Panorama-VR-System

MANUAL

NOVOFLEX

Congratulations! By purchasing your ***Panorama-VR-System*** you have acquired a tool, which enables you - together with a digital or analog camera, a tripod and a personal computer - to generate high quality panoramas simply.

To achieve exceptionally good results, you should make some adjustments before and after taking your pictures. This applies to the hardware as well as to the software. These instructions will help familiarize you with the most important working steps.

Which equipment is necessary?

Beside your ***Panorama-VR-System*** (consisting of *Panorama Plate*, focusing rack *Castel-Q*, angle bracket *Q=Plate Vertical*, *spirit level* for the flash shoe and the software *PanoramaStudio*) you will require:

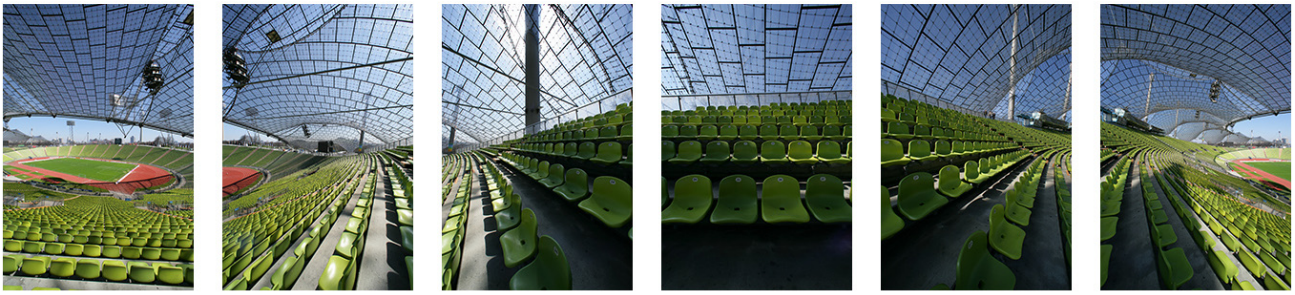
- A digital camera (ideally a full-featured SLR with a standard or wide angle lens) or as an alternative, an analog camera and a scanner
- A stable tripod
- A ball head (recommended: Novoflex ***ClassicBall*** or ***MagicBall***), a 3-way head or a leveling center column
- A *Windows™* PC or a Mac (ideally a current computer with a lot of ram and a large hard disk)

Please note: Because *PanoramaStudio* is for *Windows™* only, you need another stitching software when using a Mac. For your first trials I recommend the easy to use and inexpensive ***DoubleTake*** software from http://echoone.com

How is the panorama created?

Using the stitching technique, the final panorama will be an assembly of a series of individual images. Between these single shots the camera will be rotated around a certain angle. You create your panorama afterwards on the computer using a stitching software e.g. *PanoramaStudio.*

Even 360 degree panoramas are possible!



Why should I use a panoramic tripod head?

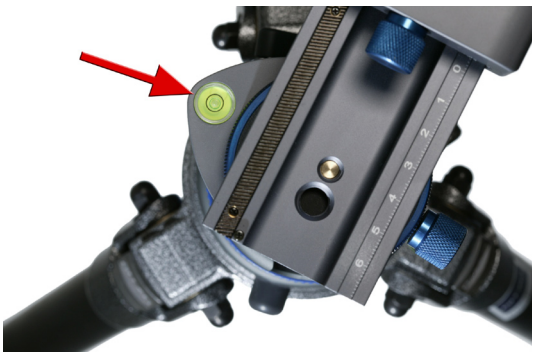
The panoramic tripod head (your ***VR-System***) makes it possible to rotate the entire optical system around the nodal point of the lens. Thereby parallax effects are avoided, which is very important for the subsequent composition of the single frames. Only this way can the stitching software work accurately and give you the best possible results.
Let's try the following experiment: With one eye closed, hold a finger at a distance of 4 inches (10 cm) and bring it in line with another finger 20 inches (50 cm) apart from you. Be sure, that both fingers are in line. Now turn your head to the left and to the right. What will happen? Pivoting your head to the left, the finger in the front of you will move to the right (even though you are not moving your arms), pivoting to the right, the finger in front of you will move to the left - why? Because the optical center of your open eye is not over the center of your head rotation. But with a little bit of practice it is easy to manage to hold both fingers in line while pivoting your head - try it!

Preparatory Steps:

Finding the nodal point:
The position of the nodal point is dependent on the camera-lens-combination and - when using a zoom lens - on the focal length you use. Therefore you should try to find the position of the nodal point of all lenses that you will use and write them down. When taking the pictures later, you only have to transfer the value to the focusing rack, before you start shooting.

Preparatory step 1:
Assemble all components of your system, beginning from the top down:

- *Spirit level* on the flash shoe
- Camera with lens
- Angle bracket *Q=Plate Vertical*
- Focusing rack *Castel-Q*
- *Panorama Plate*
- Tripod head
- Tripod



Preparatory step 2:

Level your panoramic head with the horizon:

Watch the spirit level on your *Panorama Plate* and level the system by the ball head beneath. You don't have to align the tripod.

Preparatory step 3:

Bring the camera to a precise vertical position:

Observe the spirit level on the flash shoe of your camera and use the screw, that connects the body with the angle bracket, for adjusting. For this purpose you need a coin or a hexagonal wrench. When looking through the viewfinder, the AF point in the middle is now at the horizon.

Tip:

If you do not remove the camera from the angle bracket for transport, you don't have to do this step again when taking your actual shots later.

Preparatory step 4:

Side-to-side adjustment: Move the camera into the pivot axis of the tripod head

Unlock the screw (*a*) on the base and shift the angle bracket until the center of the lens is directly over the pivot axis of the panoramic head. To do this, move to the front of the panoramic head so you're looking into the lens. For exact adjustment you can use a ruler, a pendulum or a second angle bracket. Afterwards lock the screw (*a*) on the base of the focusing rack.

Tip:

Mark the location you have found e.g. with a waterproofed pen on the angle bracket and the base of your focusing rack. For transport you will presumably disconnect the angle bracket from the focusing rack. When assembling the head in front of the scene you don't have to do this adjustment once again. You only have to bring your check marks in line.

Preparatory step 5:

Forward-Backward Adjustment:

Mount the lens, whose nodal point you want to find, to the camera body. When using a zoom lens, set the required focal length.

Look through the viewfinder. Find a vertical edge or line, such as a floor lamp, which is located in the foreground and bring it in line with a vertical object in the background e.g. a door frame or an edge of a building. You may have to move the tripod for this purpose. Now pan the camera from right to left and back while looking through the viewfinder. When the two vertical lines move to each other *(see fig. 1+2)*, you are outside the nodal point. When they stay together *(see fig. 3+4)*, you are inside the nodal point.

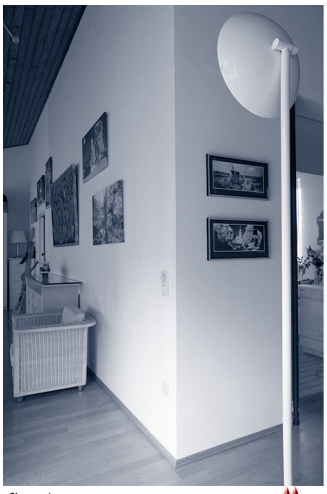


fig. 1

fig. 2

In this example I brought the floor lamp in line with the door frame (*fig. 1*). When I panned the camera to right, the floor lamp moved to left in relation to the door frame (*fig. 2*). This is an indication of rotating outside the nodal point of the lens.

Advice:

If you have depth of field preview with your camera, use it while you are looking through the viewfinder and close the aperture, so that you have maximum depth of field.

fig. 3

fig. 4

Now set another distance (*b*) on the focusing rack. When panning again you will notice that the movement of the lines will either be stronger or weaker. In the last case you shifted the focusing rack in the right direction. Repeat the procedure until the vertical lines don't move (*see fig. 3+4*).

Now the whole system is panning in the nodal point of the lens.

You have found the right distance (*b*) on the focusing rack: Floor lamp and door frame don't move to each other even though you are panning the camera! With this setup you avoid all parallax effects.

Now write down these settings for future exposures with this camera-lens-combination. For this purpose read off the values given by the indicator scale at the focusing rack (*c*).

Field use:

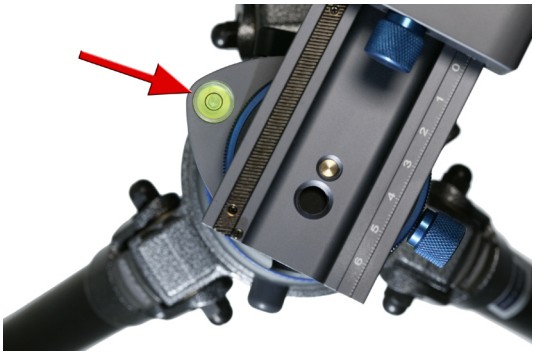
Step 1:

Transport:

Common practice is to transport the equipment in two parts:

- Part 1: Tripod with mounted ball head, with the panorama plate and focusing rack
- Part 2: Angle bracket with mounted camera and spirit level on the flash shoe

When you have performed *preparatory steps 1 to 5 in the chapter "Finding the nodal point"* before, only a few steps are necessary to start exposing:



Step 2:

Level your panoramic head with the horizon:
Closely watch the spirit level of your *Panorama Plate* and level the system with the ball head beneath. You don't have to align the tripod.

Step 3:

Fix the angle bracket with mounted camera on the focusing rack:
When you have marked the center position before, you only have to bring your marks in line (see chapter *"Finding the nodal point"*, *preparatory step 4*)

Step 4:

Define the panning angle "increment":
Between the single exposures you rotate the system with the panorama plate around a specific angle. This angle depends on the wanted overlap, the camera you use (crop factor), the focal length and the method of mounting the camera - landscape or portrait (tip: portrait for wide angle photography, landscape when using telephoto lenses). For optimal performance the software needs an overlap of 20-50%. Between each exposure use a fixed panning angle. To estimate the increments, look through the viewfinder while panning your system through the scene. It's much easier to orientate yourself with these charts:

MOUNTED PORTRAIT

Recommended increments using cameras with APS-sensor (crop factor 1.6 or 1.5 e.g. Canon EOS 350D, Nikon D70s) mounted portrait:

focal length	no. of expo. for 360°	increment (panning angle)	overlap crop 1.6
10 mm	6	60°	19%
12 mm	9	40°	38%
14 mm	9	40°	29%
17 mm	12	30°	37%
18 mm	12	30°	34%
20 mm	12	30°	27%
24 mm	18	20°	42%
28 mm	18	20°	33%
35 mm	24	15°	38%
40 mm	24	15°	29%
50 mm	36	10°	41%
70 mm	36	10°	18%

MOUNTED PORTRAIT

Recommended increments using cameras with full frame sensor (e.g. Canon EOS 1Ds, EOS 5D) mounted portrait:

focal length	no. of expo. for 360°	increment (panning angle)	overlap crop 1
12 mm	6	60°	33%
14 mm	6	60°	26%
16 mm	6	60°	19%
17 mm	9	40°	43%
20 mm	9	40°	35%
24 mm	12	30°	44%
28 mm	12	30°	35%
35 mm	12	30°	21%
40 mm	18	20°	40%
50 mm	18	20°	26%
70 mm	36	10°	49%
105 mm	36	10°	23%

Tip:

The specialty of panoramic photography is the unique opportunity, to display extremely wide angles of view, even 360°, which is impossible with an ordinary camera.

The horizontal field of view of your completed panorama is specified by the number of pictures you take.

The vertical field of view is dependent only on the focal length of the lens used.

If you want a panorama with a field of view as large as possible, mount the camera in **portrait mode** while using a short focal length. In other words, use a wide angle lens vertically.

Portrait mode:
This is the most common way to mount the camera. Ideal for wide angles of view (e.g. 360° panorama) using short or medium focal length lenses.

On the other hand, if you want to create telephoto panoramas with a limited field of view and using long focal lengths, I suggest mounting the camera in **landscape mode**. The advantages are larger increments, what makes the adjustment on the panorama plate much easier.

By the way, the position of the nodal point will not alter when changing the method of mounting.

Landscape mode:
Recommended when using telephoto lenses with focal length 70mm or above.

MOUNTED LANDSCAPE

Recommended increments using cameras with APS-sensor (crop factor 1.6 or 1.5 e.g. Canon EOS 350D, Nikon D70s) mounted landscape:

focal length	no. of expo. for 360°	increment (panning angle)	overlap crop 1.6
70 mm	36	10°	45%
80 mm	36	10°	38%
90 mm	36	10°	30%
100 mm	36	10°	22%
105 mm	36	10°	18%
135 mm	72	5°	48%
150 mm	72	5°	42%
180 mm	72	5°	30%
200 mm	72	5°	22%
210 mm	72	5°	18%

MOUNTED LANDSCAPE

Recommended increments using cameras with full frame sensor (e.g. Canon EOS 1Ds, EOS 5D) mounted landscape:

focal length	no. of expo. for 360°	increment (panning angle)	overlap crop 1.6
70 mm	18	20°	31%
80 mm	18	20°	21%
90 mm	24	15°	34%
100 mm	24	15°	26%
105 mm	24	15°	23%
135 mm	36	10°	34%
150 mm	36	10°	37%
210 mm	72	5°	49%
250 mm	72	5°	39%
300 mm	72	5°	27%

Tip:

Don't take large charts with you, when you go out for taking pictures, but narrow them down to the information you really need on location. That is the nodal point distance and the increments of your favorite lenses. It is very useful to write down this information on a little label and fix it to the angle bracket or tripod.

You can see my personal label in the illustration on the right.

Please notice: My label only applies for my personal camera-lens-combination, based on my experience and is not transferable in general. By the way, I mount my camera only in portrait mode.

f. length	*angle*
17-20	40°
21-30	30°
31-49	20°
50	15°
nodal pt:	***cm***
17-40	10,7
50	4,2

My personal label

Step 5:

Set up the nodal point:

Adjust the distance between the rotating axis and the camera with the focusing rack, depending on the lens you are using. Reuse the settings you've found before (see chapter *"Finding the nodal point", preparatory step 5*).

Step 6:

Camera settings:

- For best quality, stabilize the exposure of light with each single frame, meaning choose manual exposure mode. When it is not possible, because the intensity of light varies between the single exposures strongly, choose aperture-priority mode with a fixed aperture.
- The optimal f-stop is located between 8 and 16. In this range you have enough depth of field and fewer problems with vignetting of the lens (dark corners).
- Place the sharpness on the main subject of the scene. Then turn off the auto focus system.
- Use a fixed white balance such as sunny, cloudy etc. (don't use automatic white balance, otherwise you will have frames with different colors).
- In the case of longer exposure time, I recommend using a remote switch and - if possible - the mirror lockup function of your SLR.

Step 7:

Taking the pictures:

Last checkup:

- System leveled with the horizon (examine the spirit levels on the panorama plate and on the flash shoe)?
- Determined a fixed panning angle (increment) depending on the focal length?
- Set up the nodal point (distance with the focusing rack depending on the values you've found before for this lens)?
- Using a fixed white balance (e.g. sunny)?
- Manual exposure mode?
- Set up the right exposure (f-stop 8 to 16, corresponding exposure time)?
- Sharpness on the main subject of the scene?
- Turned off the auto focus system?

OK let's go!

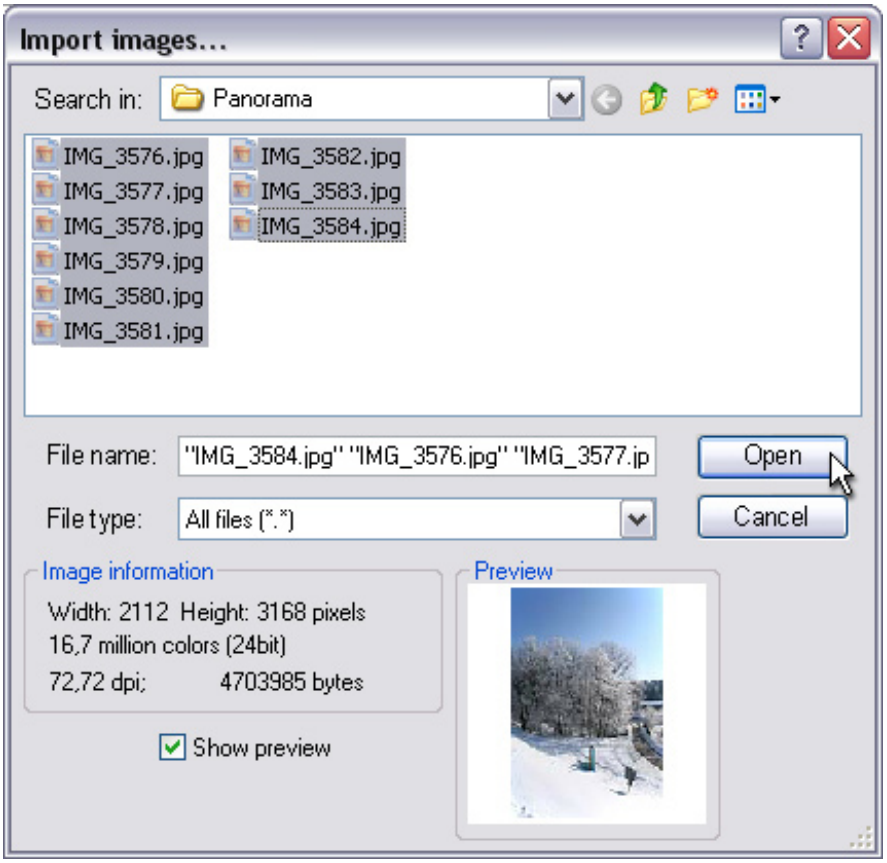
Stitching the single frames together with *PanoramaStudio*

These are the basic steps, working with the stitching software *PanoramaStudio* for *Windows™*, which is in the package with your *Panorama-VR-System*. You will find a detailed PDF manual with further information on the software CD.

Step 1:

Select pictures:

Back home, copy all pictures belonging to one panorama to a folder on your desktop. Start the software ***PanoramaStudio*** and click on ***"Import..."*** to select the input images for the panorama from the desired folder.



Navigate into the folder with the single frames, click on the first picture, hold the ⇧-key pressed and click on the last image. After that all pictures between will be selected. Now click on ***"Open"***.

The single frames will be loaded one after the other and shown in the row below.

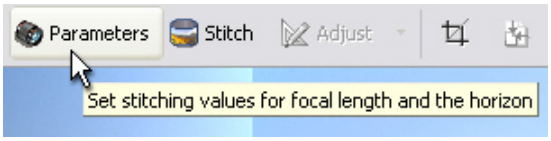
In the middle at the top there is a preview with a red frame, showing you where you are standing in the panorama.

In the case of wrong sequence click on the button ***"Reverse image order"***.

If you want to rotate the pictures in steps of 90 or 180 degree use the buttons on the side. Try all four buttons to see their effects!

Step 2:

Set up the focal length and the position of the horizon:
When all pictures are in position click on ***"Parameters"***.



A corresponding tool window will be opened. You may set the focal length and the position of the horizon in this dialog box:

If the images are from a digital camera which exists in the database of *PanoramaStudio*, you may simply activate the ***"Use focal length from EXIF"*** option. *"Focal length"* will be taken from the EXIF data included in the image files.

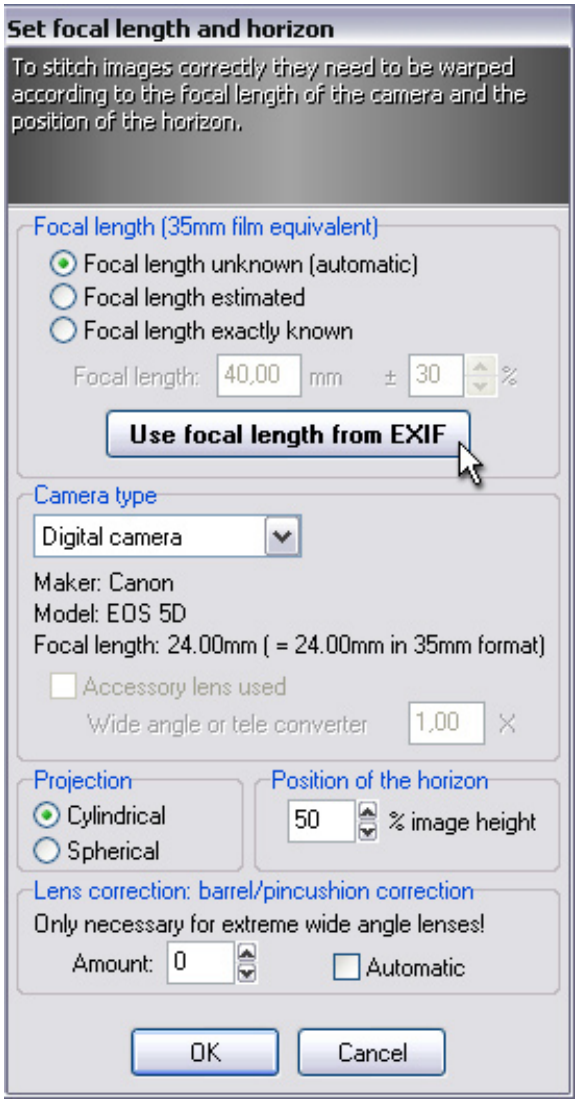
If the digital camera cannot be recognized automatically on the base of the image files, but EXIF information is still available, *PanoramaStudio* asks you to add this camera to its database. In this case, you will find a button labeled ***"New camera ..."*** in the box *"Camera type"*.

If the cases mentioned above don't apply, you can specify 35mm focal length film equivalents manually.

In the box *"Projection"* choose ***"Cylindrical"*** for a flat panoramic picture for printing or displaying on the screen. If your output should be an internet presentation with a Java™- or QuicktimeVR™ player I suggest choosing the ***"Spherical"*** projection.

Leave the *"Position of the horizon"* at ***50%***. You leveled the camera with the horizon when you took the pictures. This is equivalent to 50% image height.

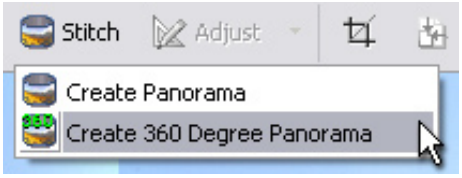
A *"Barrel/pincushion correction"* is only necessary when using a wide angle zoom lens or wide angle converter. Therefore, you first should enable the ***"Automatic"*** option in the *"Lens correction"* box. If the result still isn't satisfying, the automatically computed correction value may be adjusted manually in a post processing step.



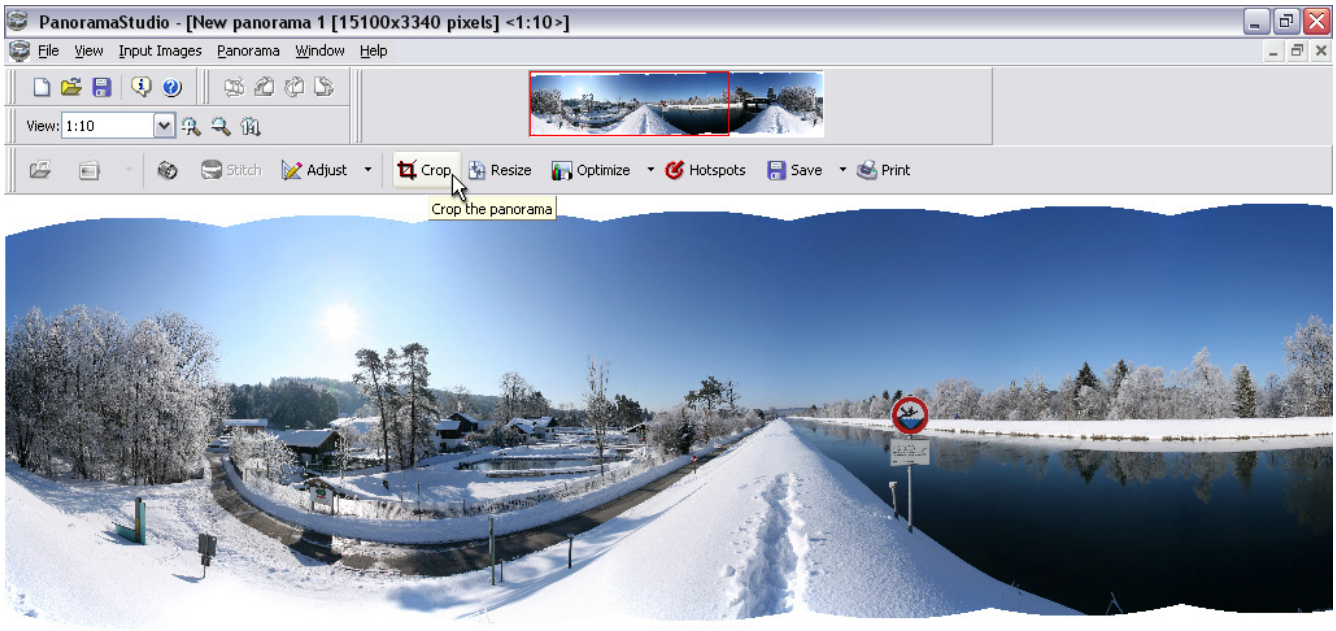
Step 3:

Stitching the panorama:

OK, let's go! Click on the button ***"Stitch"*** and next on ***"Create Panorama"*** or ***"Create 360 Degree Panorama"*** if you shot enough pictures for that kind of panorama. After that, the software will start computing. Depending on the size, the numbers of pictures and the performance of your PC the processing will take a couple of minutes.



After processing the result will be shown in the main window:



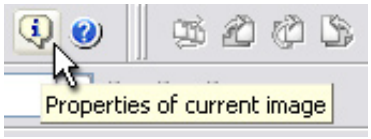
Step 4:

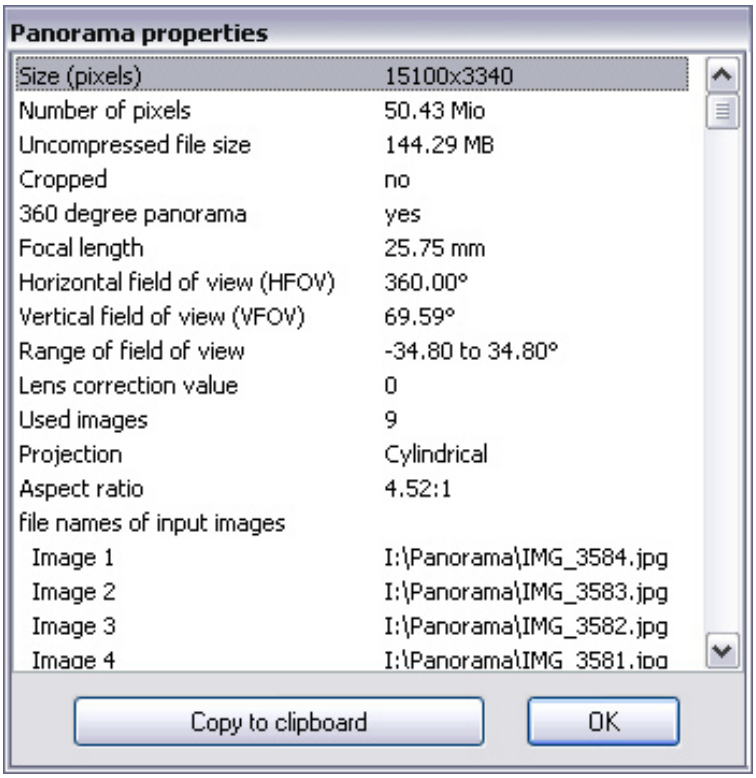
Cropping the panorama and further optimization:

When the stitching process is done, it is still necessary to crop the panorama in order to remove irregular edges caused by the stitching. *PanoramaStudio* offers you a cropping tool as well as many other tools for additional image editing such as resizing, sharpen, brightness and contrast adjustment etc.

Tip:

Before closing your current image look at the panorama properties. If required copy this data to the clipboard and save them into another file. Otherwise this extremely interesting information is lost.





Step 5:

Save your panorama:

With ***„File - Save As Image...“*** you can save your panorama using the JPG, TIFF, PSD or other formats.

Ready!

These are the most important steps to create a panorama from a row of single images using *PanoramaStudio* software

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