



Autopano Pro 1.4

USER MANUAL

Useful links:

- [Online documentation with video tutorials](#)
- [Support forums and Users' Gallery](#)

www.autopano.net

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1 Installation and registration

1.1 Contents

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1.2 Installing Autopano Pro

Welcome to the Autopano Pro installation tutorial!

We will first start by downloading the software from the official website.

To do so, follow the link provided below and download the installation package matching your operating system.

<http://www.autopano.net/buy-autopano/download.html>

1.3 Unregistered Version Limitations

The version of the software you can download from the website has some functional limitations in demo mode:

- All rendered images will have a watermark,
- Projects files (.pano) cannot be saved,
- Export to panotools is limited (only the first image pair will be exported with all the control points).

These are the only 3 limitations; the rest of the software is fully functional. Moreover, the trial version is not time-limited. You can use the unregistered version for as long as you want to evaluate the program.

1.4 Purchasing a License

Thank You! It is a good idea to support our efforts in bringing you the best stitching software available on the market today. To do so, just go to our online store:

<http://buy.kolor.com>

You will find all necessary details regarding the purchase procedure, the available payment options. Once registered you will also be able to manage your customer account.

At the end of the purchase process you will receive an e-mail with you invoice in PDF format and the registration key for your purchase. Here is an example of the registration e-mail you receive:

To the attention of:

Thank you for purchasing our software. We hope that you will be fully satisfied and we wish you a pleasant use of it.

This message contains important information; please conserve it cautiously.

INFORMATION ABOUT AUTOPANO PRO

Download

You can download the latest version of Autopano Pro on the following page:
<http://www.autopano.net/buy-autopano/download.html>

Documentation and technical support

Take a look at the Wiki, which contains Autopano Pro manual, training videos and details on several software features:

- [Main documentation page](#)
- [Installation and registration](#)
- [Your first panorama](#)

Moreover, forums are at your disposal if you have any problem registering or using Autopano Pro:
<http://www.autopano.net/forum/>

If you cannot find the information you need in the Wiki or on the forums, you can contact us directly via our online form:
<http://www.autopano.net/contact-kolor/write-to-us.html>

REGISTRATION KEYS

You will find below the registration keys of the products you ordered.

Warning: Please write in the software the data exactly as it appears below. The user code can be the e-mail address you used when you registered on our website.

Produit	User code	Registration key
Autopano Pro Windows	your-email@domain.com	1A345-6B89C-12345-67E90-12G45-67890

INVOICE

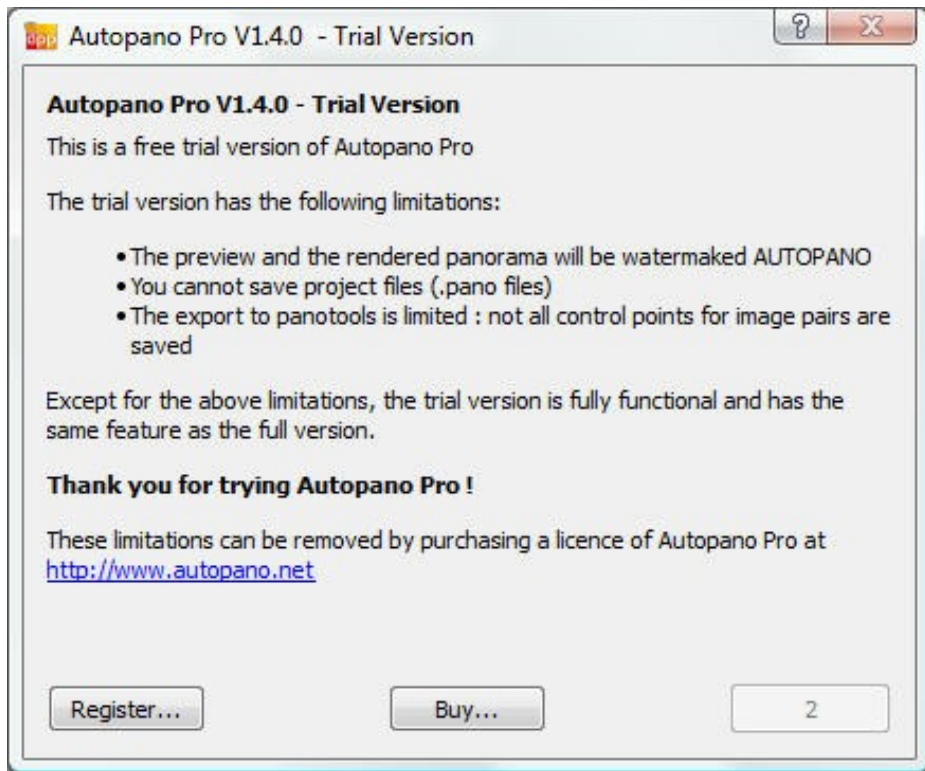
Your PDF-format invoice is attached to this message. You can open it with Adobe Reader, which you can find on:
<http://www.adobe.com/products/acrobat/readstep2.html>

The team at KOLOR thanks you for your confidence in us.

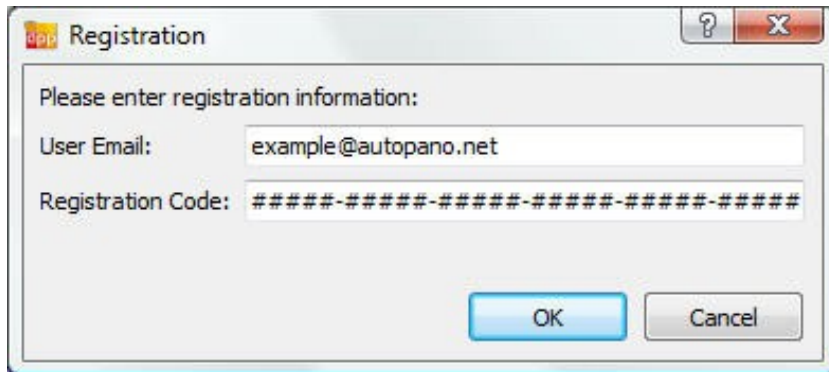
Support : <http://buy.kolor.com/page/support>

1.5 Registering

When you launch Autopano Pro without having registered the software, this screen appears:



Click on the **Register** button to enter the registration information you received after your purchase.

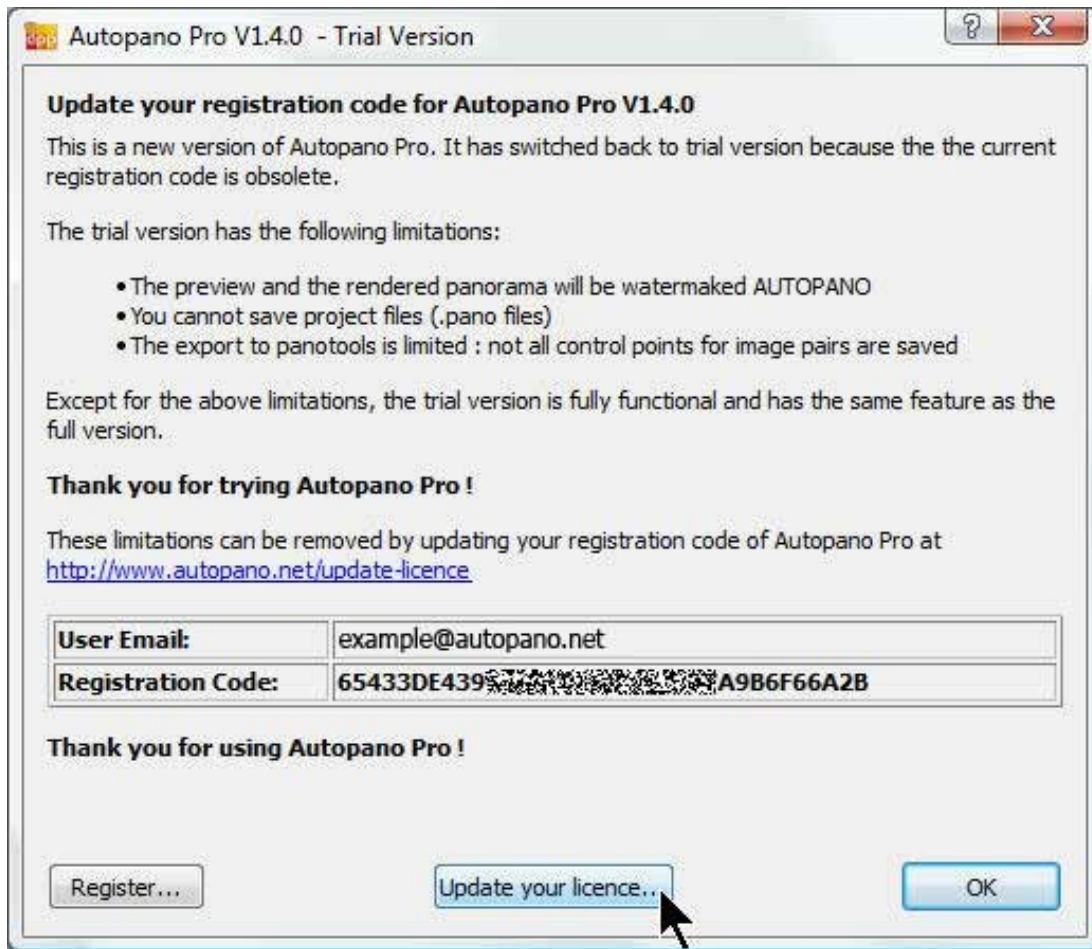


Make sure you enter the data exactly as it was sent to you

That's it! You have completed Autopano Pro installation!

1.6 Update from a previous version to the version 1.4

The update to the version 1.4 is free of charge if you bought a previous version. Download Autopano Pro 1.4 and launch the installation process as described above. If a previous version of Autopano Pro is already installed on your computer, this screen will appear when you launch Autopano Pro 1.4:



The registration system was modified with the version 1.4. Therefore, you have to retrieve your new registration number. To do so, click on **Update your license** to connect to your customer account and get your new registration number.

Then, come back to Autopano Pro, click on **Register** and enter your new registration key.

2 FAQ – Frequently Asked Questions

This page is a list of questions and answers of issues for which we are frequently contacted. Please read this page before contacting us.

2.1 Contents

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2.2 Installation / Registration

2.2.1 Which operating systems are supported?

Autopano Pro is **multi platform software**. It can run on:

- Microsoft Windows XP / 2000 / Vista
- Apple Mac OS X 10.4 'Tiger' or Mac OS 10.5 'Leopard'
- Linux kernel 2.4 or more

2.2.2 What is the recommended configuration?

To run Autopano Pro correctly, your computer should have at least:

- Processor: 1 Ghz
- RAM: 1 GB
- Display: 1024 x 768 minimum

You can give it a try to know if the program runs well on your computer.

2.2.3 What are the differences between the demo version and the full one?

Autopano Pro has some functional limitations in demo mode:

- All rendered images have a watermark
- Projects files (.pano) cannot be saved
- Export to Panotools is limited (only the first image pair will be exported with all control points)

These are the only 3 limitations; the rest of the software is fully functional. Moreover, the trial version is not time-limited. You can use the unregistered version for as long as you want to evaluate the program.

2.2.4 How do I get a full copy of Autopano Pro?

- 1. Download Autopano Pro and install it.
- 2. Create an account on our online shop and buy a registration code.
- 3. You receive the code by e-mail. Copy and paste it in Autopano Pro as mentioned here.

You're done!

2.2.5 I didn't receive my registration code, why?

After purchasing Autopano Pro on our online shop, you should receive very shortly the registration code via e-mail. If you don't receive the e-mail, it is likely because it was wrongly detected as a Spam or junk mail by your mail program or your Internet Service Provider. Please check your junk mail filter, your Spam folder and the Spam settings of your Internet Service Provider.

If you have a Spam folder or a junk mail folder, check for a mail from **Kolor Shop** or **buy@kolor.com** with the object **[Kolor Shop] Your Invoice**.

buy@kolor.com
contact@autopano.net

Add these e-mail addresses in your contacts to avoid them to be detected as Spam :

If you did not find any message from us in your Spam or junk mail folder, please contact us, but use another e-mail account otherwise you may not receive our reply either.

If, after sending this e-mail, you do not receive a reply from us within a week, it means that our reply was also rejected by your ISP or mail program. In this case, please send us your telephone number so that we can call you and fix your problem.

2.2.6 My registration code does not work, why?

Autopano Pro asks for your user e-mail and your registration code. Be sure to type them exactly as mentioned in your order confirmation e-mail.

To be sure to enter the correct registration code, copy it from the e-mail you received from us, and paste it in Autopano Pro. If you prefer to type it manually, be careful with the letters and numbers like I, 1, L, etc. which can be confusing.

You can verify all your registration details on your user account.

2.2.7 I lost my registration code; how to get it back?

Log into your user account and you will find all your registration details.

2.2.8 I cannot log into my user account, what should I do?

If you lost your password, please use this form to get your password back via e-mail.

If you lost your password and if you also changed your e-mail address, please contact us.

2.2.9 How can I change my e-mail address?

In your user account, you cannot modify your e-mail address by yourself. Please contact us to do so.

2.2.10 How do I uninstall Autopano Pro?

- On Microsoft Windows: go to **All the programs**, then **Autopano Pro** and click on **Uninstall**
- On Apple Mac OS: delete Autopano Pro directly from your **Applications** folder and delete the **com.kolor.Autopano.plist** file located in the **Library/Preferences** folder.

2.2.11 How to get Autopano Pro CD-ROM?

Autopano Pro is sold as a downloadable file. We do not sell a boxed version.

If you wish to burn a CD-ROM of Autopano Pro, we prepared an ISO file which is ready to burn. It contains the latest version of Autopano Pro and videos from the online documentation. The ISO file is to download on the bottom of the download page.

2.3 Autopano Pro's Features

2.3.1 What are the differences between Autopano Pro and the free Autopano v1.03?

Autopano v1.03 is a free extension for Panotools. It generates controls points but does not perform any of the other steps required to obtain a panorama (optimization, color correction, projection and blending). The SIFT algorithm used in this extension was written after a quick overview of the original publication.

Autopano Pro uses a professional license of the SIFT algorithm written by Dr Lowe, the algorithm creator himself. This is why the SIFT algorithm used in Autopano Pro is in many way superior to the one used in Autopano v1.03.

Autopano Pro is also a complete solution managing all aspects involved in panorama creation. It's a standalone piece of software, allowing the easy creation of panoramas, from A to Z.

2.3.2 What are the differences between Autopano Pro and AutoStitch?

Even though Autopano Pro is based on a license including AutoStitch, the two programs are very different. In fact, only one common point remains between them: the SIFT algorithm for control points detection. All other algorithms were recreated or improved.

- higher detection quality,
- better repartition of the control points,
- exclusive color correction system,
- lens distortion correction not present in AutoStitch,
- HDR support,
- Fisheye lenses support,
- numerous input/output formats supported, etc.

Assembling the same group of source images with the two programs will give you an idea of the progresses introduced in Autopano Pro.

2.3.3 What are the differences between Autopano Pro and Panotools?

We kept and will keep compatibility between our products and Panotools. Both solutions are offering interesting functionalities and we think that keeping import/export routines to and from Panotools can benefit to both solutions.

2.3.4 Autopano Pro versus Adobe Photoshop CS3?

If we had to make a comparison chart between Photoshop CS3 panorama ability and Autopano Pro, it would be all about control:

- In CS3, you don't have control of final panorama look (to straighten building for example along a panorama). In Autopano Pro, you have full control over it: How to straighten a panorama
- The Autoblend feature in CS3 has a big issue, it does only correct color difference on the pixels that are visible. So if you paint into a mask created by Autoblend to reveal or hide some parts of the panorama (for moving object for example), it's just useless because the pixel doesn't have the right color. You cannot use this. In Autopano Pro, every part of every picture even if not used, is color corrected to allow you to use it if you need it. Here's how to edit in Photoshop an Autopano Pro panorama : Photoshop Layer Edition

Autoblend feature is not quite as good as our equivalent blender, Smartblend. You can see a quick review here : Autoblend, Smartblend, Enblend

– Color correction. CS3 has one, but it's a hack, not the real solution. We solve the real equation and it really does the difference. So we can provide you a real HDR stitcher. You can see our color correction system here : http://en.wiki.autopano.net/Color_and_Brightness

2.3.5 Does Autopano Pro support fisheye lenses?

Fisheye lenses are now supported by Autopano Pro (since version 1.4). A fisheye lens enables you to make less shots to create a full 180° or 360° panorama. It is a great advantage for the production of virtual tours, for instance. Our solutions can deal with all fisheye types ? full-frame, circular fisheye on reflex camera, or digital camera fisheye accessories. Results are obtained in the same way, and just as simply as with a standard lens.

2.3.6 What file formats are supported for input?

2.3.6.1 List of the supported file formats

The recommended file formats for panorama stitching are those used by digital cameras.

- **JPEG** ? No particular comment on this file format.
- **TIFF** – 8 or 16bits, the file must not contain an alpha channel.
- **PNG** – 8 or 16bits, the file must not contain an alpha channel.
- **RAW files** ? This generic *raw* term, is used to designate "raw sensor data" files of each camera brand (or one model of a brand), it can be NEF for Nikon, CRW or CR2 for Canon, etc.

At the current time Autopano Pro supports the following RAW formats: CRW, CR2, RAF, NEF, SRF, SR2, ORF, MRW, PEF.

- **DNG** – The Digital Negative format from Adobe allowing to store any raw file in a unified raw format.
- **HDR** – The radiance format is supported and allows to stitch HDR panoramas from HDR source images.

But that's not all! The complete list is given here: Complete list of supported file formats All formats containing at least three channels (R,G,B) with a minimum of 8bits are supported. Be aware that formats containing an alpha channel are not supported.

2.3.6.2 EXIF Data

The "EXIF data" contain numerous information regarding shooting parameters. You can refer to the EXIF data definition provided on the following web-site: EXIF Definition

Autopano Pro analyzes the EXIF data to extract several pieces of information:

- **The lens focal length.** This parameter speeds up the stitching process. When Autopano Pro cannot retrieve the focal length, it assumes that a "standard" lens (50mm in 35mm format) was used.
Be aware that Autopano Pro calculations are based on a 35mm equivalent. In order to calculate the 35mm equivalent of the focal length stored in the EXIF data, it is necessary to know the size ratio between the sensor used for capture and a 35mm sized sensor. A complete table is given in the cameras.txt file located in the resources folder of the Autopano Pro installation folder.
See the page describing the cameras.txt file
- **Shutter speed and aperture.** These two bits of information are mandatory for the HDR mode (if they are not included in the file, the HDR option is disabled in Autopano Pro).
- Other information are retrieved, like the date and time of capture in order to sort the source images in groups, or the ISO value, even if not used at the present time this information is valuable.


Regarding the cameras.txt file, it is possible that some errors remain in this file. If after loading a source image in a group, the focal displayed is obviously wrong, you can be sure that there is an error in the cameras.txt file. In the same way, if the software does not correctly decode the EXIF data even though they are present in the image file, it is because the model of the camera used for capture isn't currently included in the cameras.txt file. In such a case do not hesitate to send us the problematic image file so we can rapidly correct the cameras.txt file and include support for your camera in the software.

2.4 Technical Advice


2.4.1 How to save a panorama as a .JPG or .TIFF file?

You should distinguish 2 concepts:

- **Project saving** : Saving a project means saving all parameters that permitted the stitching, and all modifications you made. This is helpful if

you want to get back to the project at a later moment. To save the project, click on  in Autopano Pro. The file created has the type **.pano**. Find out more about saving project files.

- **Project rendering** : Rendering a project means launching the final stitching and saving the resulting file as an image of one of these types:

.JPG, .TIFF, .PNG, .HDR or multilayered .PSD. To render the project, click on this icon in the program:  . Find out more about the render settings.

2.4.2 Which programs support TIFF files from Autopano Pro?

Autopano Pro can render TIFF images with several options: 8 or 16 bits, integrated layers or not.

- 16-bits TIFF files cannot be opened by LightZone, RawTherapee, FastStone Viewer.
- Adobe Photoshop can open all types of TIFF from Autopano, but it opens them as a single layer file, even if it is a multilayer file. Use Gimp to open multilayer TIFF files.

2.4.3 Should I pre-process the RAW files?

This will depend on the panorama:

- If the panorama was entirely shot in **manual mode and the shooting parameters did not vary** during the whole capture time, it is then best to pre-process the raw files outside of Autopano Pro. The raw processing programs will eventually give better results than our software, as its primary purpose is image stitching and not raw processing. In such a case you should be cautious and make sure that the raw processing parameters do not change from one source image to another, if you do not follow this guideline all benefits from using an external raw processing program will be lost.
 - ◆ In Camera Raw, all the following must be disabled:
 - ◇ Exposure: auto
 - ◇ Shadows: auto
 - ◇ Brightness: auto
 - ◇ Contrast: auto
- If the panorama contains **bracketed images**, or if the **shooting parameters changed during capture**, it is the better to let Autopano Pro process the raw files.
- If the panorama is assembled from a lot of sources images (> 100 images), Autopano Pro can take a long time to process the raw files, and it will do it every time the corresponding *.pano* project file is loaded. In such a case, it can be a good idea to pre-process the raw files and export them in a 16bits file format, making sure the processing parameters are the same for all images, to speed up the loading of the *.pano* file in case you often come back to it.

2.4.4 Which processing tasks must be performed before Autopano Pro and which ones must be performed after?

Not an easy question :-> Here is an answer given regarding a debate on DxO.

2.4.4.1 DxO

DxO does things that Autopano Pro doesn't (yet?) : chromatic aberrations, noise, etc. But there are things it'd better leave alone: Lens distortion correction, D-Lighting.

Uncertainties

Lens distortion: The algorithm used by DxO is based on lab measures of the average image distortion for a given camera/lens couple at a given focal length. By reading the EXIF data, DxO will then correct the image based on the distortion he knows is produced at this particular focal length for this particular camera/lens couple. 2 problems:

- No lens is exactly identical to another. A friend of mine who owns a lens testing equipment often mentions it to me. So, even though we can perform an average distribution of the distortion produced by a given model of lens, it is possible that the one you own is not located in the center of the Gaussian scale (if it is located on the good side, on the very good side, then you should keep it).

- The relation between focal length and distortion can be greater with some zooms. The problem is that the focal length is not accurately recorded in the EXIF data, it's what we call a discrete value. On my Sigma 17–35mm I get the following values: 17, 19, 21, 23, 28, 35 (6 values and nothing in between). How do we do then?

So why does Autopano Pro obviously do a better job?

When looking at two images the resulting knowledge is greater than the sum of the information of the individual images taken separately.

Let's illustrate this concept with a metaphor:

- Sentence 1: *"The average temperature in Marseille is 22°C over the year"*. This sentence contains one bit of information.
- Sentence 2: *"The average temperature in Paris is 18°C over the year"*. This sentence also contains one bit of information.

Now let's combine everything in the same sentence:

- Sentence 3: *"The average temperature in Marseille is 22°C over the year, while it is 18°C in Paris"*. The two bits of information of the original sentences are present, but much more is now available. We can deduce that the climate is warmer in Marseille than in Paris. We can see that the difference is exactly 4°C. Marseille must be located south of Paris, etc. By putting two bits of isolated information together we can deduce information that did not exist at first!

It's the same for image assembling. I can get a lot more information when I get a match/stitch than before. When analyzing the pixels contained in the overlapping area between two images we can calculate:

- the exact focal length: all is needed is to relate pixels to each other.
- distortion: same as above.
- by measuring the brightness changes between some pixels of both images representing the same thing (same object, same sky, etc.) we can recalculate the sensor response curve, the white balance, and much more.

The resulting accuracy of this approach is far greater than with any other method. For distortion correction, when I can estimate that DxO can generate a 15% or 20% accuracy because of all the uncertainties given above, Autopano Pro can easily fall under 1% as we produce hundreds of constraints for a few unknowns by relating images to each other.

The focal length is a special case. We can obtain a decent accuracy starting with 2 images, but only an excellent accuracy when we "close" the panorama (i.e. the panorama covers 360° and the last image of a row "plugs" onto the first image of the same row).

Another note: since the distortion is calculated for each panorama it is possible to apply more or less correction for each particular case. This is exactly what Autopano Pro is doing. If some more correction is needed on the lens to render a particular panorama Autopano Pro will do it. There is no way to achieve this with DxO.

Last note: This might be an advantage of DxO, and since they do not communicate on what they are really doing in the software, I can't really tell. The lens model: they are numerous ranging from very simple ones to very complicated ones. Autopano Pro is using a standard model, maybe DxO uses a better model (or the same), I don't know.

2.4.5 Interpolators and Blenders: which options to choose?

Refer to this document to understand the differences: Interpolation and blenders

2.4.6 Adobe Photoshop Tips for big panoramas

- Memory allocation and usage (Photoshop CS2)
- Improve performance in Photoshop CS2 on computers with more than 1 GB RAM
- Optimize performance of Photoshop CS3 on Windows XP and Vista
- Optimize performance in Photoshop CS3 on Mac OS

3 Main Window

3.1 Introduction


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- 6 Batch Render

The main window of Autopano Pro is divided into three main areas:

- The **main toolbar**: contains tools for finding images, saving project files and configuring the interface
- The **Groups View**: lists all image groups that will be scanned for existing panoramas
- The **Panoramas View**: displays panoramas that have already been detected or loaded from a project file







 Screenshot of the Main window

3.3 The main toolbar



This toolbar is divided into 4 major parts

- Projects files management: 
- Panorama detection: 
- UI arrangement: 
- Batch render: 



The last icon provides online help. Just click on this icon, then on the button you want help for.

3.4 Project Files (.pano)

The Autopano Pro project file format (extension .pano) is used to save all the panorama settings: images used, color correction parameters, render file format etc.

It is good practice to save your projects in this file format, as it will allow you to work on a panorama again at a later time (for example, render with different settings) without re-detecting. The file is in plain text, and can be read by any text editor.

Autopano Pro also supports the very common PanoTools project file format. You can import from and export to PT.

3.4.1 Opening an Autopano Project

This button (same as *File: Open* or shortcut *Ctrl+o*) loads a previously saved Autopano Pro project (also called .pano file).
Note: in the dialog window, you can select and open multiple files.

3.4.2 Importing a Panorama Tools Project

This button (same as *File: Import Panotools*) allows you to read Panotools projects files: PTGui (.pts), PTAssembler (.ptp) format and Hugin (.pto).
Note: in the dialog window, you can select and import multiple files.

3.5 Panorama Detection

3.5.1 Browse a folder

This button opens the Browse Folder settings dialog. It allows quick, automated selection of image groups, out of any number of images in a folder (or subfolders). This tool scans the target folder and decides, based on several factors, which files should be grouped into a potential panorama. After the scan is finished, you will get one or more groups in the left hand panel of the program, called the Groups View.

3.5.1.1 How does it work?

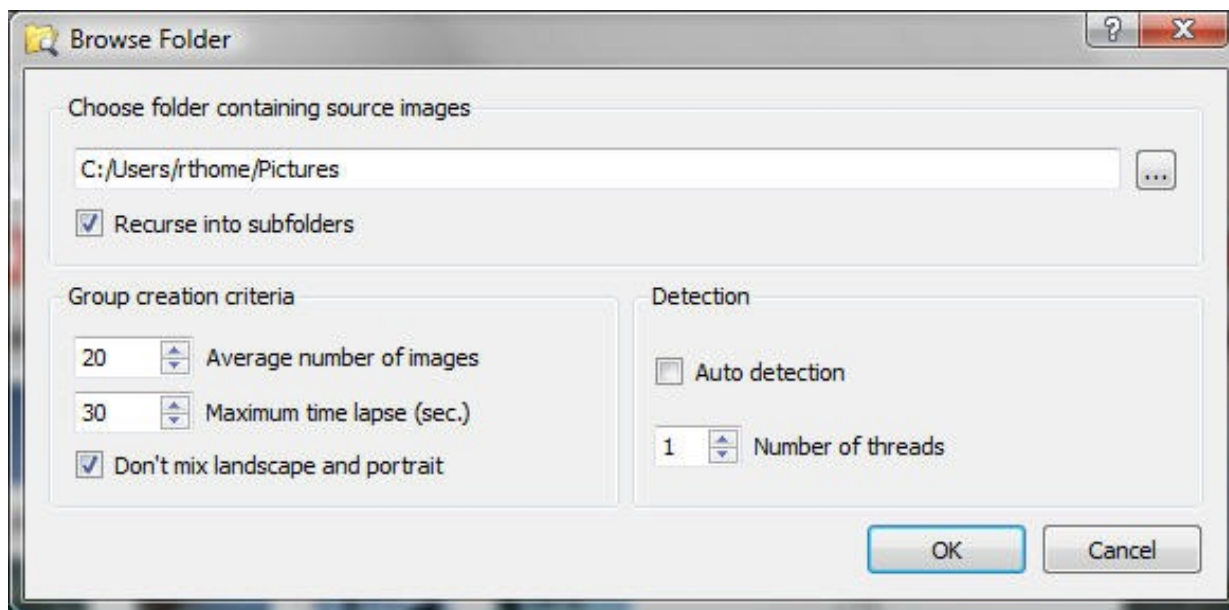
Imagine you just downloaded your vacation photos from your memory card and you're scratching your head, trying to figure out which ones form a panorama, or wondering which photo goes in which image set... Don't worry about that anymore – Autopano Pro can do the job for you!

When you take images while traveling, on vacation, or even as a professional, the shooting date and time are stored in the image file itself, down to the second you took that shot. The usual behavior when shooting panoramas is taking, let's say, 10 images in a row, then move to another interesting location (or stage of your trip) and take another set of images.

What Autopano Pro does, is check the date and time for each image. It is a fact that, most of the time, images belonging to the same panorama are taken almost at the same time (just a few seconds apart from each other). If an image is on its own, i.e. there are no other images taken at the same time or within the same 10 minutes or an hour, it means the photo is not going to be part of a panorama set.

Using the Browse Folder button, Autopano Pro will group images according to their shooting date and time (and several other factors; see the Options below). It's a fast and convenient alternative to manual sorting, and you can always modify the image groups later.

3.5.1.2 Options



- **"..." (browse button)**

The input field and the browse button let you select the folder you want to scan for panoramas.

- **Recurse into subfolders**

Check to force Autopano Pro to scan all subfolders contained in the root folder you specified above. Every subfolder will have a separate group of images.

- **Average number of pictures**

Choose an average number of photos in each panorama you shot. This number tells Autopano Pro when the count of images in a group is too big to be a single panorama. Don't forget that you can always move images from one group to another later (or edit groups any way you want) using the Groups View.

- **Maximum time lapse**

Set the maximum allowed difference in shooting time (in seconds) between two consecutive photos. Example: 60 seconds means that any consecutive images, taken within a 1 minute range, probably belong to the same panorama.

- **Don't mix landscape and portrait**

If set, groups will be made of portrait- or landscape-only photos.

- **Auto detection**

Launches the automatic control point detection and Panorama Preview for all groups, after they are composed.

- **Number of threads**

This value indicates the number of simultaneous detections made in parallel. Value of 1 is recommended in case you want to use your computer while Autopano Pro is performing this task. Higher values can give better results with multi-core CPUs.

The grouping algorithm works this way: We have a full set of images sorted by date / time of shooting.

- if this set size is below the number of picture per group, it stops.
- if not, we'll find the greatest delay between two consecutive shots for this group.
 - ◆ if this greatest delay is below the minimal time lapse, it will not divide this group, as all images were taken with no more than this delay between each shot.
 - ◆ if not, you'll get two sub groups.

For the user, you can use this two ways balanced rule in different manner :

Example 1: set the average number of images at 1, set the maximum time lapse at 60 seconds => Any 60 sec. delay between two shots will create a new group.

Example 2: set the average number of images at 10, set the maximum time lapse at 1 second => you will only get groups containing exactly 10 images each.

Note that images in subdirectories are never grouped with images from other subdirectories.

3.5.2 Select images

This button opens a selection dialog where you select the image files directly, not a folder. All selected files are brought together in a single group of the Groups View, and the panorama detection inside this group begins automatically. It is possible that the images you selected produce more than one panorama. Any panoramas detected are displayed in the right hand panel of the screen, called the Panoramas View.

3.6 UI Arrangement



: Split the main window into two equal panels: Groups View on the left and Panoramas View on the right



: Hide the Panoramas View and leave only the Groups View visible



: Hide the Groups View and leave only the Panoramas View visible

3.7 Batch Render



: Show or hide the Batch Rendering window.



4 Application Settings

4.1 Contents

- 1 Basics
- 2 General
- 3
Detection
- 4
Optimization
- 5 Editor
- 6 Render

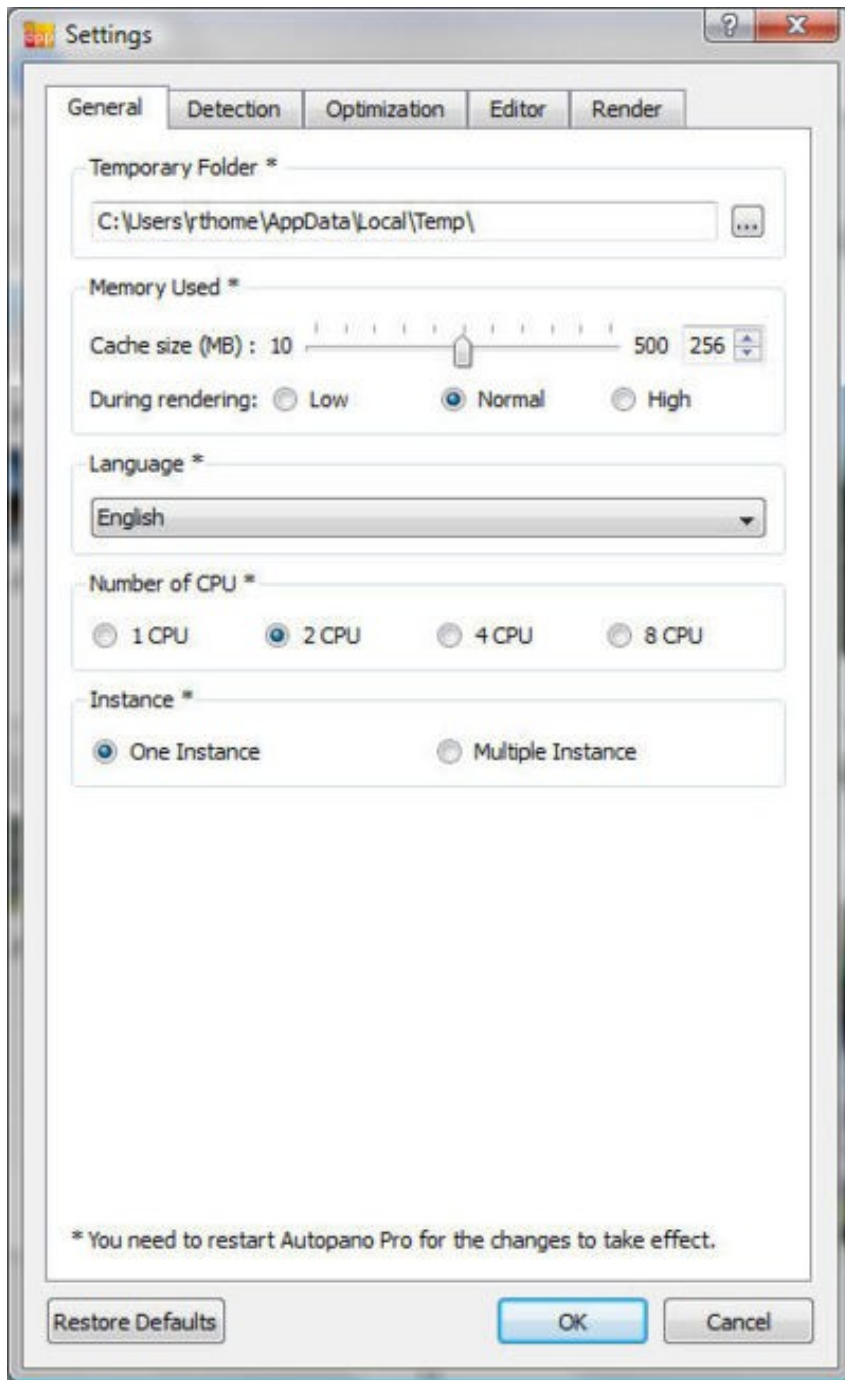
4.2 Basics

This dialog will allow you to set all the software preferences as well as the default settings for many tools. You can open the dialog using one of the following depending on your operating system:

-  *Edit: Settings*
-  *Autopano Pro: Settings*

The dialog is divided into 5 tabs: General, Detection, Optimization, Editor, Render.

4.3 General

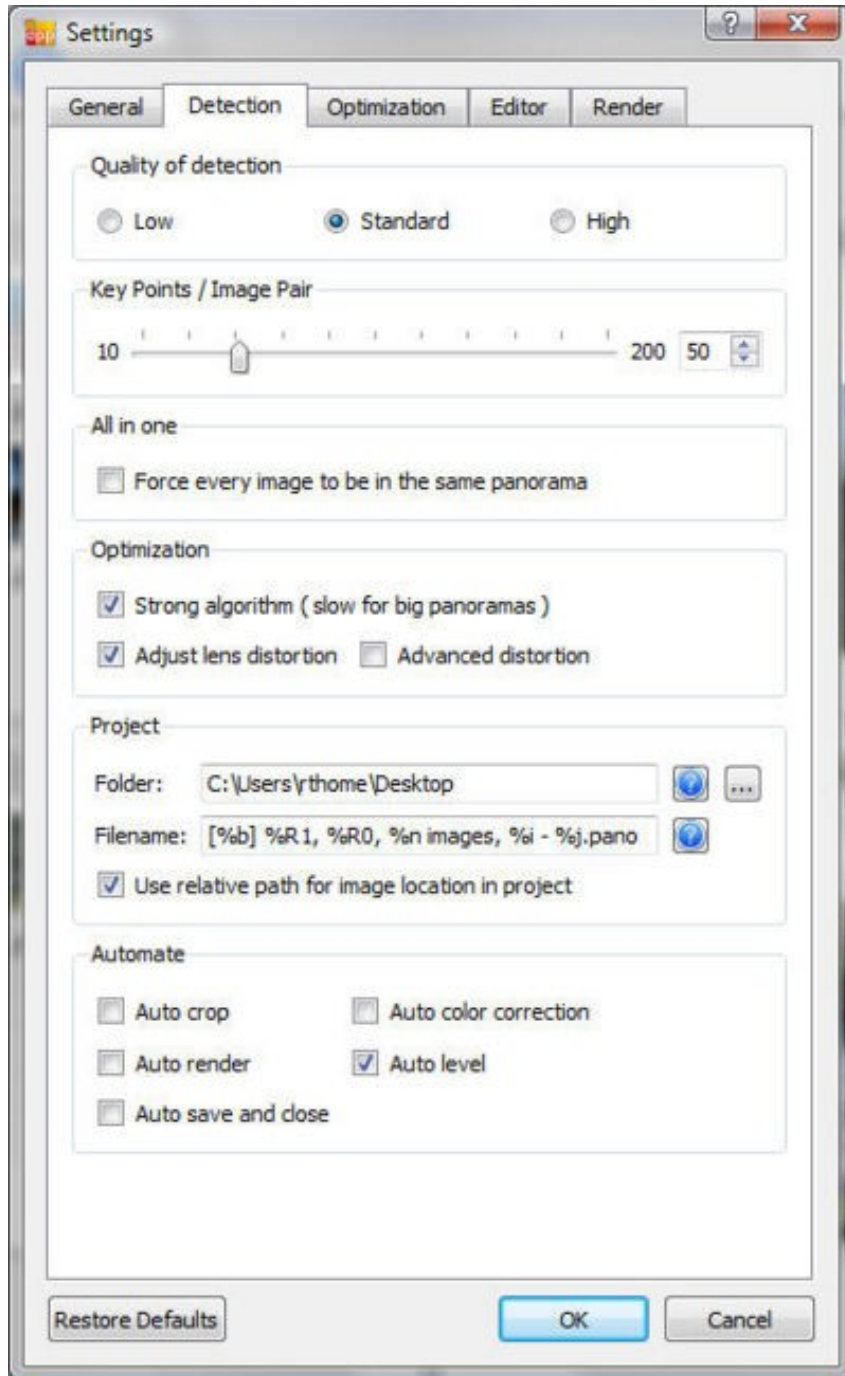


General setting tab

- **Temporary folder:** Allows you to choose a folder path where Autopano Pro will write the temporary files it needs. If you have multiple physical drives on your computer then choose the one you purchased last as it is probably the fastest drive on your system and the one with the largest amount of free space. The choice you make here can be very important if you are stitching very large panoramas (even more if you use the PSD/PSB multi-layer format and/or using Smartblend as a blender). In the event you are running out of space you will see an error describing how much space you need to stitch a particular panorama, so you can change the temporary folder path accordingly. **Please note:** you need to restart Autopano Pro for changes to take effect.
- **Memory Used:** The header is related to memory management for Autopano Pro. **Please note:** you need to restart Autopano Pro for changes to take effect.
 - ◆ *Cache size (MB):* Set the amount of RAM used by Autopano Pro to cache image information. There is no universal good setting, but keeping the value close to 15–20% of your total RAM should be sufficient. Keep in mind that, beyond a certain point, more cache will not speed up the Panorama editor or the rendering process. Those depend mainly on your CPU and hard drive speed.
 - ◆ *During rendering:* By changing our cell engine settings, you can reduce the memory usage. You should need to change the default setting only when rendering big panoramas (>100 pictures) on a machine with less memory (512MB RAM, for example). This flag has an effect on Autopano Pro only during rendering.

- **Language:** Choose a language for the Autopano Pro interface. Currently (version 1.3) the supported languages are: Dutch, English, French, German, Italian, Polish, Russian, Spanish. **Please note:** you need to restart Autopano Pro for changes to take effect.
- **Number of CPUs:** Autopano Pro was built from the ground up with multi threading in mind. It takes full advantage of dual and multi core CPUs, as well as multi processor configurations. At installation, Autopano Pro will detect the number of CPUs available in order to use the full computing power available on your system. This setting can be manually altered.

4.4 Detection



Detection settings tab

Detection settings determine the speed, quality and a few other aspects when it comes to scanning an image group looking for panoramas and stitching the images together. It is important to understand that the Detection Settings have two instances – Global, set from here, and Local, set for each image group, if need be. Whatever you set in this dialog will be the defaults for every newly created image group, you can then alter the settings locally on a per group basis using the Local Settings once the group is created.

- **Detection Quality** – determines how much work will be put into finding matching areas and points in overlapping images. This setting is very CPU intensive and using High or Maximum can multiply the detection time from three to four times.
 - ◆ **Standard:** This is the default setting and, for most cases, is a good compromise between quality and detection speed.
 - ◆ **High:** Increases control point density and accuracy, but slows down the detection speed. Useful in cases with small overlap between images, bracketed photos, or other specific cases. **Note:** most experienced Autopano-ers set *High* as their default, as it usually gives better results without too much of a wait on a high-end computer.
 - ◆ **Maximum:** The most accurate, but also the slowest method. Used mainly for desperate cases. It can save the day, but prepare for a long wait. This method is also known to sometime produce an excess of control points that can actually ruin a good panorama, so use in extreme cases only.

- **Key Point / Image Pair:** Set the number of control points per overlapping image pair. Keep in mind that too many control points will not lead to a better panorama. Anything above 100 is, in the generality of cases, useless. For the average user, 50 control points should be quite enough.

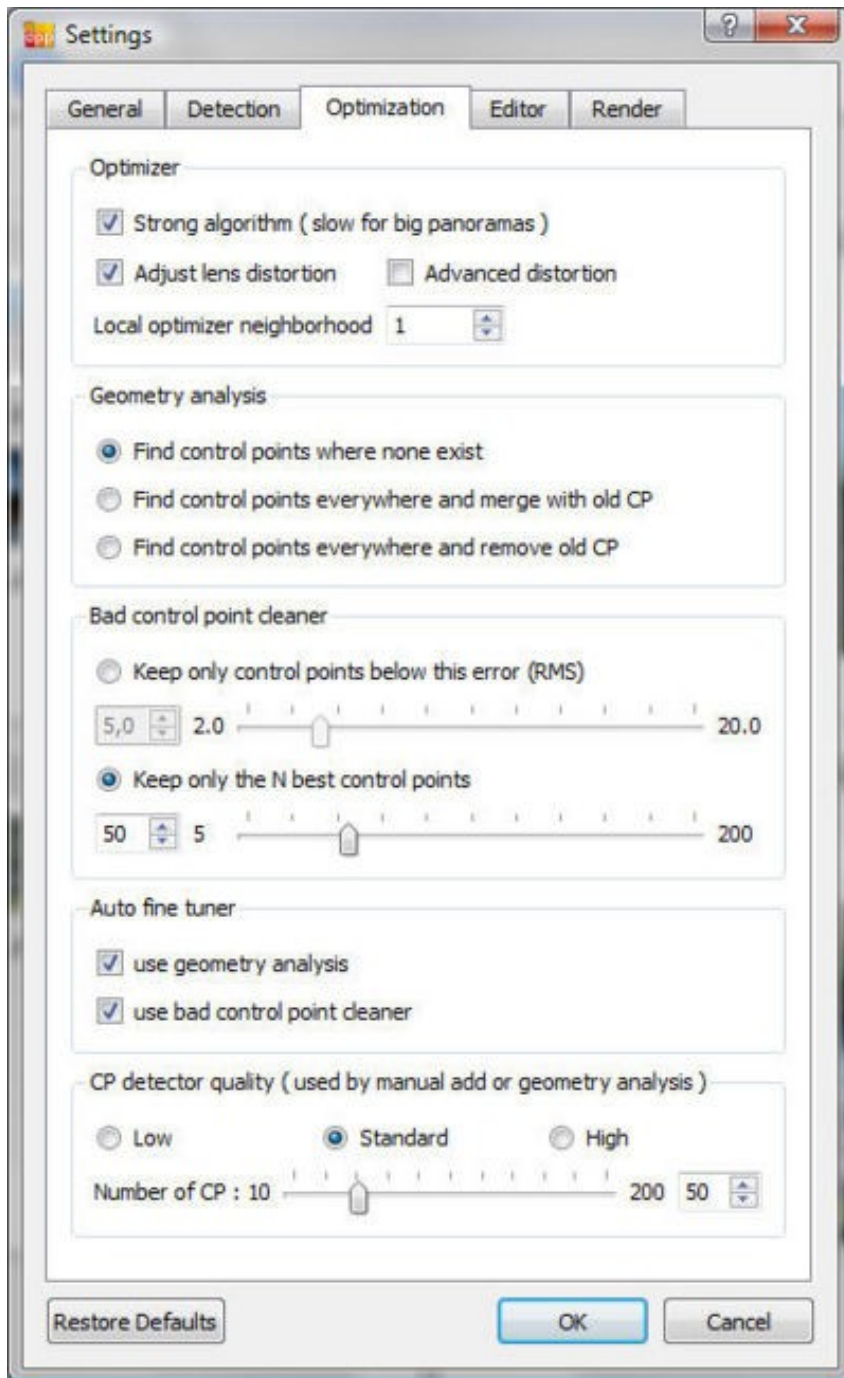
- **Force every picture to be in the same panorama:** Self-explanatory. There are cases where you know a set of images belong in a single panorama, but Autopano Pro fails to detect a panorama at all, or leaves some of the images out. Checking this option will force Autopano Pro to always try and make a panorama of all images in an image group, no matter what. **Note:** if your workflow includes putting each image set in a separate folder prior to dropping them into Autopano Pro, you will want this option turned on by default.

- **Optimisation:** By default, the two following options are checked and this setting should work fine most of the time. Turning those off will really speed up the detection of large panoramas (hundreds of files). The third option should be used in case of fisheye lenses.
 - ◆ **Strong algorithm:** Turn on/off the use of a stricter algorithm while optimizing after panorama detection.
 - ◆ **Lens distortion:** Turn on/off the lens distortion correction logic.
 - ◆ **Advanced distortion:** Check this option if you use fisheye lenses.

- **Project:** You can modify the destination folder and the name syntax of the project files.
 - ◆ **File name:** Set a template for naming all detected panoramas. This will be the project file name if you decide to save it, and it will show in the Panoramas View, as a title for each panorama. Click the ? (question mark) button next to the text field to see the syntax used for the file name template.
 - ◇ %i / %I – short / long name for the **first** image in the panorama (short = filename; long = full path and filename)
 - ◇ %j / %J – short / long name for the **last** image in the panorama (short = filename; long = full path and filename)
 - ◇ %n – number of images used in the panorama
 - ◇ %g – auto incremental index
 - ◆ **Directory:** Set the folder where the project file will be saved when *Auto save and close* is checked

- **Automate:** Autopano Pro is able to build great quantities of panoramas in a totally automated way. You can use the provided check boxes to choose what options will be enabled by default.
 - ◆ **Auto crop:** Crop the panorama to its usable pixels (i.e. non-black, containing image information). Same as the Crop tool in the Panorama Editor.
 - ◆ **Auto color correction:** Turn on color correction, as set in the Editor tab of the settings. Same as the Standard color correction switch in the Panorama Editor.
 - ◆ **Auto render:** Add the panorama to the Batch rendering interface and begin rendering as soon as the detection is completed.
 - ◆ **Auto level:** Adjust the level automatically.
 - ◆ **Auto save and close:** Save the project file in the source files' folder and close the panorama for later editing.

4.5 Optimization



Optimization settings tab

Optimization Settings determine image positioning, the quality of CP pairs, global RMS and the overall panorama quality. It is important to understand that the Optimization Settings have two instances – Global, set from here, and Local, set from the Control Points Editor. Whatever you set in this dialog will be applied to every newly created panorama, unless overridden by its local settings.

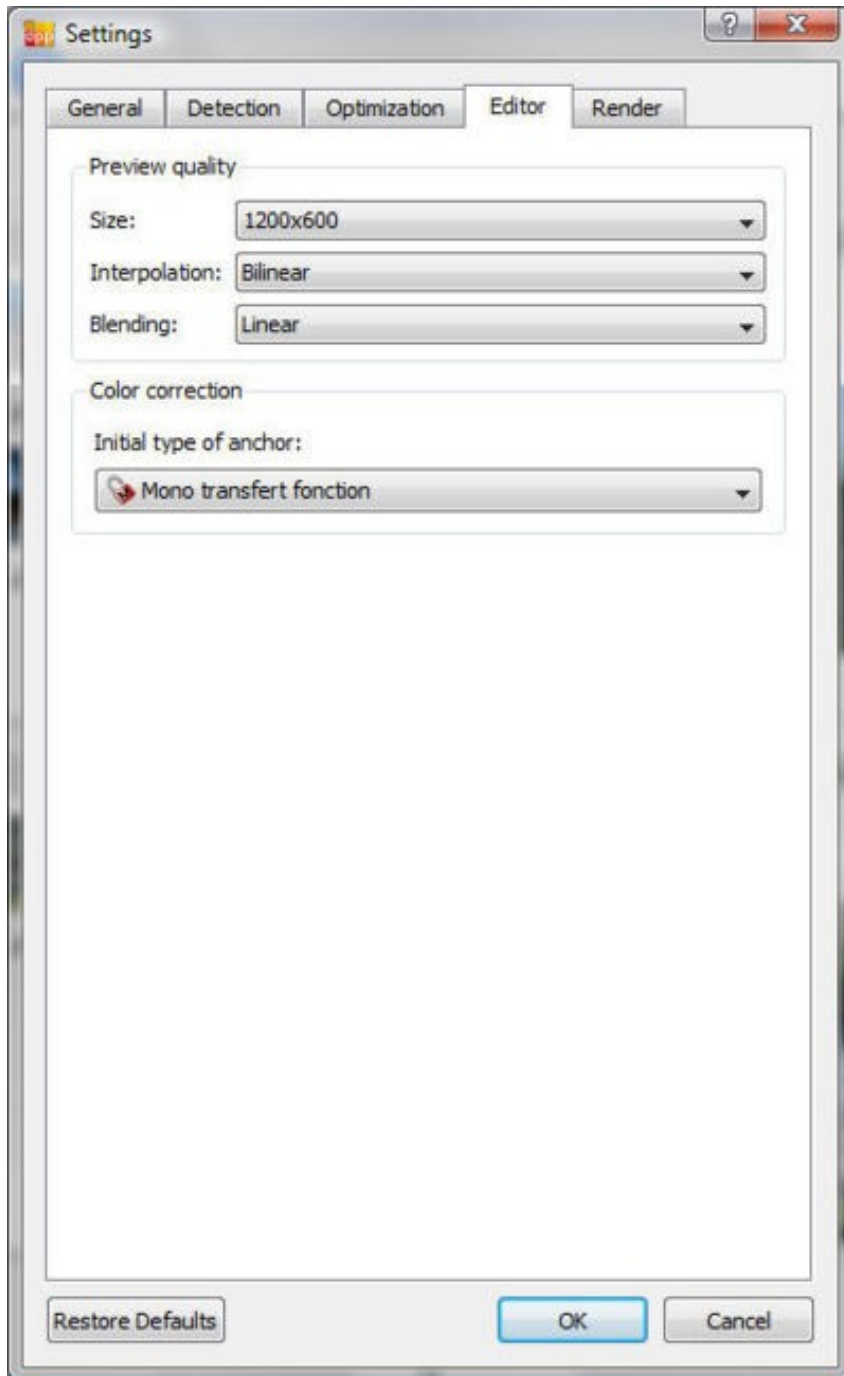
- **Optimisation:** By default, these two options are checked and this setting should work fine most of the time. Turning those off will really speed up the detection of large panoramas (hundreds of files).
 - ◆ **Strong algorithm:** Turn on/off the use of a stricter algorithm while optimizing after panorama detection.
 - ◆ **Lens distortion:** Turn on/off the lens distortion correction logic.
- **Geometry analysis:** Geometric analysis automatically looks for control points in all images. This option defines the behavior of the Add control points using geometric analysis button in the Control Points Editor. As this analysis relies on images already pre-positioned, Autopano Pro can concentrate on the seam areas between the images. Three modes are provided:
 - ◆ **Find control points where none exist:** Look for control points between overlapping images that have no Image Link created. Use this mode when there are some missing image links.
 - ◆ **Find control points everywhere and merge with old CP:** Look for control points in every image, then add the newly generated points to those already present. Use this mode when there are too few control points in the panorama overall.
 - ◆ **Find control points everywhere and remove old CP:** Look for control points in every image, then remove the current points and use only the new ones. Use this mode when the overall control point quality is weak.

- **Bad control points cleaner:** This function is like a filter applied to all control points, leaving only the best ones. This option defines the behavior of the Clean bad control points button in the Control Points Editor. Two modes are provided:
 - ◆ **Keep control points below this error (RMS):** Remove all points that have a RMS above the selected value. Gives better quality, but with badly positioned images can remove most of (or all) control points.
 - ◆ **Keep the N best control points:** Leave an exact number of points per image pair, removing only the worst ones. Usually the best mode with hand-held panoramas or difficult cases.
- **Auto fine tuner:** Allow you to trigger the following functions automatically:
 - ◆ **Use geometry analysis**
 - ◆ **Use bad control point cleaner**

Note: **Use geometry analysis** is launched before **Use bad control point cleaner**

- **CP detector quality:** This options enables you to choose the quality of the control points detector. By defaultt, it is set on "standard", which is a good compromise between speed and detection quality. You can also set the number of control points to be detected.

4.6 Editor





Editor settings tab

The Editor Settings determine the preview quality in the Panorama Editor. This in no way affects the final panorama rendering – the render settings can be found in the Render Settings dialog. It is important to understand that the Editor Settings have two instances – Global, set from here, and Local, set for each panorama. Whatever you set in this dialog will be applied to every panorama you create, unless you override it with its local settings, from the Panorama Editor *Edit: Settings* menu.

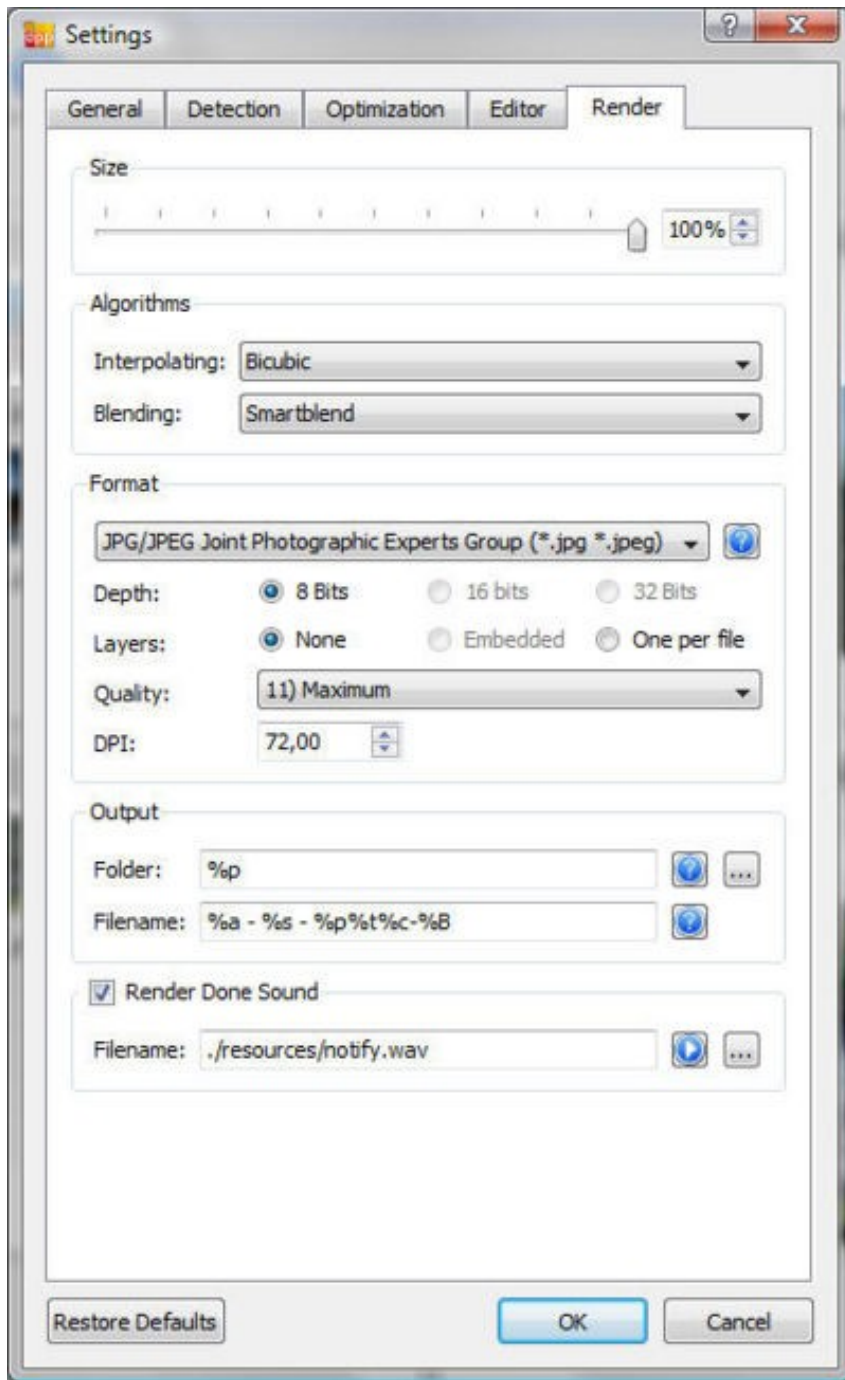
- **Preview quality:**

- ◆ **Size:** Set the size of the panorama preview for the Panorama Editor in pixels. The default value is 1200 x 600 pixels. The preview refreshes after each parameter change in the Panorama Editor. You might want to experiment to see if bigger sizes (higher quality) will have better speed/quality ratio for you. 3200 x 1600 is the highest possible setting, but is equivalent to rendering a 3200 x 1600 panorama and can take some time. Interpolator and blender settings also affect the preview refresh speed.
- ◆ **Interpolation:** Use to choose the interpolating algorithm – these are described in the Interpolation section of the Render Settings page.
- ◆ **Blending:** Use to determine which blending mode will be used on seams. There are several blending modes but only some of them can be used for previews:
 - ◇ *None:* No blending applied, show the images stacked
 - ◇ *Linear:* Fast with reasonable quality blending
 - ◇ *Multiband:* Slower, but best possible quality. **Note:** For now, Smartblend is not available as a blending option for the Panorama Editor, only for final rendering.

- **Color Correction:** This option defines the behavior of the Color Correction button in the Panorama Editor.

- ◆ **Initial type of anchor:** Set a default type of anchor for any panorama with color correction turned on. When you turn on color correction, there will always be a single yellow anchor and the rest of the images will have the type of anchor you set here.

4.7 Render



Render Settings Tab

The Render settings determine the output file size, the quality, and the format of your panoramas. It is important to understand that the Render Settings have two instances – Global, set from here, and Local, set for each panorama. Whatever you set in this dialog will be the defaults for every newly generated panorama, unless you override the global settings with local settings at the end of the stitching process.

- Size as a percent of the total image size (*in the Local Settings, you can choose an exact size in pixels*)
- Interpolation and Blending algorithms
- Output file format

A complete description of these options can be found in the Render Settings page. The following options are specific to the Global instance of Render Settings:

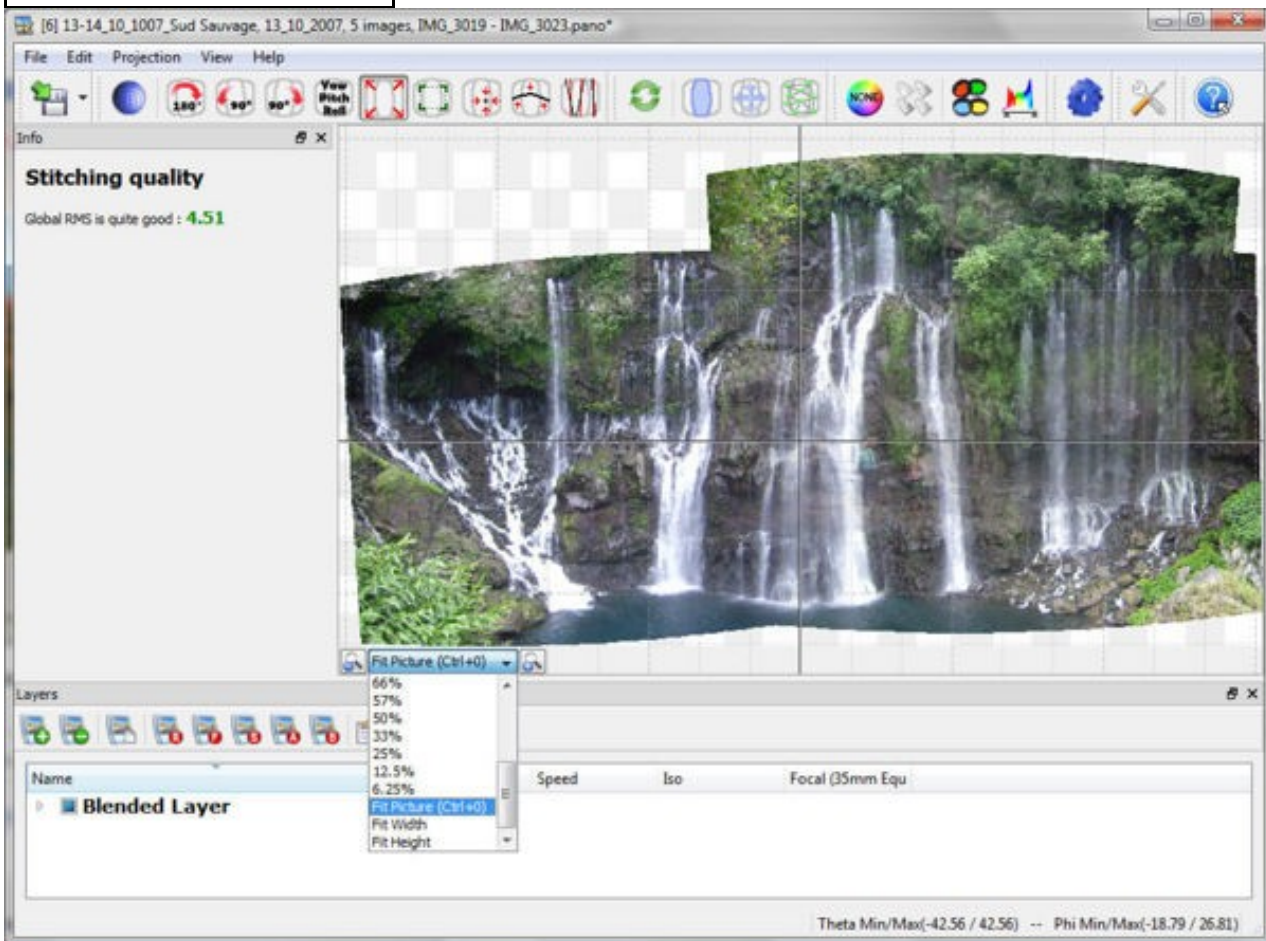
- **Output:** Set the default location for the rendered panorama; you can also change this later, for each individual panorama
 - ◆ **Folder:** Set the folder where to save the output image.
 - ◆ **Filename:** Syntax of the filename (click on the "?" icon to learn about the signs)
- **Render done sound :** Choose a custom sound to be played after all jobs in the Batch Rendering queue are done. You should provide an .WAV audio file.

5 Panorama Editor

5.1 Interface Presentation

5.2 Contents

- 1 Interface Presentation
- 2 The Toolbar
- 3 The Preview Area
- 4 Project Files
 - ◆ 4.1 Save your project
 - ◆ 4.2 Extended Save As...
 - ◆ 4.3 Export your project to Pano Tools
- 5 History
- 6 Editor Settings
 - ◆ 6.1 Editor tab
 - ◆ 6.2 Grid tab
 - ◆ 6.3 Toolbars tab
























Panorama Editor Screen Capture

The Panorama Editor interface is divided into 3 main areas:

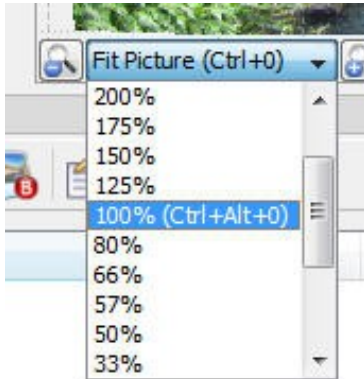
- The Toolbar: hosting the main tools (saving, history, geometrical correction, color correction, etc.)
- The Preview Area: displaying a preview of the panorama, allowing to zoom and move the panorama.
- The Status Bar: displaying information related to shooting conditions. This information is useful to monitor the coherence of the capture. For example, for a complete panorama, the FOV should return a Theta Min/Max $-180^{\circ}/180^{\circ}$ and a Phi Min/Max $-90^{\circ}/90^{\circ}$.

5.3 The Toolbar



- Project file Save and Export:  
- Geometry Editing:         
- History (of undos): 
- Image selecting and moving:  
- Control Points Editor: 
- Color and Brightness:   
- Render Settings: 
- Editor settings : 
- Contextual Help:  Click on this icon, then click on the icon you need help for.

5.4 The Preview Area



The Preview Area allow you to zoom in and out the panorama.

- To move the panorama preview:
 - ◆ Hold down the **Spacebar** on the keyboard and move the image with the mouse (right-click).
- To zoom in and out the panorama preview:
 - ◆ Hold down the **Alt** key (or Apple key on a Mac) while scrolling with the mouse wheel,
 - ◆ Or use the options located below the panorama preview.

Note:

- Some tools are using the keyboard and/or the mouse, like the *Layer View* mode.
- It is also possible to adjust the panorama preview size to the window size by selection the "Fit Picture" zoom setting.

You can play with the various types of zoom provided to determine which one fits best into your workflow.


5.5 Project Files

The Autopano Pro project file (.pano extension) is a file used to save all the panorama parameters: the list of source images used, the color correction parameters, the rendering file format, etc. It is beneficial to save and keep this file as you will be able to come back to the panorama at a later time and

continue working on it or add the .pano file to the batch renderer without having to redo all the detection and correction work. This file is a plain text file and can be opened with any text editor.

Autopano Pro also supports other very popular project file types: the Pano Tools project file formats. Can import from and export to these file formats.

5.5.1 Save your project

This icon is used to save your panorama in the Autopano Pro file format (.pano).  ? Tip: Ctrl-click on the Save button to bring up the Save as... dialog, where you can change your projects name or simply save different versions of the same file.

5.5.2 Extended Save As...

This option lets you:

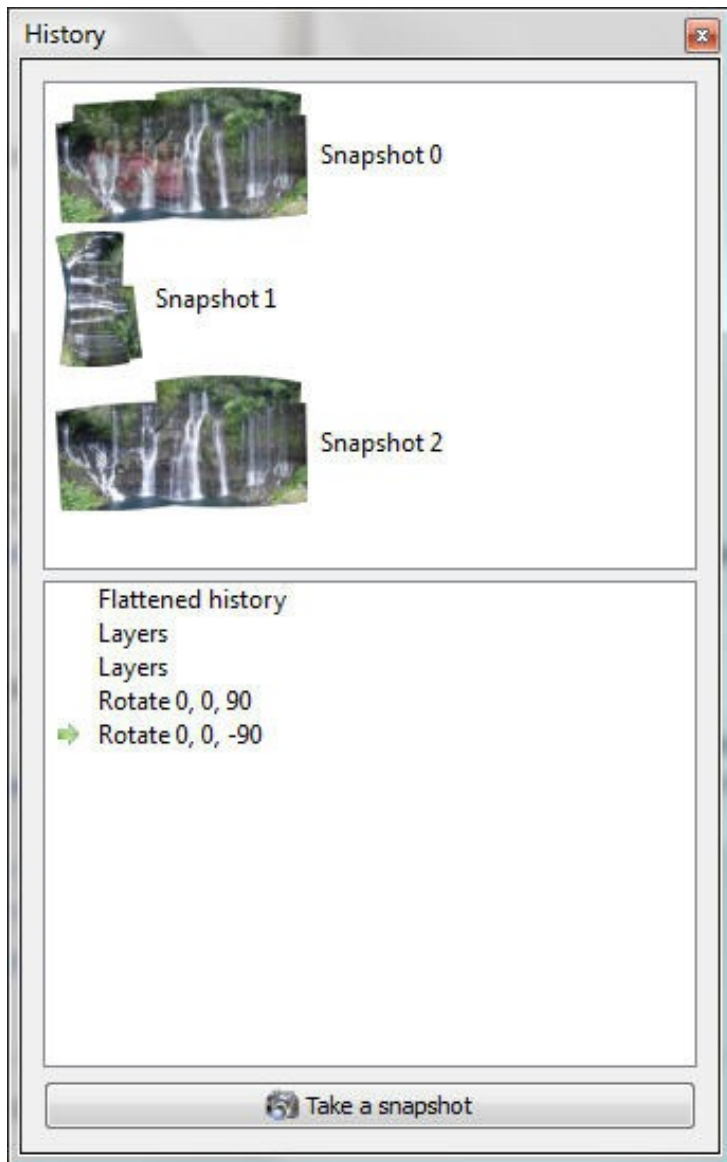
- Save the project as a .pano file,
- Copy or move the images used in the project to a specific folder.

This can be very useful: if you detected the images of the panorama from a big photo stock (a memory card for instance), you can automatically extract from this stock the images composing your panorama.

5.5.3 Export your project to Pano Tools

This icon is used to export your panorama in the PTGui (.pts), PTAssembler (.ptp) and Hugin (.pto) file formats.

5.6 History



"History" Dialog

You need to undo the last few actions performed on your panorama as you are not satisfied with the result? No problem! Just click on the History button. The "History" dialog will pop up and display a list of all the steps performed since the panorama was created or opened. All you need to do is click on the desired step to restart from there.

The dialog will also allow you to take a snapshot of the panorama at any given time. Just click on the **"Take a snapshot"** button in the History dialog. You will then be able to restore the snapshot state by clicking on the desired **Capture Thumbnail**.

Keep in mind that exiting the Panorama Editor will discard the History information. If you reopen the same panorama, only the last version of it will be displayed in the History.

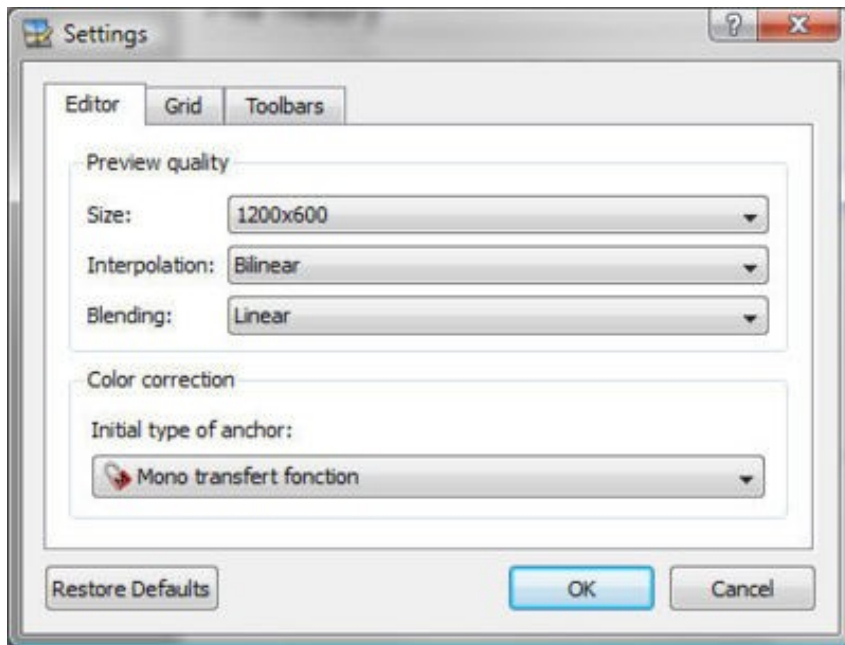


Tip:

- Take a snapshot every time you save your work to keep track of your progress.
- You can also use the snapshot feature to compare two different color corrections, for example.

5.7 Editor Settings

5.7.1 Editor tab



Local Editor Settings

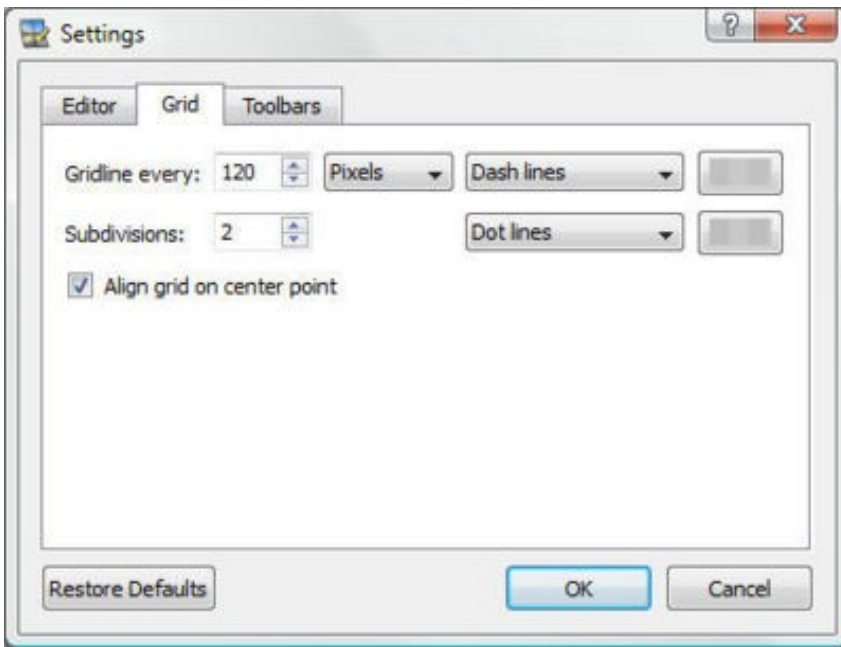
The Editor Settings determine the preview quality in the **Panorama Editor**. This in no way affects the final panorama rendering – the render settings can be found in the Render Settings dialog. It is important to understand that the Editor Settings have two instances – Global, set from here, and Local, set for each panorama. Whatever you set in this dialog will be applied to every panorama you create, unless you override it with its local settings, from the **Panorama Editor Edit: Settings** menu.

• Preview quality:

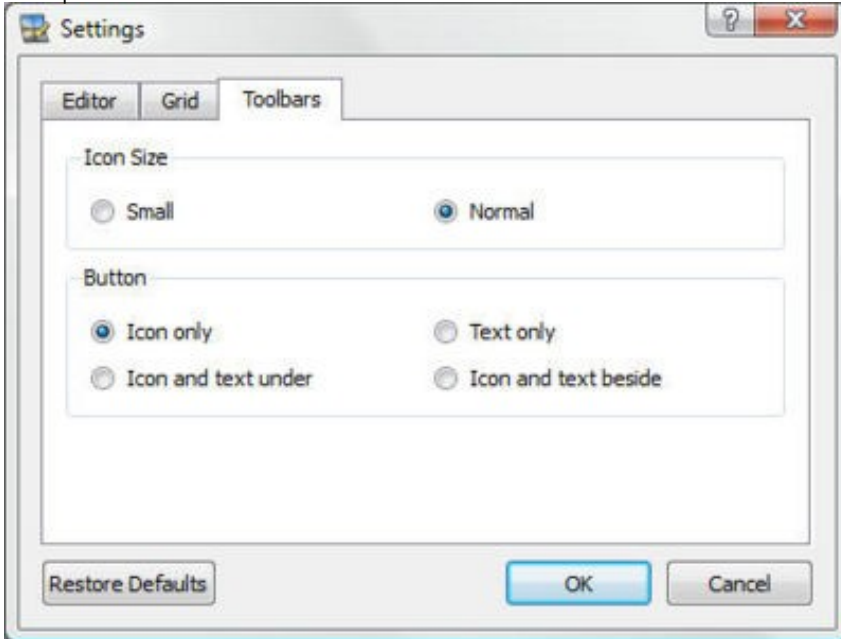
- ◆ **Size:** Set the size of the panorama preview for the **Panorama Editor** in pixels. The default value is 1200 x 600 pixels. The preview refreshes after each parameter change in the **Panorama Editor**. You might want to experiment to see if bigger sizes (higher quality) will have better speed/quality ratio for you. 3200 x 1600 is the highest possible setting, but is equivalent to rendering a 3200 x 1600 panorama and can take some time. Interpolator and blender settings also affect the preview refresh speed.
- ◆ **Interpolation:** Use to choose the interpolating algorithm – these are described in the Interpolation section of the Render Settings page.
- ◆ **Blending:** Use to determine which blending mode will be used on seams. There are several blending modes but only some of them can be used for previews:
 - ◇ *None*: No blending applied, show the images stacked
 - ◇ *Linear*: Fast with reasonable quality blending
 - ◇ *Multiband*: Slower, but best possible quality. **Note:** For now, Smartblend is not available as a blending option for the **Panorama Editor**, only for final rendering.

• Color Correction: This option defines the behavior of the Color Correction button in the **Panorama Editor**.

- ◆ **Initial type of anchor:** Set a default type of anchor for any panorama with color correction turned on. When you turn on color correction, there will always be a single yellow anchor and the rest of the images will have the type of anchor you set here.



Grid options



Toolbars options

5.7.2 Grid tab

This tab lets you define the type and the spacing of the grid lines.

5.7.3 Toolbars tab

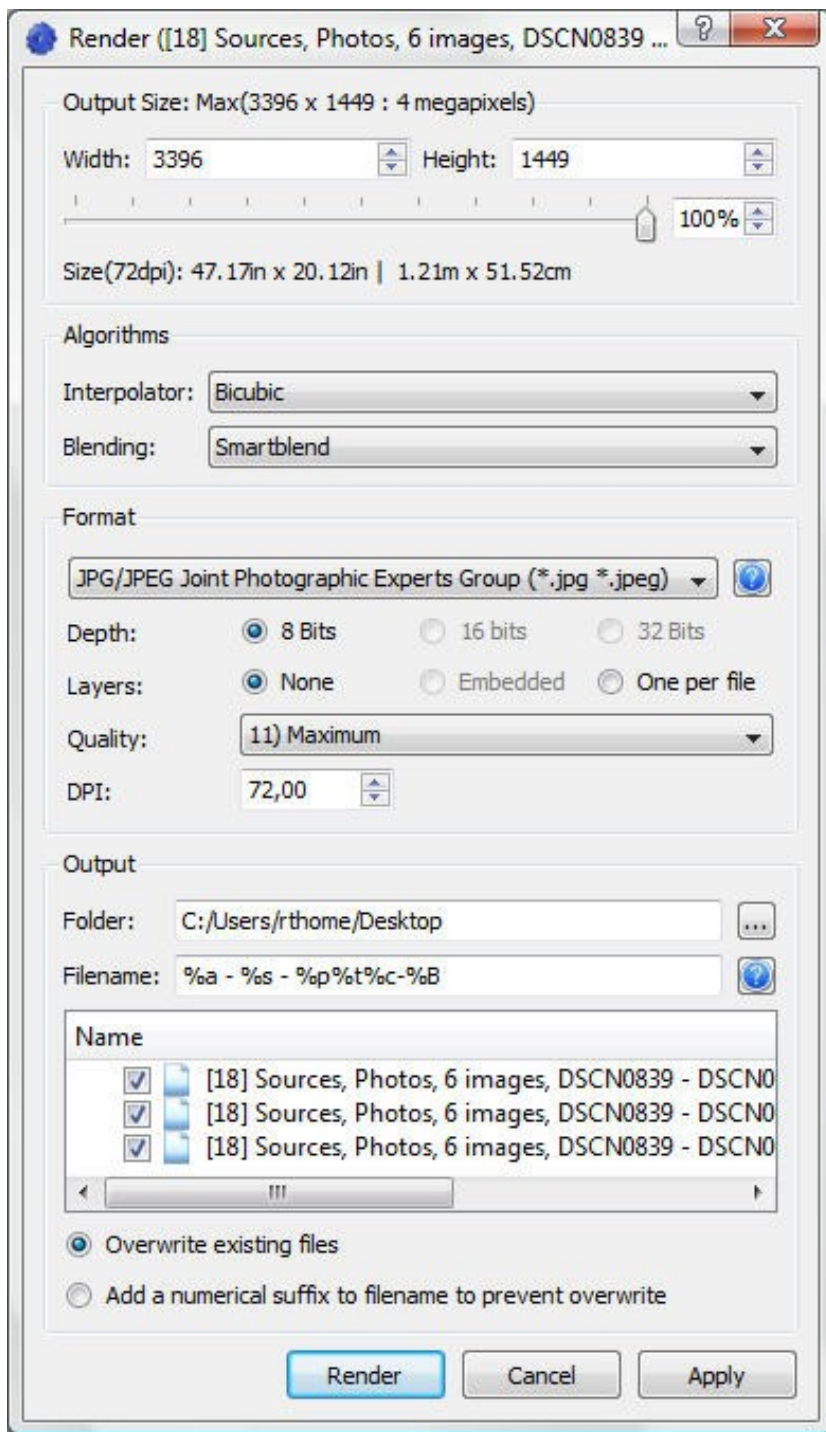
This tab lets you define the size of the toolbars' icons. You can also choose to add a descriptive text besides the icon, or choose to replace the icons with text.

6 Render Settings

The *Render* dialog will allow you to set the panorama rendering parameters.

6.1 Contents

- 1 Output Size
- 2 Algorithms
- 3 Interpolator
- 4 Blender
- 5 Formats
 - ◆ 5.1 Notes
 - ◆ 5.2 Layers:
None /
Embedded / File
 - ◆ 5.3 EXIF data
- 6 Output
- 7 Validation
- 8 About our Rendering Engine
 - ◆ 8.1
Cell-Rendering
 - ◆ 8.2 VFW, virtual
file writer



6.2 Output Size

There are to 3 ways to choose the output size of the panorama:

- with the slider (percent of the max. size)
- by entering a numerical value for the desired width (value expressed in pixels)
- by entering a numerical value for the desired height (value expressed in pixels)

The panorama's maximum size is given on the first line (taking into account any use of the *Crop* tool). This maximum size (100%) is the resulting size of the source images after stitching. At the maximum size, all the details recorded when shooting the scene will be incorporated in the final image.

Note: Don't feel pressured to always use 100%. When working with a Planar Projection or Cylindrical Projection with a FOV wider than 90°, the pixels located in some specific areas of the resulting image will abnormally be stretched (right and left edges in Planar, top with Cylindrical). If we choose 100% the image sharpness cannot be constant across the resulting image, it can be a good idea to take this fact into account and reduce the value to 70% or even 50%. As far as the time needed to render the final image, the percentage output size determines the computing load: going from 100% to 30% will give you a 1 to 10 decrease in rendering time!

Maximum size with multiple focal lengths: When working with a panorama using source images shot at various focal lengths, the maximum size of the resulting image is calculated based on the source image with the highest amount of detail (i.e. the longest focal length) and this image is given a ratio of 1 (i.e. for one pixel of this image, there will be one pixel in the final panorama). Therefore, the pixels belonging to the source images taken with shorter focal lengths will be stretched in the rendering process.

6.3 Algorithms

The Blender and Interpolator are two algorithms used to manage the global output quality of the panorama.

6.4 Interpolator

The interpolator is used to reproject the source image's pixels on the panorama. The Interpolator's quality will then influence the sharpness of the rendered panorama.

- **Nearest neighbour:** to be used for testing purposes only because of the large amount of artifacts it generates. As a tradeoff it's the fastest of all.
- **Bilinear :** Represents a decent quality/speed ratio.
- **Bicubic:** If you don't know which one to pick this is the one you should be using. Any differences from Bilinear will be hardly visible to the naked eye, but can be seen on highly contrasted lines. It is the default, and recommended setting.
- **Bicubic Sharper:** same formula as Bicubic with some strength added (same as bicubic, only a touch stronger). This sampling mode is the same as the one found in the "Image Size" dialog, in the "Resample Image" drop-down of Adobe Photoshop.
- **Bicubic smoother:** Same formula as Bicubic with less strength (same as bicubic only a touch lighter). This sampling mode is the same as the one found in the "Image Size" dialog, in the "Resample Image" drop-down of Adobe Photoshop.
- **Spline36:** The use of this powerful interpolator is to be reserved for cases where heavy post-processing will take place. To the naked eye, there is absolutely no visible difference with Bicubic.
- **Spline64:** More powerful, slower, but generally even better than Spline36 (if you can see the difference!). To be reserved for cases where heavy post-processing, including reprojection and successive image transformations will take place.

6.5 Blender

The Blender is an algorithm used to combine several reprojected images (source images projections on the panorama). The Blender is generally used on the areas where the sources images overlap, but not only. There can be cases where it modifies some pixels outside of the overlapping areas (i.e. where only one input source for a pixel is available). The primary goal of the Blender is to combine the two or more source images, and process the overlapping areas to produce a seamless panorama.

Several blending algorithms are available:

- **None:** no blending is performed. Only the *the top picture* is used. The stitching seams are visible (geometry and/or brightness).
- **Linear:** this very fast mode can be a good quality/speed compromise if you are not too demanding on quality.
- **Multiband:** slower, but produces much higher quality results than "Linear". The stitching seams (i.e. transition between source images) are hardly visible. This mode does not take into account objects that could have moved from one shot to the other and some "ghosting" can occur.
- **Smartblend:** this blender combines a Multiband blender and picture analysis engine in order to identify objects common to the source images (a moving object, a strong line,?). From the results of this analysis, Smartblend tries to keep the features common between images (edges, lines, curves,?) and automatically discard objects that have moved. Even though much slower than the other algorithms, this blender gives a much higher rendering quality.

Be aware: this blender is not HDR compatible yet.

6.6 Formats

File format	Options	Comments
JPEG	<ul style="list-style-type: none"> • <i>Compression:</i> quality ranging from 1 to 12 • <i>Bit depth:</i> limited to 8bits (discards the alpha channel) 	<ul style="list-style-type: none"> • Maximum size: 64,000 x 64,000 pixels. Be aware that Adobe Photoshop will refuse to open any valid JPEG file larger than 30,000 pixels.
PNG	<ul style="list-style-type: none"> • <i>Compression:</i> ranging from 1 to 7 • <i>Bit depth:</i> 8 or 16bits (keeps the alpha channel) 	<ul style="list-style-type: none"> • Maximum size: 64,000 x 64,000 pixels

PSD / PSB^[1]	<ul style="list-style-type: none"> • <i>Bit depth</i>: 8 or 16bits with alpha channel • Can manage embedded layers 	<ul style="list-style-type: none"> • Maximum size: 300,000 x 300,000 pixels
TIFF	<ul style="list-style-type: none"> • <i>Bit depth</i>: 8 or 16bits with alpha channel • <i>Compression</i>: none, RLE, LZW, JPEG, ZIP^[2] 	<ul style="list-style-type: none"> • Maximum size: none • Saving in multilayered TIFF enables you to process the image in GIMP, but not in Photoshop. To process it in Photoshop, save it in multilayered PSD. • 16 bits TIFF files are not compatible with some programs.
HDR^[3]	<ul style="list-style-type: none"> • <i>Bit depth</i>: 32 bits • <i>Compression</i>: none, RLE 	<ul style="list-style-type: none"> • Maximum size: none

6.6.1 Notes

1. ? The **PSD** file format is the traditional Adobe file format, supported by all versions of Photoshop and by many computer programs. The **PSB** file format is another Adobe file format, recently introduced, and not as popular as the PSD format. It was introduced after version 7.0 and is not supported in 7.0 and earlier version of Photoshop. It was introduced in 2003 and is supported in Photoshop CS and CS2. This format is actually an extension of the PSD file format developed to store larger images, allowing the possibility of storing huge images when we think in terms of conventional image sizes. So, when the final panorama size is over 30,000 pixels or when the resulting file size is over 2 GB, Autopano Pro will **automatically** select the PSB file format instead of PSD.
2. ? The various compression modes are not equal in terms of quality. It is strongly recommended to avoid the LZW compression with a 16bits TIFF file as the resulting **compressed** file will be **larger** than a **non compressed** file. It is also not a good idea to choose the JPEG compression, as it will, just as with a regular jpeg file, introduce strong limitations into the file (no alpha channel, max. size quite small). The good choice remains the ZIP compression.
3. ? This file format can be opened with Photoshop CS 2 and by ?Tone Mapping? software like Photomatix or FDRTools.

6.6.2 Layers: None / Embedded / File

When performing a rendering with Autopano Pro, it is sometime useful to reproject the totality of the surface of the stitched source images to, in a second time, edit the resulting panorama with an image processing software.

This can be done with all available file formats, except that some file formats will support embedded layers within a single file (PSD/PSB) and some won't. Three options are provided to manage embedded layers:

- *None*: none of the reprojected source image will be kept.
- *Embedded*: this option will be enabled if supported by the selected file format. In this case each individual source image will be added to the rendered file as an separate layer.
- *File*: each individual source image will be rendered in a separate file; you will obtain one file per image.

The color and brightness corrections applied to the panorama are also applied to the individual layers: Color Correction, Filters and Levels are applied.

In the other hand the *Blender* is not active on the source images; therefore it has no effect on the resulting individual layers. This, even if surprising in the first place, is absolutely necessary. This will translate into color and brightness variations between the different layers themselves, and also between the layers and the *background* layer (the resulting stitched panorama is assigned to the background layer in Photoshop).

The layers will be arranged correctly, barrel and pincushion distortions are corrected.

6.6.3 EXIF data

For the JPEG, TIFF and PSD/PSB file formats, Autopano Pro will store the original Exif data (found in the source images) into the rendered file. This allow for tracing the original shooting conditions. It also adds some improvements:

- ImageDescription (0x010E): "Stitched Panorama"
- SoftwareUsed (0x0131): "Autopano Pro"
- FileChangeDateTime (0x0132): the panorama's rendering date
- UserComments (0x9286): A short summary for describing the panorama, as it appears in the Panorama Window.

Notes: at the present time, no calculation is being made to compute the equivalent focal length of the panorama. We focused more on keeping the original shooting condition rather than producing numerical values for the resulting panorama.

6.7 Output

This area of the dialog will allow you to choose a path and a filename for the resulting panorama.

- **Path:** Easy! This is the file folder where the resulting file will be stored.
- **Filename:** Well? it becomes a little more complicated but very powerful. Instead of giving always the same filename we came up with a system that generates the file name using a powerful syntax. This system will allow you, for example, to specify the height * width, the interpolator or blender used, etc. inside the produced filename. The syntax is as follow:

%i / %I	Short/long name of the first image of the panorama
%j / %J	Short/long name of the last image of the panorama
%n	Number of source images
%s	Render size (Ex: 11,254 x 2,541)
%f	FOV (Ex: 25.6° x 14.3°)
%p / %P	Short/long name of projection mode used <ul style="list-style-type: none"> • S = Spherical • C = Cylindrical • P = Planar
%t / %T	Short/long name of the interpolator used <ul style="list-style-type: none"> • NN = Nearest Neighbor • LI = Bilinear • CI = Bicubic • CA = Bicubic sharper • CO = Bicubic smoother • S3 = Spline36 • S6 = Spline64
%b / %B	Short/long name of the Blender used <ul style="list-style-type: none"> • N = None • L = Linear • M = Multiband • S = Smartblend
%c / %C	Short/long name of the color correction applied <ul style="list-style-type: none"> • N = None • L = LDR • H = HDR
%l / %L	Group name as defined in the Layer Editor
%v	Version of Autopano Pro used for rendering
%g	Panorama # (unique global index #)

The following model is used by default: "Pano - %i - %s - %p%t%c - %l" returning the following:

"Pano - DSCN0839 - 1261x512 - SLIN - Blended Layer.psd"

```
Name of the first image: DSCN0839
Render size: 1261x512
SLIN => (S)pherical, (LI)near, (N) no color correction
```

- **Name:** this area of the dialog displays a translation of the naming syntax model used, allowing you to preview the final filename. It also displays real time information regarding possible naming conflicts: does this name already exist? We wouldn't want to overwrite an existing file.

Note: a panorama can generate several files if you created some layers using the Layer Editor. They will all be listed here. In the same way, if one of the file to be rendered contains embedded layers a small crosshair will appear next to its name. You can click on this crosshair; a list of all the layers that will be created during the rendering process will then be displayed.

- **Overwrite existing files:** this option allow you to force file overwrite.
- **Add an ending number in filename to prevent overwrite:** this option will automatically modify the filename by adding a trailing series of numbers to the filename in order to avoid conflicts.

6.8 Validation

- **Render:** apply the chosen parameters, launch the rendering and close the dialog.
- **Apply:** apply the chosen parameters, close the dialog, but does not launch the rendering.
- **Cancel:** cancel all changes and close the dialog.

6.9 About our Rendering Engine

6.9.1 Cell-Rendering

During the rendering operation, you may have noticed that everything is performed on small cells, this is a technique called "cell-rendering". The whole workload to be performed on the panorama is divided in a set of small jobs, taking in charge small portions of the final image. This model is a lot harder to develop but presents huge advantages:

- immediate support for multi-core / multi-processors systems: each computing unit manages a cell (in the future, this same approach will be used to easily perform network rendering and split the work load across multiple computers on a network).
- the amount of RAM required is lower: this is a logical consequence as we reduce the amount of work to be performed to a small cell, we then need less resources to process it (the number of source images used in a cell is often reduced to a maximum of 3 or 4 images, even if the panorama is composed of a 100 source images).

6.9.2 VFW, virtual file writer

This exclusive technology combined with cell-rendering allows us to even further reduce the resources needed to generate very large panoramas. You will be able to generate panoramas from a large number of source images even if your computer does not have a lot of RAM.

For example, if you perform a rendering from jpeg source images using Multiband as blender and writing to a PSD file, the Virtual File Writer will generate the panorama without the need to create a temporary file or using a lot of RAM. Everything is perfectly optimized for this mode to be as efficient as possible, even with panoramas of several gigapixels.

7 Batch Rendering

7.1 Concept

7.2 Contents

- 1 Concept
- 2 Interface Description
- 3 The Toolbar
- 4 Rendering Queue and Properties

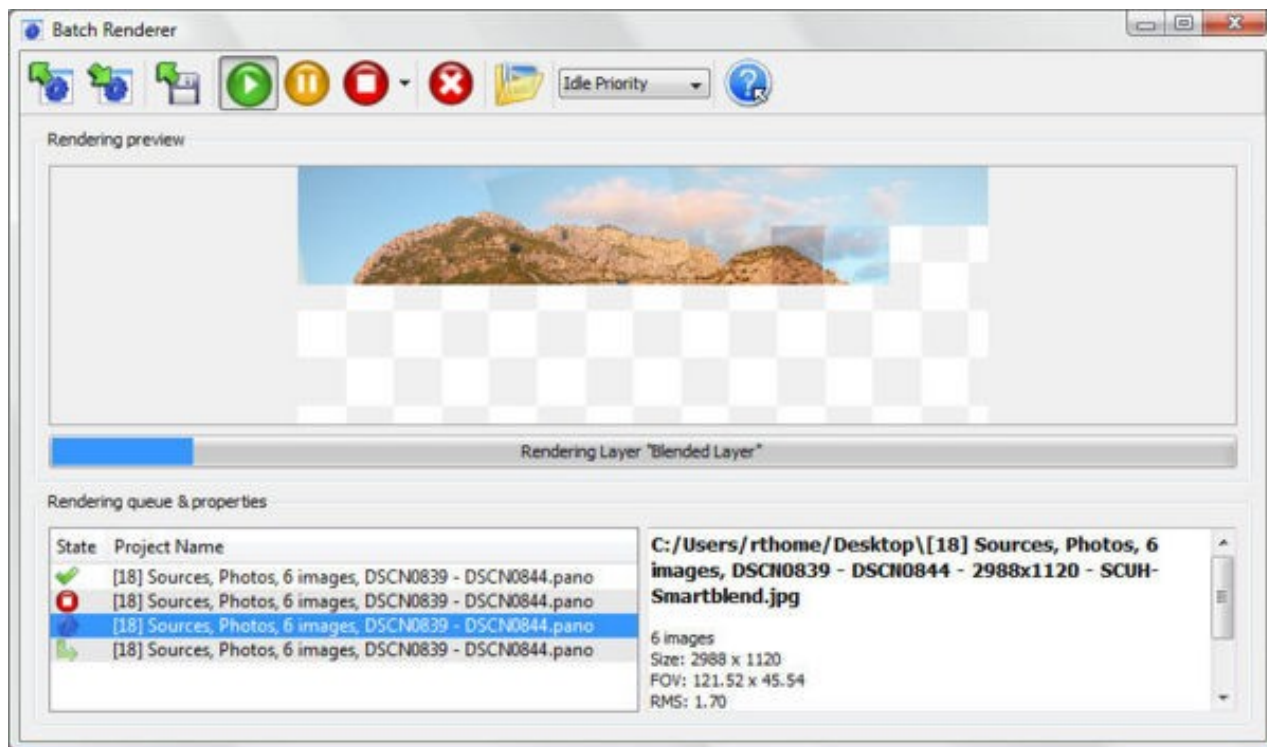
The Batch Rendering feature was introduced to automatically process a queue of panorama rendering tasks. All you need to do is define a list of project files (.pano) you want to render. Each project will be rendered once the previous rendering task is completed.

Note: Even though Autopano Pro allows you to continue working (panorama detection/editing) while a panorama is being rendered in the background, it is sometimes a better idea to defer the final rendering and perform it at a time when you do not need to use your computer (at night for example), especially if you need to render very large panoramas.

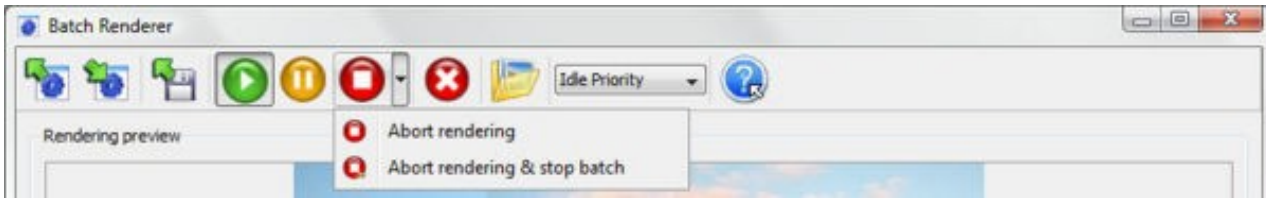
7.3 Interface Description











The interface is divided in three major areas.

- **The Toolbar:** with buttons to launch, pause and stop the batch rendering,
- **Rendering Preview:** display a real time preview of the rendering process
- **Rendering queue & properties:** list the projects waiting to be rendered.




7.4 The Toolbar

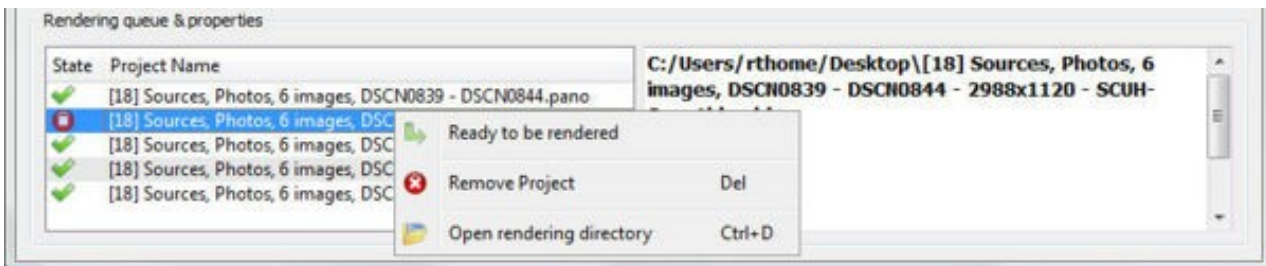


-  **Open the rendering list:** Open an (.apb) file containing a list of projects to be rendered.
-  **Save rendering list:** Save an (.apb) file containing the list of the projects currently in the rendering queue.
-  **Add a project:** Add one or several projects to the rendering queue.
-  **Start/Stop the batch renderer:** Start or stop the processing of the rendering queue. Only the projects flagged ?Ready to be rendered? in the queue will be rendered. This means that a rendered, canceled or failed project will not be rendered. To stop the batch renderer without canceling the rendering currently in progress, click again on Start.
-  **Pause the batch rendering:** Pause the rendering process in progress. Note: Pause is not available when Smartblend is selected as the blending algorithm.
-  **Cancel the current rendering:** Cancel the rendering of the current project and start the rendering of the next project. The batch renderer itself is not stopped.
-  **Cancel the current rendering and stop the batch renderer :** Cancel the rendering in progress and suspend the processing of the rendering queue.
-  **Remove one or several projects from the list:** Remove the selected projects from the list. A project currently being rendered cannot be removed from the list.
-  **Open the destination folder:** Provides easy access to a project's destination folder.
-  **Process priority:** A rendering set to maximum priority will use the full available processing power of the computer (rendering is then faster); this will affect the performance of all the other programs currently running on your system. On the other hand, a rendering set to **no priority** will share its computing needs with the other programs needs (rendering will then take longer), you can continue using the computer for other tasks.




The last icon  , will allow you to display some help for each button. Click on this icon then click on the button you need help with.






7.5 Rendering Queue and Properties



This area displays a list of the projects selected for rendering. You can display a project's properties by selecting a project; its properties (filename, file format etc.) will then be displayed in the area located to the right.

The icon displayed in front of a project name gives you information about the state of the project:








-  : the project was successfully rendered.

-  : the project is currently being rendered.
-  : the project is waiting to be rendered.
-  : an error was encountered while rendering the project.
-  : the rendering of the project was canceled.
-  : the rendering of the project was paused.




The contextual menu choice **Ready to be rendered** will reset the current state of the project to **Ready to be rendered**. This will allow you to render a project a second time without having to remove it and add it again to the queue.

8 Icons and Shortcuts










8.1 Regrouping Source Images

	 Ctrl+B Cmd+B	Analyse a folder looking for possible panoramas
		Select the sources images you want to analyse
		Add images to a group
		Image properties
	 Ctrl+N Cmd+N	Create a new empty group




8.2 Launching Panorama Detection










	F2	Launch panorama detection in all groups / Stop all detections in progress
		Start or stop panorama detection in a group
		Detection group settings, used to tune the detection quality of this particular group

8.3 Project Files Management














		Save Autopano Pro project file
 Ctrl+ Cmd+ 		Save-as (dialog asks for a filename)
 Alt+S Option+S		Save all project files for all opened panoramas.
 Ctrl+ Cmd+ 		Save-as: asks for a filename for all opened panoramas.
 Ctrl+O Cmd+O		Open an Autopano Pro project (.pano)
		Exports project to PTgui, PTassembler or Hugin
		Imports projects from PTgui, PTassembler or Hugin

8.4 UI Layout Management




	 Alt+G Option+G	Close all groups
		Close all opened panoramas. For every unsaved panorama a dialog will ask if you want to save the project file.

	 Ctrl+1  Cmd+1	Divide the Main Window into two equal halves: Groups View on the left and Panoramas View on the right
	 Ctrl+2  Cmd+2	Hide the Groups View and leave only the Panoramas View visible
	 Ctrl+3  Cmd+3	Hide the Panoramas View and leave only the Groups View visible









8.5 Render Management


		Launch the rendering of the panorama
 Ctrl+  Cmd+		Launch the rendering of the panorama, bypassing the Local Render Settings dialog
	 Alt+R  Option+R	Launch all panoramas rendering
 Ctrl+  Cmd+		Launch all panoramas' rendering, bypassing the Local Render Settings dialog
	 Ctrl+R  Cmd+R	Show/Hide the Batch Rendering window

8.6 Panorama Edition














	Launch the panorama editor and display the editing tools below
	Show/Hide Control Points Editor
	Show/Hide History window

8.7 Geometry correction







	Projection mode modifier: Rectilinear, Cylindrical, Spherical
	Activate the Layer View Mode allowing for selection of individual source images inside the panorama being edited
	Rotations: 180°, 90° counterclockwise, 90° clockwise
	Numerical Transformation
	Display all the pixels of the panorama
	Crop tool, to frame a chosen area of the panorama
	Set Center Point, used to set the panorama's center point
	Auto Level, used to automatically adjust the panorama's geometry





	Set Verticals, used to level the panorama using reference lines
---	---

8.8 Color Correction

	No color/exposure correction
	Apply a LDR color correction (also called standard correction)
	Apply a HDR color correction
	Display the color correction anchors for advanced color corrections
	Anchor type <i>Locked</i>
	Anchor type <i>Transfer Function</i>
	Anchor type <i>White Balance</i>
	Anchor type <i>Transfer Function + White Balance</i>
	Anchor type <i>Mono Transfer Function</i>
	Anchor type <i>Mono White Balance</i>
	Anchor type <i>Mono Transfer Function + White Balance</i>
	HDR set of filters
	Levels/Histogram

8.9 Control Points Editor

	Views on / off
	Displays horizontal or vertical views
	Views synchronization
	Optimize the panorama
	Add Control Points inside the defined areas
	Remove the selected control points

	Add control points/links using Geometry Analysis
	Removes bad control points using a configurable algorithm
	Shortcut used to launch all the panorama tuning algorithms
	Control Point Editor Settings