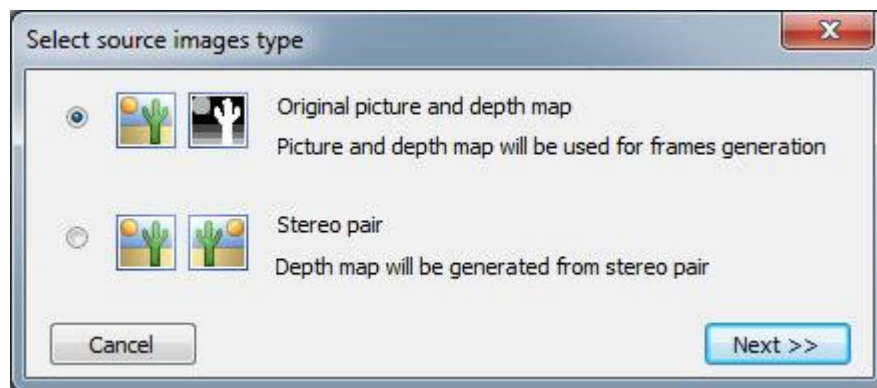


Figure 5.1 **Select source images type** dialog

- 2) It is necessary to specify files' names in the **Open source images** dialog. First, ordinary picture (2D) is selected. For example, C:\Program Files\Triaxes\StereoTracer-x.x\samples\Raspberry\raspberry.jpg (see Fig. 5.2).

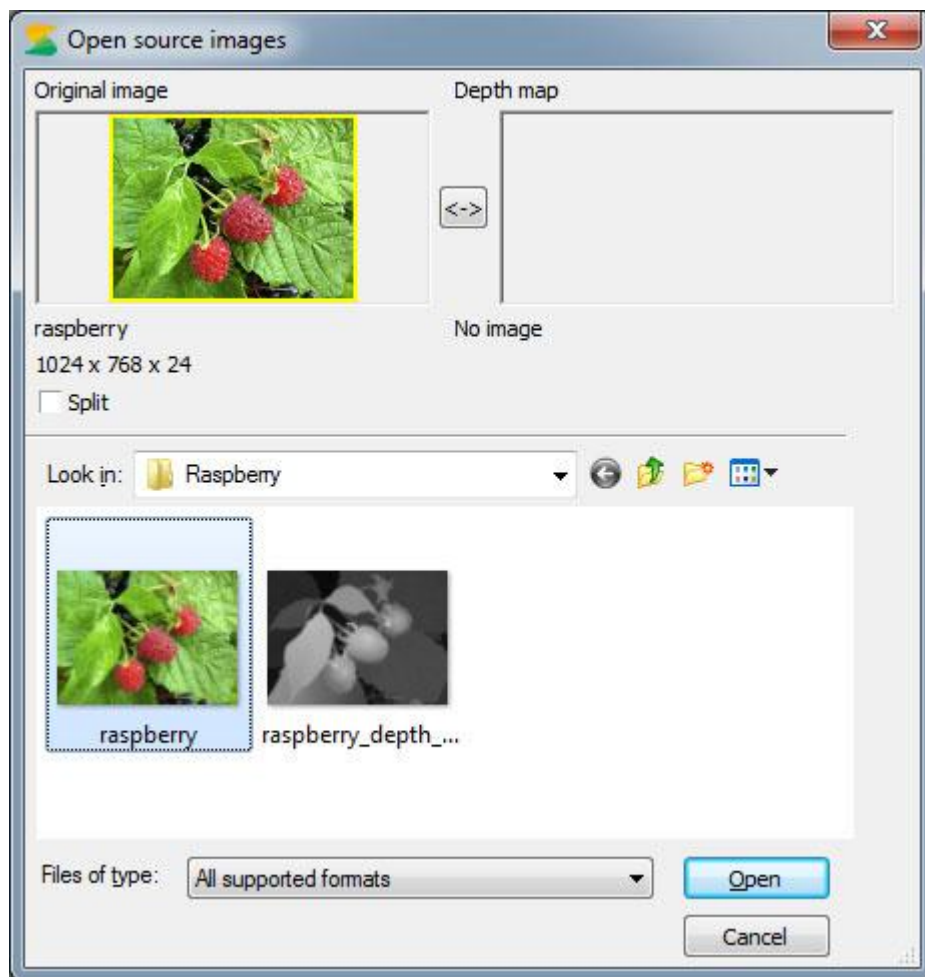


Figure 5.2. **Open source images** dialog

Preview of the chosen image will be shown in the left window of the dialog under the sign “**Original image**”.

Then, press left mouse button on the right dialog's window under the sign “**Depth map**” and press mouse button on the depth map's file name. For example, Files\Triaxes\StereoTracer-x.x\samples\Raspberry\raspberry\_depth\_map.jpg (Fig. 5.3).

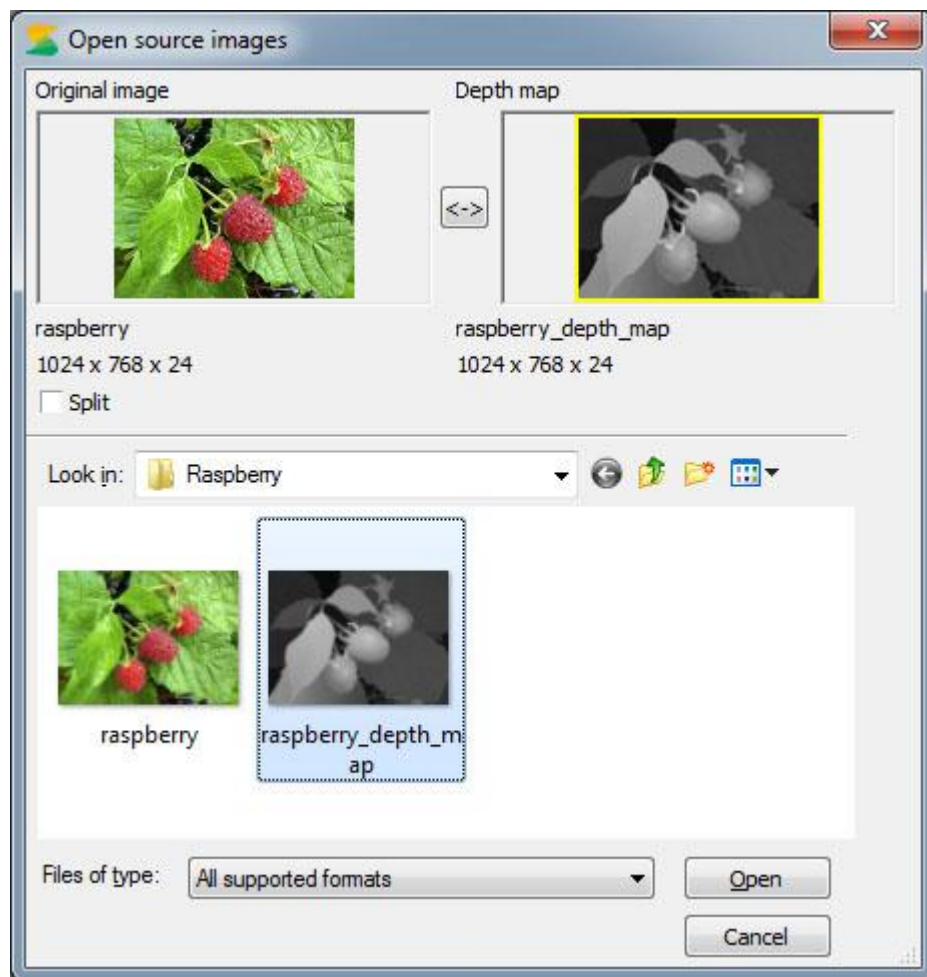


Figure 5.3 **Open source images** dialog

- 3) Press «**Open**». After that chosen images will be opened in the main program window.
- 4) Select menu command **Image | Generate frames (Alt+G)**. The **Frames generation options** dialog will be shown (Fig. 5.4). Select a method and press **Start** button (see also [Generated frames saving](#)). As a result 3D sequence of frames will be generated.

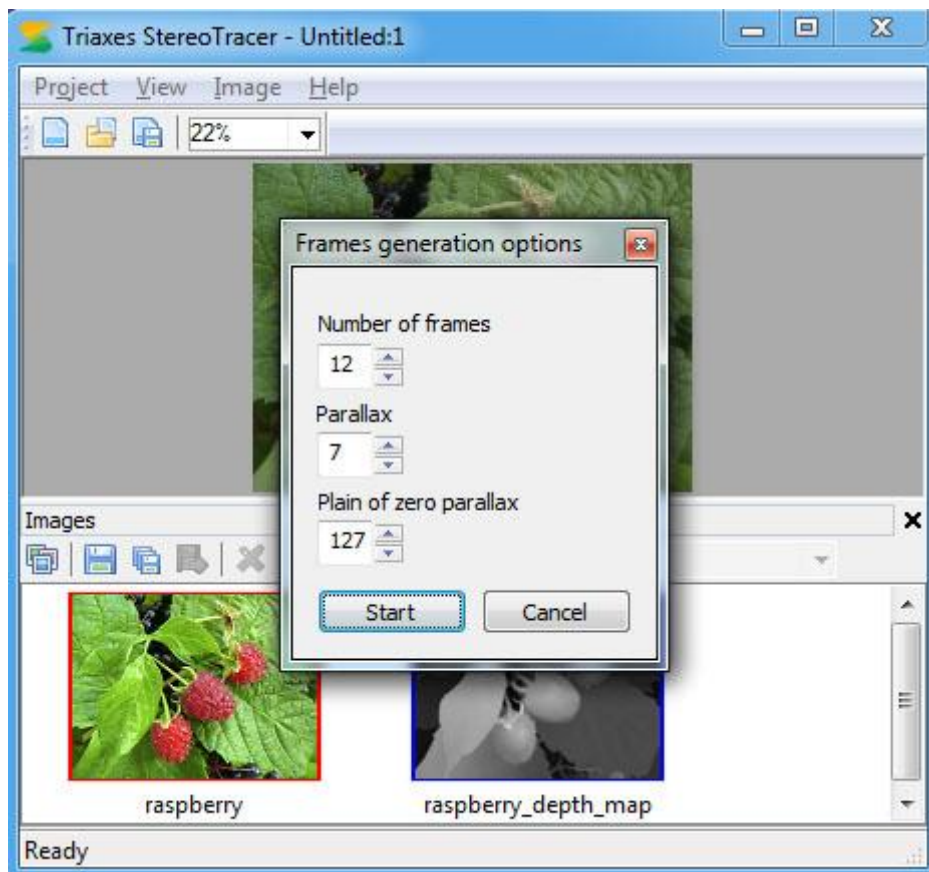


Figure 5.4 The main program window and the **Frames generation options** dialog

- 5) Gotten 3D sequence of frames can be saved on disk as separate files (Image | Save frames (Ctrl+Shift+S)) or export to Triaxes 3DMasterKit (Image | Export to 3DMasterKit).

## Depth map creation from a stereo pair

1. Choose «Stereo pair» in the **Select source images type** (Fig. 5.5)

Menu command: **Project | New**, hot key **Ctrl+N**

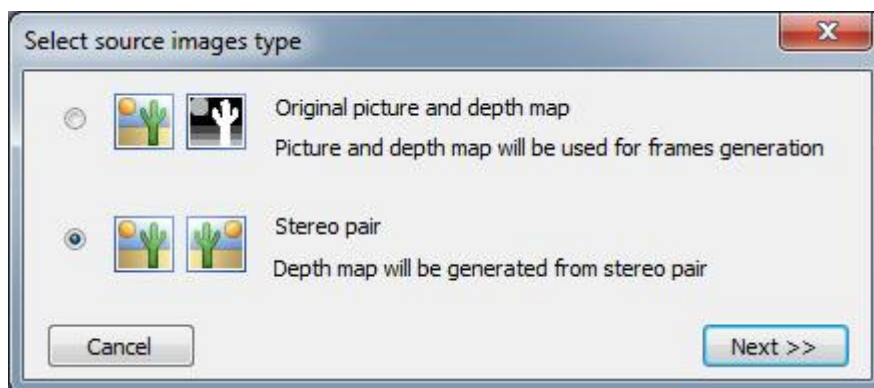


Figure 5.5 **Select source images type** dialog

Press **Next>>** - **Open source images** dialog will appear.

2. Select and open left and right frames of a stereo pair in the **Open source images** dialog (Fig. 5.6).

First, left image is selected. For example, C:\Program Files\Triaxes\StereoTracer-x.x\samples\Stereo pair\white\_flower\_L.jpg. Preview of the chosen image will be shown in the left window of the dialog under the sign “**Left image**”. Then, press left mouse button on the right dialog's window under the sign “**Right image**” and press mouse button on the depth map's file. For example, C:\Program Files\Triaxes\StereoTracer-x.x\samples\Stereo pair\white\_flower\_R.jpg (Fig. 5.6). Press **Open**.

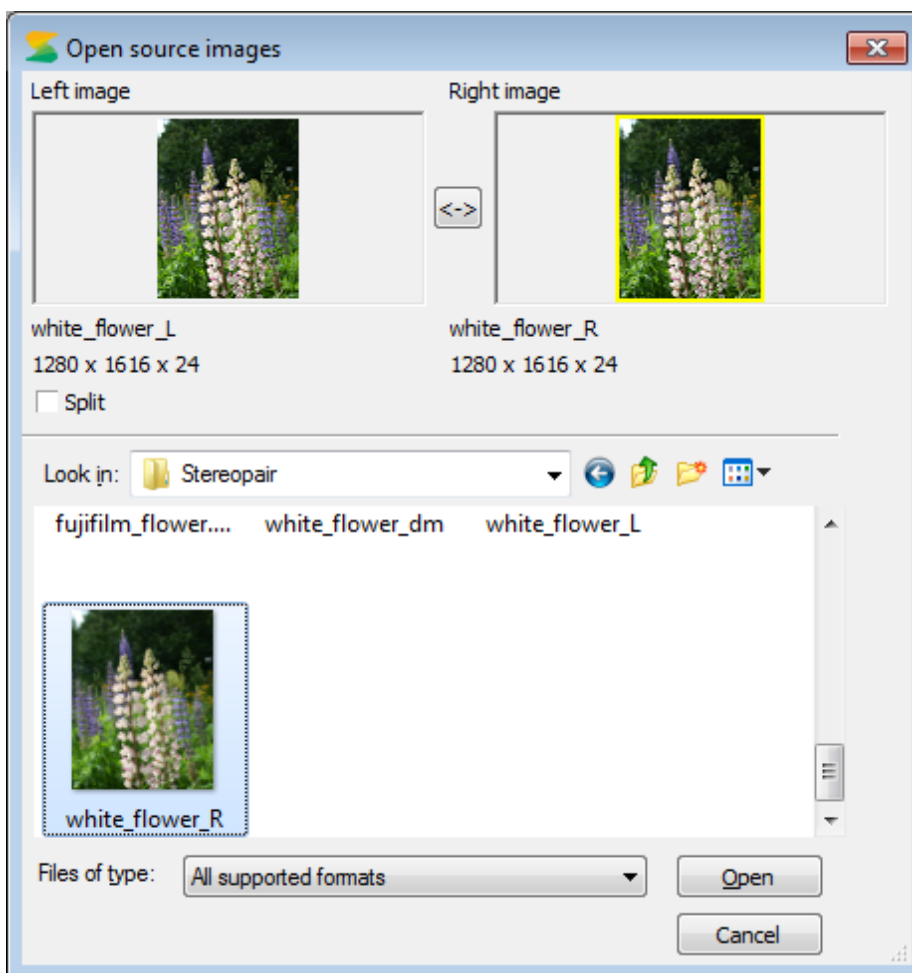


Figure 5.6 **Open source images** dialog

3. **Select outcome** dialog will appear:

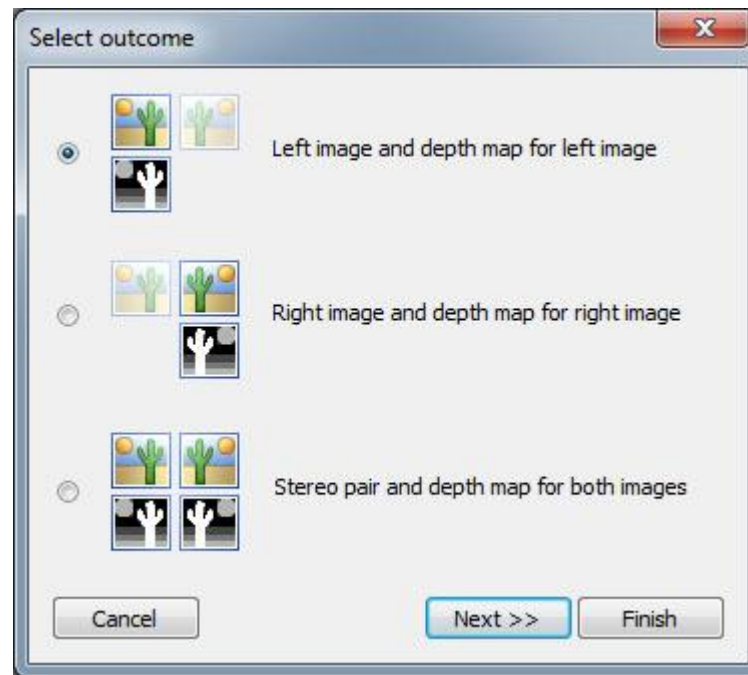


Figure 5.7 **Select outcome** dialog

It's possible to get 3 variants of the outcome, which will be used for multiview series generation:

- left image and depth map for left image
- right image and depth map for right image
- stereo pair and depth maps for both images

So, select outcome type and press **Next >>**.

4. Left and right frames of a stereo pair, overlapped upon each other are represented in the **Matching of images** dialog (Fig. 5.7.). It's possible to carry out matching of images automatically or manually. Use **Auto parallax** button for automatic matching. In order to match frames manually, move the sliders – left one by the most distant object and the right one – opposite – by the closest object, thus, to obtain the maximal sharpness of the object, by which the matching is being done.

Press **Auto align** button to align frames vertically in automatic mode. Vertical alignment provides that one and the same object in these frames will be on the same level. This is obligatory condition of getting better result.

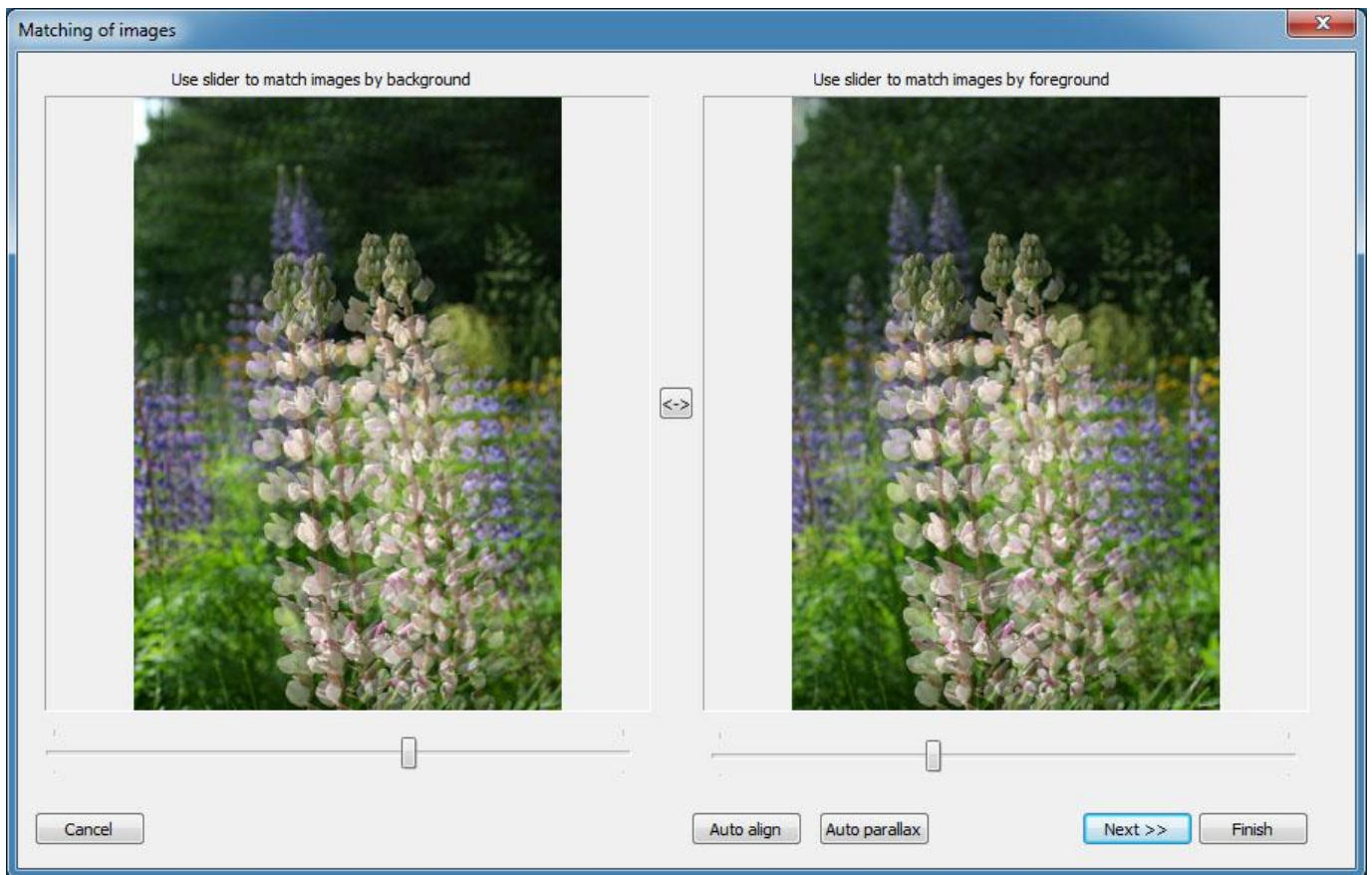


Figure 5.8 **Matching of images** dialog

5. There are 9 different variants of the depth map In the **Select depth map** dialog (Fig. 5.9), from which it is necessary to select the best one (usually it's central variant). Note, that it's just preview mode. The quality of depth maps in preview mode is lower than it will be after selection.

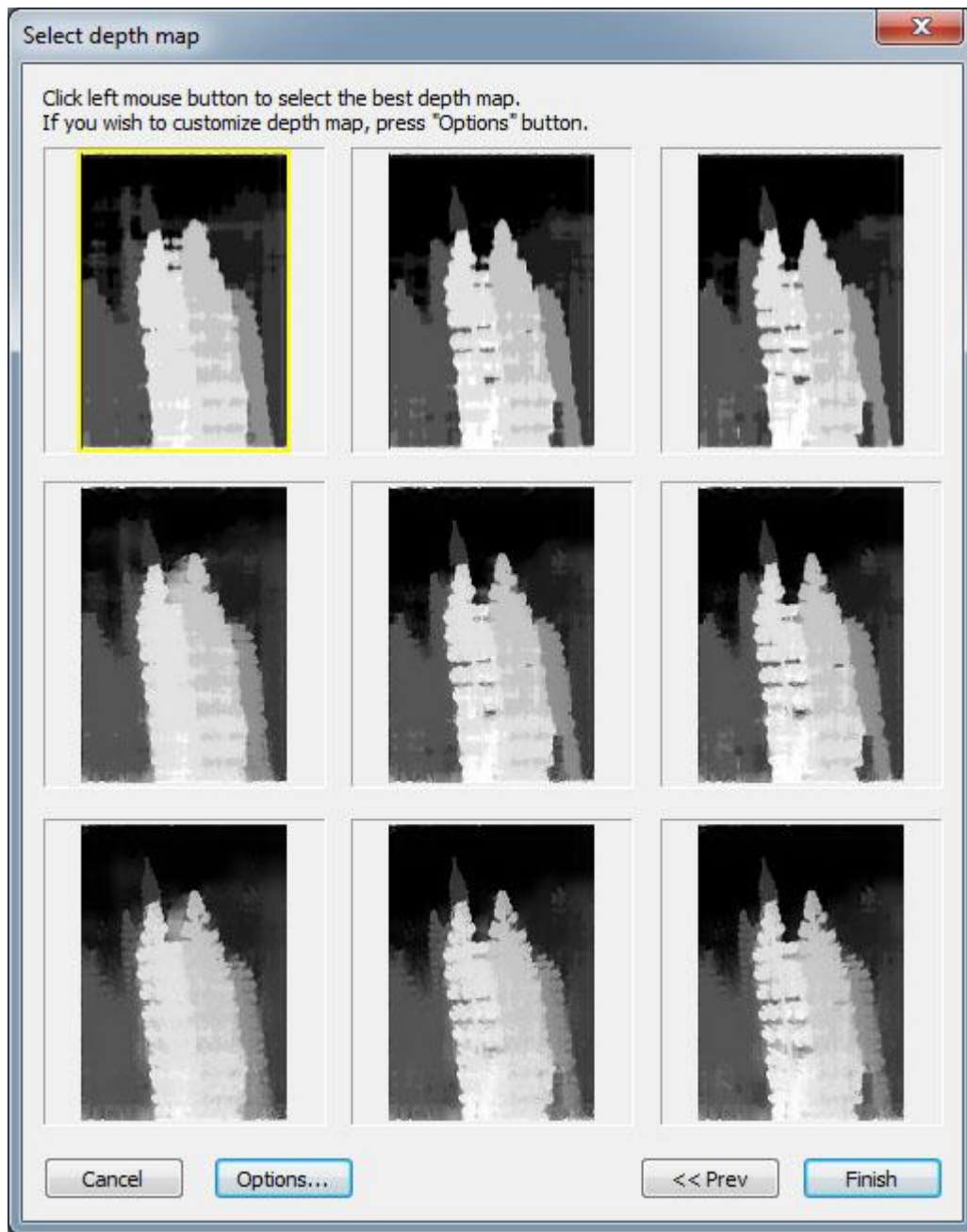


Figure 5.9 **Select depth map** dialog.

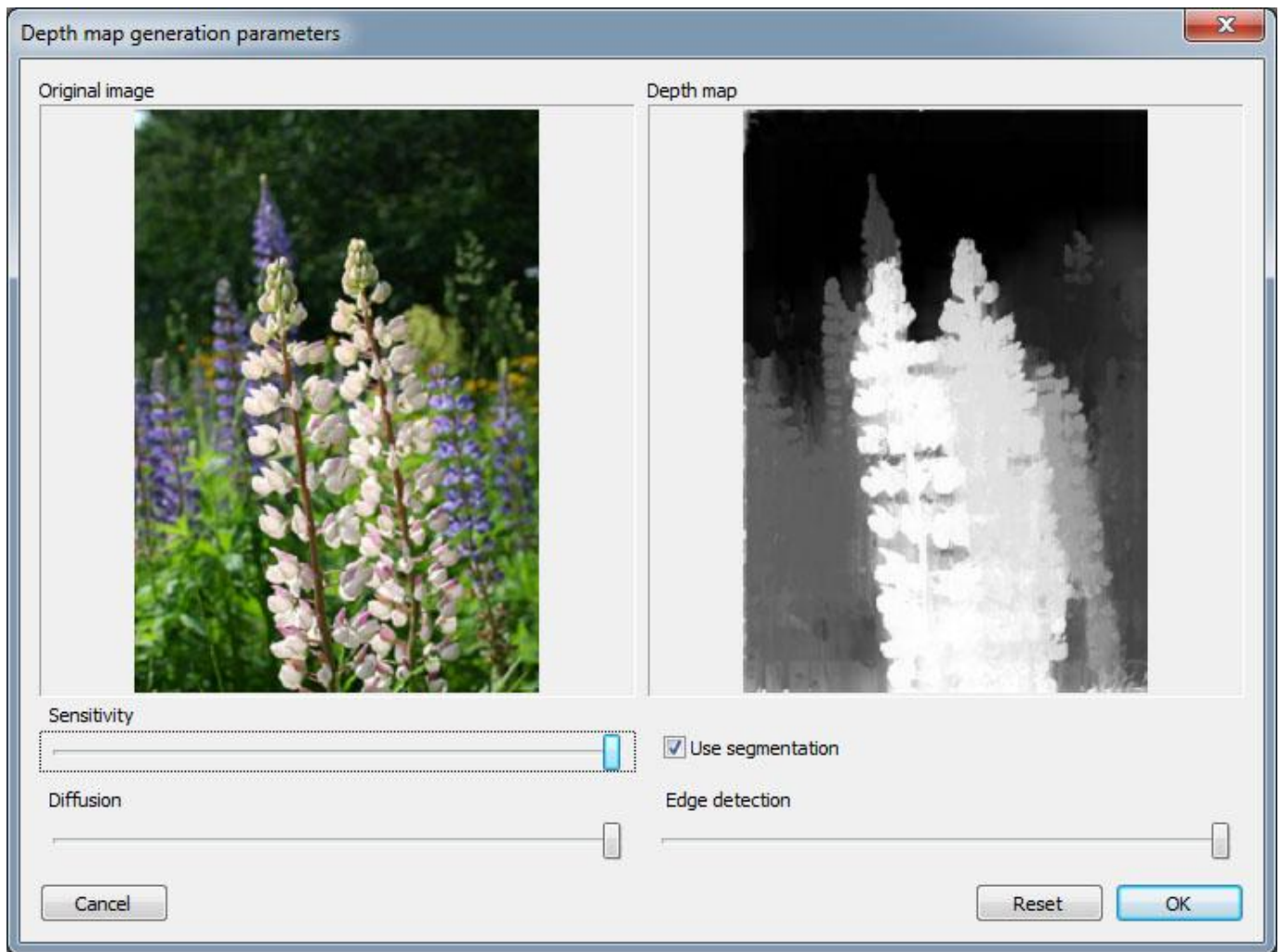


Figure.5.10 **Depth map generation parameters** dialog

It's possible to change depth map generation parameters in **Depth map generation parameters** dialog (Fig 5.10), which opens by pressing the **Options...** button in the **Select depth map** dialog (Fig. 5.9).

6. Press **Next>>** after a variant of depth map is selected – the process of a depth map generation will start. (Fig. 5.10.).

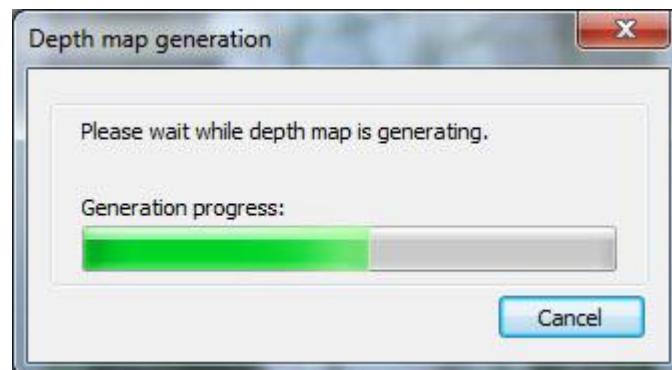


Figure 5.11 Depth map generation progress bar

7. The result, which will be shown in the main window, depends on outcome variant, you've selected in **Select outcome** dialog (Fig. 5.7). In case of selection “*left image and depth map for left image*” or “*right image and depth map for right image*” you will see image (left or right) with corresponding depth map (Fig. 5.12)

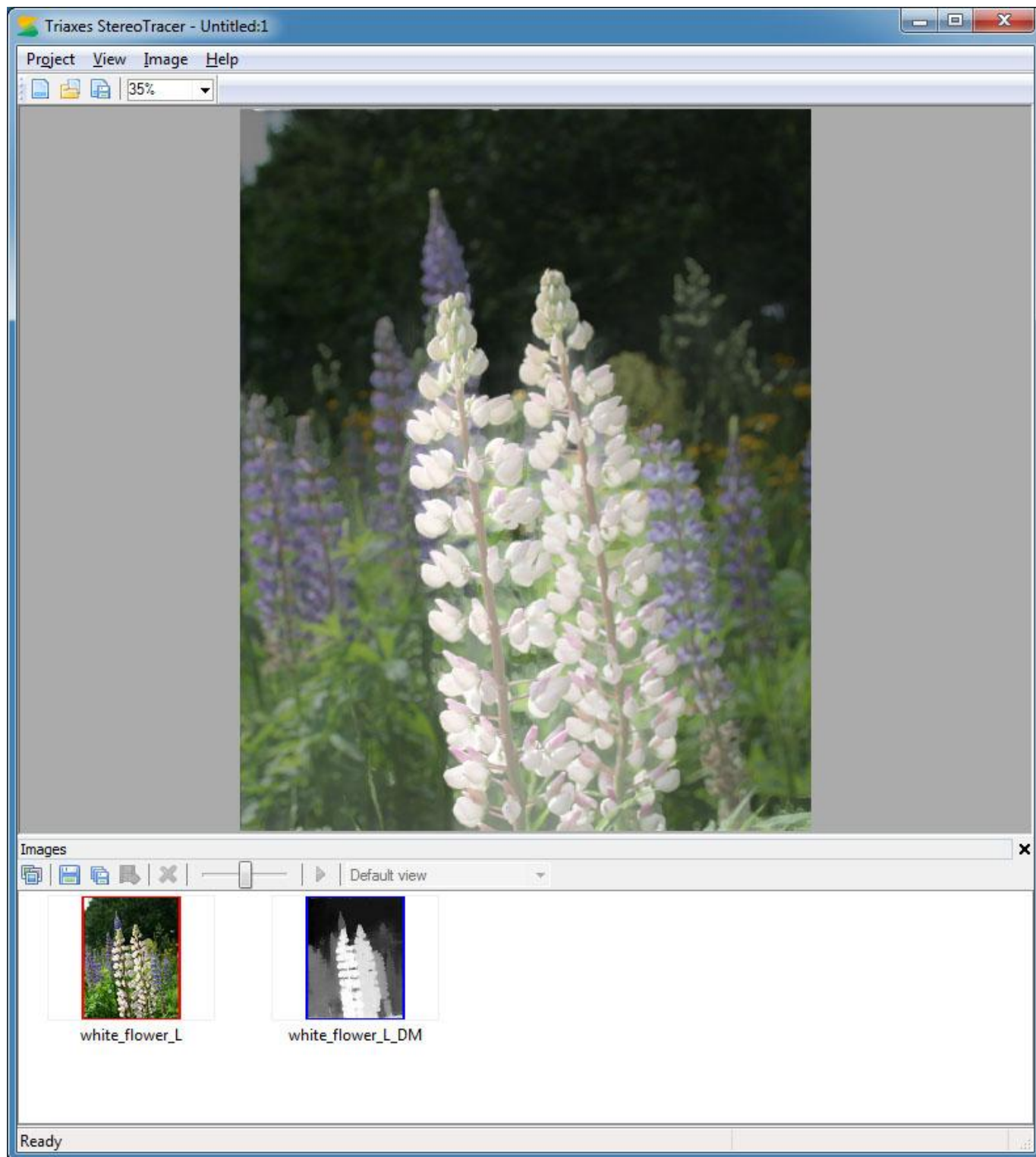


Figure 5.12 Main window

In case of selection “*stereo pair and depth maps for both images*” you will see left image with left depth map and right image with right depth map (Fig. 5.13):

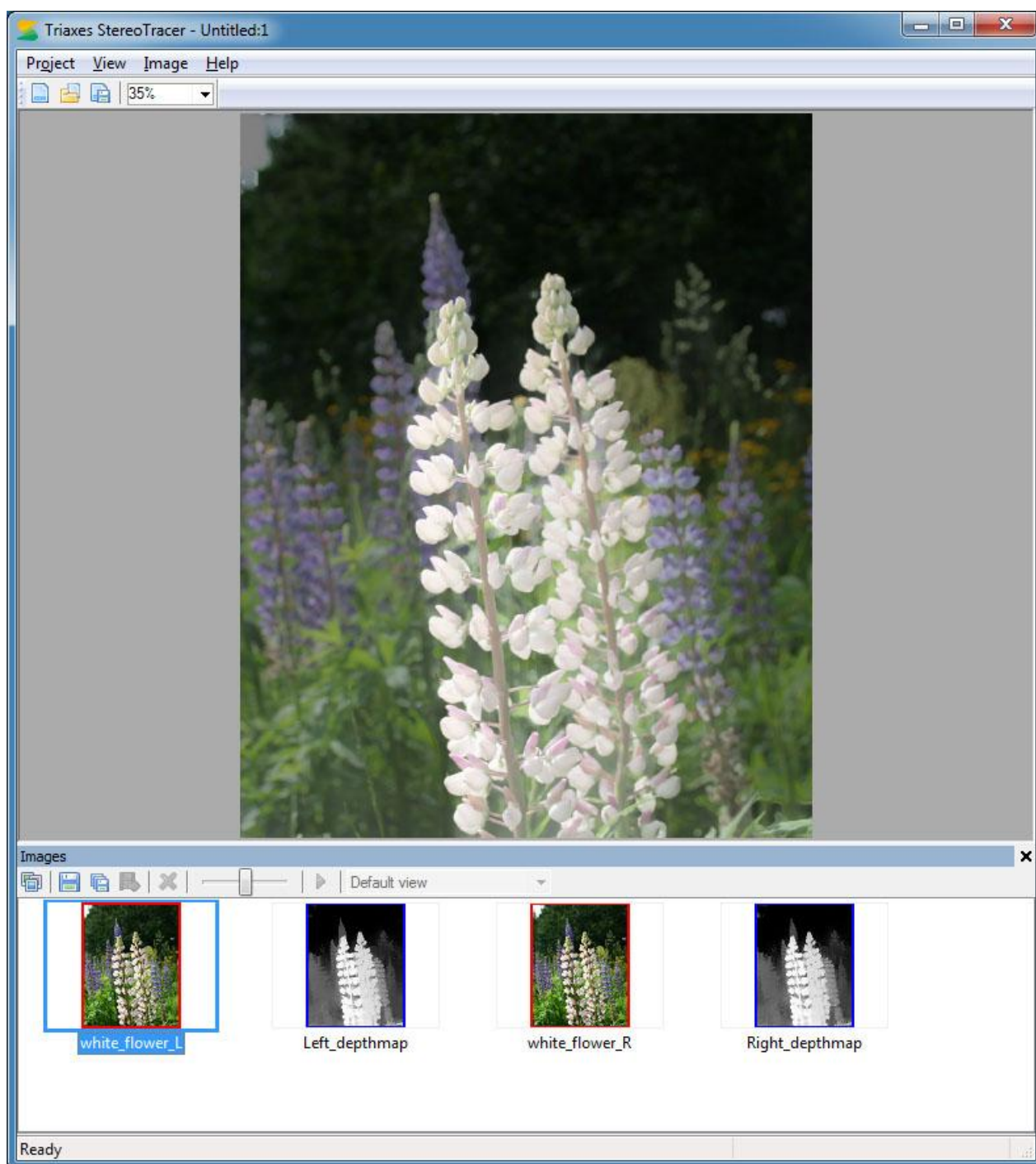


Fig. 5.13 Main window

Left image with left depth map and right image with right depth map are represented sequentially in the **Images** window. Left image and left depth map (or right image and right depth map), overlapped upon each other, are represented in the main window. Use the slider of the **Images** window to compare image and its depth map.

Now, you can generate 3D sequence of frames as it was described in [3D sequence of frames generation from 2D image and depth map](#) (steps 4 and 5).

There is the only difference in generation process namely **Frames generation options** dialog. In case of selection “*stereo pair and depth maps for both images*” you’ll get:

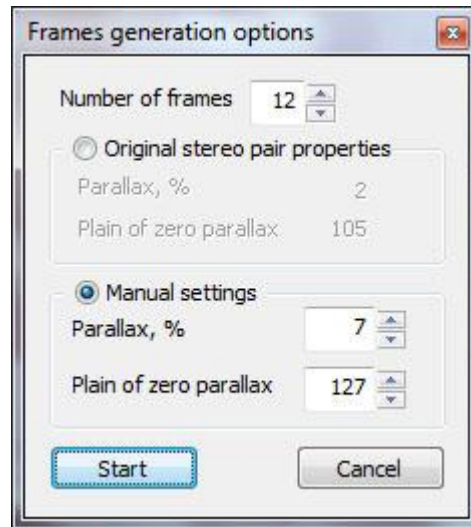


Fig. 5.14 **Frames generation options** dialog in case of selection “*stereo pair and depth maps for both images*”

It is possible to set the following parameters of generation:

- **Number of frames** is the number of frames which will be generated.
- Select, what set of parameters you will use for generation:
  - **Original stereo pair properties** are parallax and plane of zero parallax values, calculated automatically from original stereo pair.
  - **Manual settings** are parallax and plane of zero parallax values, you can set manually.

*Parallax* is the value, which characterizes the distance of the object's projections on the plane for the left and right eyes (disparity). It's specified in percentage from canvas width.

Available range: from *original parallax value* to 25.

Default value: 7.

The bigger value corresponds to the bigger 3D effect, but it should be taken into account that value bigger than 10 often cause artifacts on the generated images. So, we recommend to use values from 5 to 10.

*Plane of zero parallax* – this value characterize the placement of zero parallax plane.

Available range: from 0 to 255.

Default value: 127.

For 255 value the plane of zero parallax (disparity) is situated at the foreground (at the depth map the foreground is colored in white), while the whole image is situated in depth. For 0 value the plane of zero parallax is situated at the background (colored in black), and all of the image's objects seems to be flying above the paper or screen. Usually the best results can be achieved with the values in the 100-160 range.

## Stereo pairs batch processing mode

Batch processing of stereo pairs allows to create depth maps for the several stereo pairs at once. In order to begin work in the batch processing mode, press **Project | Stereo pairs batch processing** (Fig. 5.15).

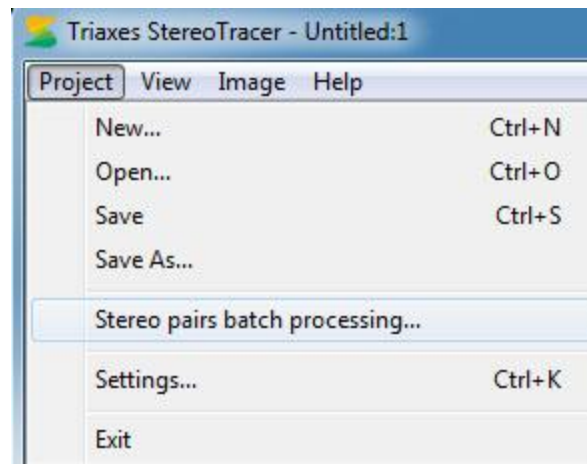


Fig.5.15 Menu **Project | Stereo pairs batch processing**

Then, specify a list of stereo pairs, for which you want to generate depth maps in the **Open stereo pairs** dialog (Fig. 5.16). Stereo pairs should be in “side by side” format, that mean one graphic file should contain two frames, left and right. If it is right frame from the left side and the left frame from the right side in the graphic file, it is necessary to select **cross eyed** check box.

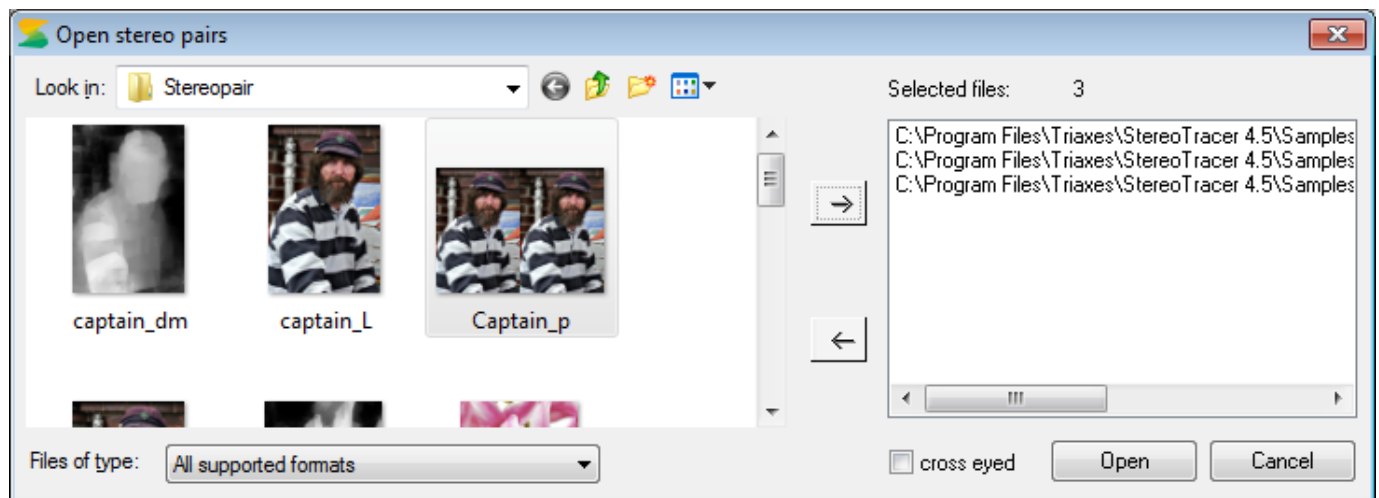


Figure.5.16 Batch processing stereo pairs opening dialog

There is an example of “side by side” stereo pairs shown in the figure 5.17.



Figure 5.17 The example of “side by side” stereo pairs

A **Browse for folder** dialog will be shown after the **Open button** is pressed (Fig. 5.18). It is necessary to specify a folder, in which depth maps generation results will be saved, by means of this dialog. Depth maps will be saved in the same format as source images.

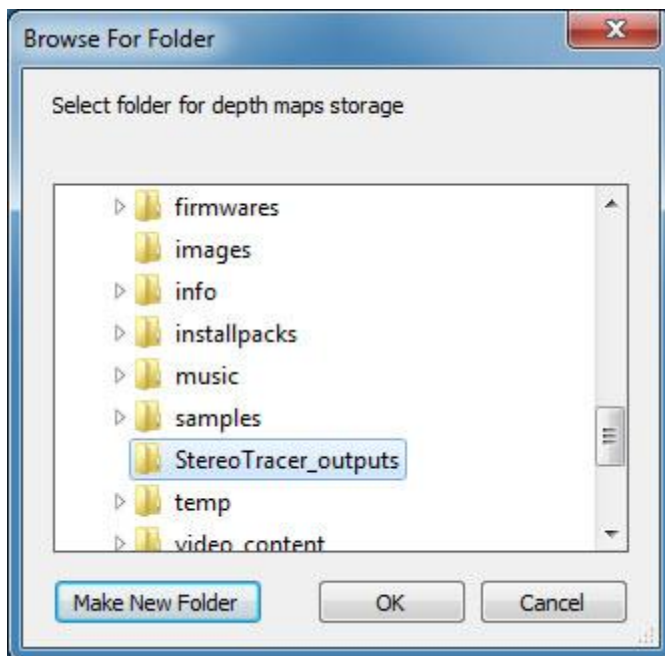


Figure 5.18 **Browse for folder** dialog

The process of depth maps generation will start after **OK** is pressed.

# Methods of manual depth map creation

## Creating depth map using conversion into grayscale and blur filter

You can create depth maps by using external graphic editors like Adobe Photoshop or GIMP.

Here is an example of using grayscale and blur filter.

(The files are located here: C:\Program Files\Triaxes\StereoTracer-x.x\samples\Fire)

Convert original image (Fig. 6.1) from color to grayscale mode and smoothing contours of the objects, using graphic editor's tools. Depth map is gotten as a result (Fig. 6.2). Such simple expedients are enough in this case to obtain depth. Depth map is coming out concerning to the location of the objects in space, because brighter forks of flame are stand out against a dark background.



Figure 6.1 Original image



Figure 6.2 Depth map

Depth map should agree in size with original image and have the same color model. *For example, if an original image is in RGB, gray scale one, before saving should be converted in RGB*

There is an anaglyph image, gotten from a pair of generated frames on the figure 6.3. In order to see 3D effect, use anaglyph glasses .

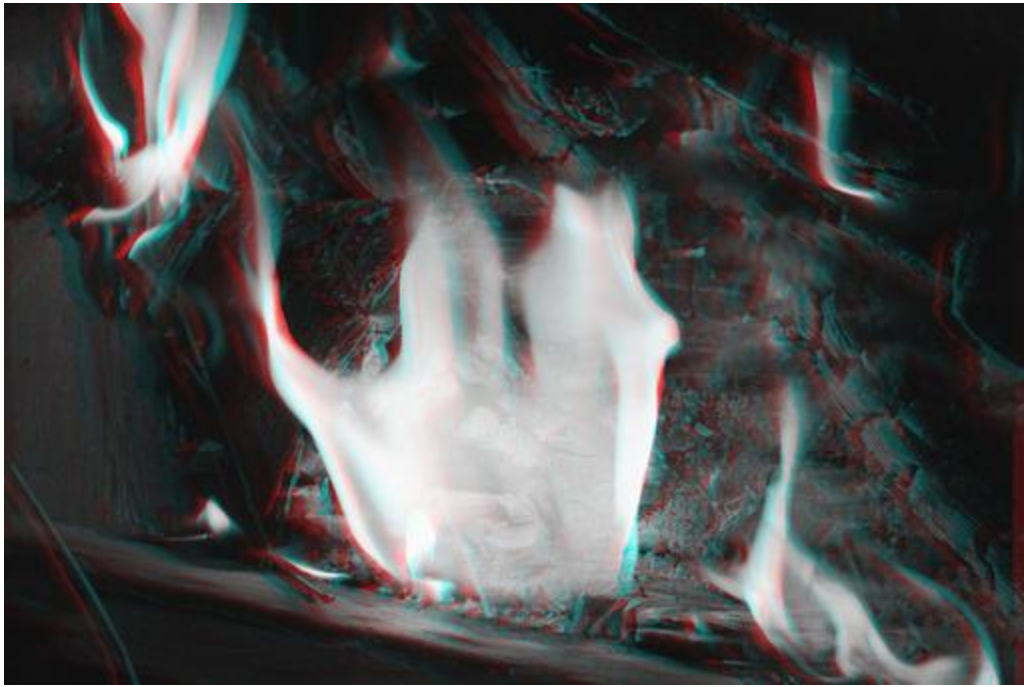


Figure 6.3 Anaglyph image

### Creating a depth map using gradient tool and color inversion

When we have landscape picture with wide distance range - gradient tool is efficient to create quality depth map. Here is an example of making such a depth map in external graphic editor.

(The files are located here: C:\Program Files\Triaxes\StereoTracer-4.0\samples\Field)

Take original image.



Figure 6.4 Original image

Create the copy of original image, select the area till the horizon line and color it using the gradient tool, as it's shown in the figure 6.5.

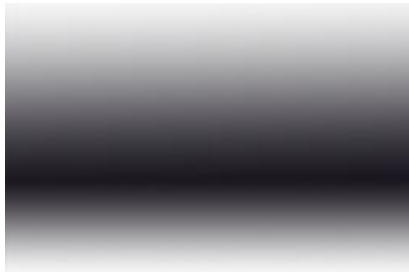


Figure 6.5 Use "Gradient" tool

Create a grayscale copy of original image and invert colors. (Fig. 6.6).




Рис.6.6 Use "Inversion" tool

Overlay inverted grayscale image on the gradient image with 50% transparency (Fig. 6.7).



Figure 6.7 Depth map is gotten by means of "Gradient" and "Inversion" effects union

The generated 3D color anaglyph image is made by using the depth map on the figure 6.8. Use anaglyph glasses  to see 3D.

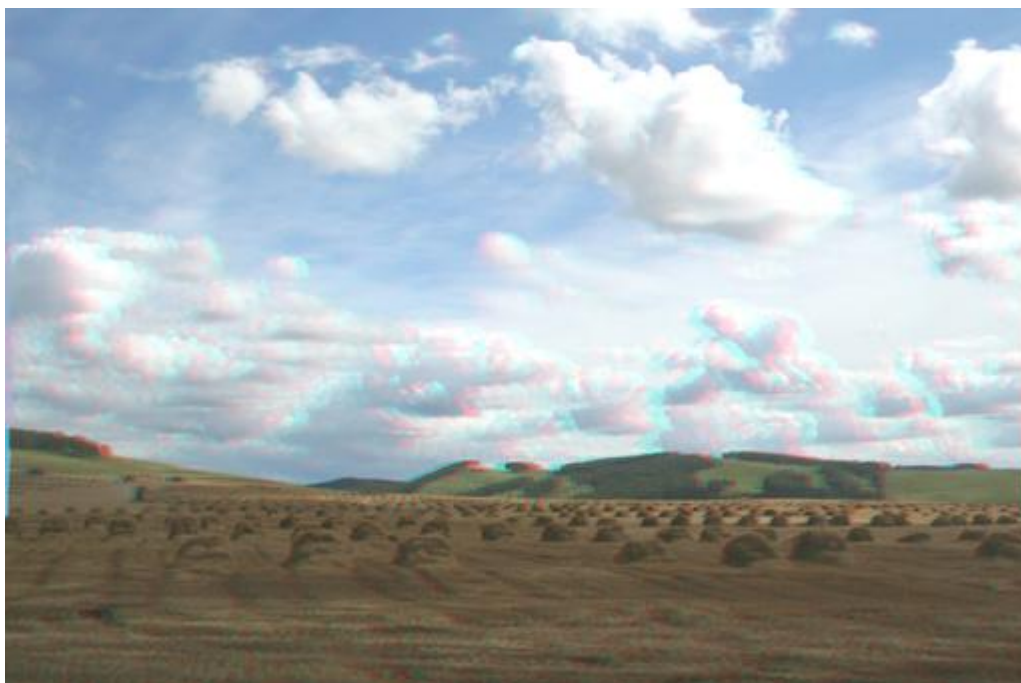


Figure 6.8 Anaglyph image gotten by means of using the depth map

## Creating depth map by means of conversion image into monochrome mode and contrast correction

In cases, foreground objects are brighter than background ones, the image itself may be used as a depth map.

Create gray scale copy of the source image (Fig. 6.9), operate on it **Blur** filter, correct brightness and contrast. Depth map is gotten as a result (Fig. 6.10)

(The files are located here: C:\Program Files\Triaxes\StereoTracer-4.0\samples\Dandelion)



Рис.6.9 Source image



Рис.6.10 Depth map


There is a colored anaglyph image, gotten from a pair of generated frames on the figure 6.11. In order to see 3D effect, use anaglyph glasses .



Figure 6.11 Anaglyph image gotten by means of using the depth map

### Additional examples of depth map creation

Additional articles and discussions upon methods of depth maps creation are located by the following addresses:

#### «Multiview rendering out of stereo in Triaxes StereoTracer»

<http://www.3dphoto.net/forum/index.php?topic=1628.0>

#### «2D to 3D conversion»

<http://www.3dphoto.net/forum/index.php?topic=1679.0>

You are welcome to visit the forum and get familiar with StereoTracer user's experience as well as share your own experience!