DOWNLOAD PDF FIND THE NO-PARALLAX POINT

Chapter 1 : Finding the no parallax point (NPP) â€“ Immersive Panoramas

FINDING THE NO-PARALLAX POINT: 1. PARALLAX AND THE ENTRANCE PUPIL. Hold up a pen in front of you, close one eye, and focus your attention on the background scene as you move your head sideways from left to right.

But some shooting situations are more demanding, and may require a method that delivers a higher degree of precision. In that case, skip to the bottom of this tutorial for further recommendations. Two-Step Leveling Alternatively, level your tripod and camera separately. For leveling the tripod, a leveling base or a leveling center column makes the first step quick and easy. And to level the camera? The physical location of the optical center is unique for each lens. For prime lenses, the No-Parallax Point with focus at infinity is stationary. For zoom lenses, however, the No-Parallax Point typically shifts for each focal length. The No-Parallax Point is best determined by experimentation: Use a "nodal slide," such as our 7. The objective is to slide the camera along its lateral axis until the No-Parallax Point is positioned over the axis of rotation. Find two vertical objects; one near, one far. Position your equipment so that these objects line up in the viewfinder. Start out by positioning the approximate center of your lens over the axis of rotation. If the rear object appears to shift to the left, then you are ahead of the No-Parallax Point. If the rear object appears to shift to the right, you are behind the No-Parallax Point. When the optical center of the lens is directly over the axis of rotation, the rear object will not appear to move relative to the front object. Record your results so that your setup can be re-created. Decide how much depth of field you want across the entire scene and choose an appropriate aperture. Since most panoramas are of places and not people, you can set maximum crispness and depth of field out to infinity by focusing on the hyperfocal distance. Set your White Balance manually. Decide how much overlap you need. This apparent shift is what is known as parallax. If both eyes were in the middle of your face, the background would look exactly the same. He aligned two vertical objects inline with his lens; Mark used two TAFS tripod foot spikes mounted upside down, but any similar item works well. So that means you need to shoot from the same perspective for all shots. Start with the lens pointed straight ahead and objects are aligned. Level the PCL, center your camera, select focal length, and start with the middle of your lens roughly over the middle of the PCL. This is what you should see in the viewfinder. If you pan camera to the left and rear object shifts left: Continue until objects stay aligned when you pan left and right. If you pan camera to the left and rear object shifts right:

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Chapter 2 : Video: Finding the No Parallax Point of a Lens | Trick Photography Ideas

The simple steps outlined below are sufficient for finding the optical center (aka No-Parallax Point or NPP) for most shooting situations. But some shooting situations are more demanding, and may require a method that delivers a higher degree of precision.

With it one may obtain all of the images required to manually stitch a image together with the help of other software tools. Generally speaking, there are mainly 2 kinds of panoramic heads for shooting You can think of it as a visual center of gravity and it must remain perfectly aligned with itself to gain a good result. You may manually stitch together the photos in post-production. Correctly aligning your sensor with a panohead negates the parallax effect which is otherwise created when you rotate the camera around any other visual center of gravity. In rare circumstances, this nodal point can be the same as the optical center of the lens but it can occur. When this happens, it is much easier to find the nodal point but as it is so rare, this tutorial can always come in handy for you. To obtain all the shots required to create your chosen spherical image, a panohead is rotated at a specific number of degrees per shot, enabling overlapping of matching control points. Once obtained, the panorama can be built with different pieces of software. Examples of software used to accomplish this are: There are different price points and range from open source software through to tools which cost a fortune. What makes a good panohead A good quality panohead will have scales to utilize different angle points and detents to utilize along with this so that you know where the most common degree points are, high quality bearings and levels so that adjusting the head is made much easier. A good quality spherical head is made up of three distinct parts: When considering purchasing a panohead, choose the notched base carefully, as it is essential for the panohead to rotate for a certain number of degrees without you having to check the viewfinder. A notched base will show you the amount of degrees it rotates, and how many shots it will take to complete a full panorama. A depth slider, which moves along the vertical arm, to enable the entrance pupil to stay above the rotatory axis. If you have a normal camera you can also use a spherical panohead but there is an extra piece to the panohead. A final slider is added so that you can place the pupil of the camera at the visual center of gravity as point and shoot cameras often have a standard mounting thread but this point and focal point of the camera itself are non-standardized. A robotic panohead has a further piece where the computing takes place and often has a screen such as in the example below. It is possible to build your own spherical panohead if you have a low budget, or are wanting to make one for a specific piece of equipment that no universal slider is compatible with yet; or if you want one for a phone, even. In that case you can still buy a rotatory base only to speed up your McGyvering.

Chapter 3 : How to Find the No-Parallax Point

This is a tutorial on how to find your lenses no-parallax point and correct for it using a nodal slide.

The pen will be seen to move to the left, relative to the background. This apparent change in position of the near pen is an effect called parallax. You cannot align both at the same time. Hence, the "eye" of the camera needs to be kept in a constant position when the camera is rotated to point in a different direction for each shot. Just as the pupil of your eye is the centre of the world it sees, so it is that the entrance pupil of the camera lens is the centre of the scene it sees. It is about this point that you want to rotate the camera The point is sometimes referred to as the no-parallax point NPP. Formerly, it was generally thought that the ideal point to rotate the camera about was the front nodal point of the lens. This has now been shown to be incorrect see link below , but as the methods generally devised for finding the "nodal point" actually locate the entrance pupil, the results are fine. A rose by any other name However, the panohead adjustment procedures are similar. However, do not assume that if you are seeing stitching errors in your panoramas, that these are necessarily due to parallax. You can have your camera perfectly mounted to avoid parallax and still have stitching errors. The cause of the stitching errors may be poor correction of lens distortions or badly placed control points in PTGui. Movement of clouds and tree branches etc. The bottom line is that if you want to check if your camera is correctly set up to avoid parallax, then you should do some tests designed specifically to reveal the presence of parallax. With the 3D vision provided by your two eyes, it is easy to judge the approximate position of the bright spot: If you have difficulty seeing a bright spot or disc, just point the back of the camera up at the sky and look into the front of the lens. This leads to a novel method of adjusting the camera position on a panorama head - simply watch the entrance pupil as you rotate the camera and check for sideways movement of the spot. It works well for short focus lenses such as fisheyes. But first, you need to set the position of the camera on the horizontal arm of the head so that the entrance pupil is laterally aligned with the rotation axis. To do this, you can rotate the camera to point vertically down. Then, the axis point of the head such as the central adjustment screw on the Nodal Ninja 3 head should be centered in the image frame. You may not be able to focus sufficiently closely with some lenses to make this adjustment, but you could temporarily switch to a different lens. Alternatively, with the head levelled, you can make a visual check of the entrance pupil spot using a plumb line held in front of the lens. The spot and centre of the adjustment screw should be vertically aligned, as shown here. The thread was taped to the top of the lens simply to take the photograph. You can just hold the thread in a steady hand. An indication that the lateral position is not quite right is a broken, sawtooth edge to the head at the nadir in a stitched panorama an unpatched nadir, of course. The example on the right is a typical example: The top of the head looks somewhat like a circular saw. In this case, the "teeth" are set for cutting with a clockwise rotation of the saw. This indicates that the entrance pupil is offset to the left of the pano head axis, as viewed from the back of the camera, so the camera needs to be shifted a little to the right. If the saw is set for cutting with a counter-clockwise rotation, then the camera needs to be shifted to the left. Next, you will need to devise some sort of sighting device to provide a fixed reference point when checking for movement of the bright spot of the entrance pupil. This shows a simple sight that can be made in a couple of minutes with a needle and a strip of cardboard: I have also used an empty ball point pen barrel set up in front of the lens so that the bright spot appears centered in the hole at the end when you peer through it. If the spot moves to the left when you rotate the camera clockwise, then the entrance pupil is in front of the rotation axis and you need to move the camera back a little. If it moves to the right, then you want to move the camera forwards. If the spot remains stationary, the entrance pupil is at the no-parallax point. This shows what you see when the camera is too far back on the top rail: The important thing is that the entrance pupil is in the same position at each angle of yaw, e. Any shift of the entrance pupil between the two angles is not important, particularly in the case of fisheye lenses, as explained in the note at the end. To check that the entrance pupil is positioned on the axis of the top rotator, rotate the top rail by degrees and the bottom rail by degrees so that the camera points straight ahead again - like this a different head this time: Use a sight as before to check that the vertical position of the spot remains the same. You just take two overlapping shots

as you would for a panorama, but shoot through a window looking out onto a distant scene. Make sure that the tripod is on a firm footing to avoid wobble of the camera and head. All you have to do then is check the position of the tape against the background in the two shots. These are crops showing the overlap in two fisheye images: Comparing the images in Photoshop is generally straightforward. It helps if you layer the images and align them so that switching the top layer on and off reveals the movement of the tape. The camera was rotated L-R for these shots. It is clear that the entrance pupil moved to the right, for you can see a bit more around the right hand side of the tape, and less on the left hand side. This means the entrance pupil was in front of the rotation axis, so the camera needs to be moved back a bit. Take another two shots and repeat as necessary until no parallax shift can be discerned. The close distance of the tape means that it can appear somewhat out of focus with some lenses, making accurate judgement difficult, especially if you also have to contend with the strong edge distortion of a fisheye lens. That problem can be solved by a quick stitch of the two images in PTGui, putting control points only on the background. For output, select only the small central area that shows the tape and generate a layered PSD file. Again, view the file in Photoshop, switching the top layer on and off to reveal any parallax movement. This is what I got on my first stitch when calibrating a 70mm lens after initially roughly estimating the entrance pupil position by eye just by looking into the lens: The tape is 25mm wide, so the shift is quite small. Understand that the size of this apparent shift of the tape is virtually the same as the sideways movement of the entrance pupil and is independent of the distance of the tape to the camera. The camera setup is already probably good enough for many purposes. As before, from the direction the tape moved as the camera was rotated clockwise, I decided which way I needed to shift the camera to move the entrance pupil closer to the rotation axis. I nudged the camera a few mm and repeated the test, using the PTGui project file from the previous test as a template and assigning 4 or 5 control points. After four attempts in all, taking three quarters of an hour, I ended up with this result: This looks well nigh perfect, with no discernable parallax shift. But as already mentioned, you can dispense with the stitching and simply compare the images in Photoshop, or even check for parallax movement just by looking through the viewfinder. If your camera has LiveView, zoom in for a magnified view. The basic method remains the same. The Nodal Ninja Ultimate R1 and R10 heads are different in accommodating different lenses and having a fore and aft adjustment mechanism, as well as tilt in the case of the R1. The techniques for finding the NPP are therefore virtually the same. The only difference is that there is no horizontal and vertical positioning to worry about. Simply select the angle of tilt required and check for parallax as the head is rotated between detent positions. Move the camera backwards and forwards until the parallax is eliminated, or at least minimised. This position will vary according to the angle of tilt selected. On the subject of accuracy, you need to be aware that the entrance pupil in a fisheye lens is not centred on a single point. Its apparent position varies for light rays entering the lens at different angles to the optical axis. The entrance pupil is therefore centred on a floating point that moves about over a surface shaped rather like the flared end of a trumpet, according to the direction of the light rays. The camera is not rotated about the entrance pupil itself, but about a point which makes the entrance pupil appear to occupy the same position when viewed in the direction at which consecutive shots will be joined - e. While this will be fine for the horizontal parts of the scene, rays from the nadir and zenith regions will be entering the lens at angles approaching 90 degrees to the lens axis, which implies a different entrance pupil location and hence theoretically necessitating a different no-parallax rotation point. The problem is largely avoided when taking 4 around plus nadir and zenith and joining at 45 degrees vertically and horizontally like a cube. To see the variation in position of the entrance pupil at different angles to the lens axis, all you need do is first view the entrance pupil from the front of the lens. It will appear to be located well inside the lens, roughly at the position of the gold band in the case of the Sigma 8mm lens. Now move slowly round to the side of the lens, keeping the entrance pupil in view. You can see the bright spot of the entrance pupil just in front of the lens barrel on this photo taken from the side, almost at 90 degrees to the lens axis:

Chapter 4 : Panoheads: How to Choose and Operate a Panohead/Gimbal for Photography | VeeR VR Blog

VIRTUAL TOUR ONLINE COURSE - FREE VIDEO SAMPLE #11 - How to find the "No Parallax Point" - check the rest of the course - www.nxgvision.com ONLINE TRAINING.

If you missed it, you can read Part 1 here. If the overlap of the pictures is not enough, it will either be not detected, or the quality of the stitching will be bad. A moving position, even slightly, often results in parallax errors. Look at the picture below to understand what a parallax error is: How to find the no parallax point? It is also called the entrance pupil of your lens. Very often, it is around the golden or silver ring that is often present near the tip of your lens. Camera Settings It may be better not to use an automatic white balance because it could be modified at each picture you take according to what you point your camera at. But anyway, the white balance is not such a big deal because it can very easily be corrected and harmonized on post-processing software. Generally, try to pay attention to the exposure of your images. It is better to have a similar exposure in all your pictures, even if the stitching software is good at harmonizing it. The less work you give your software, the better your panorama will look. For example, if you point your camera at the sky, the trees will likely appear black â€" underexposed. If you point it towards the trees, the sky might appear white â€" overexposedâ€¦ A good solution to this problem is to shoot in RAW if you are using a DSLR, and improve the underexplosed and overexposed areas with Lightroom or Photoshop. It is always better to shoot in manual or aperture priority mode. Of course, you want to keep the exact same level of zoom on all pictures. Panoramas from places with moving objects like cars on the road or the crowd can be tricky. It will be up to you to take the pictures quickly when they are not moving. For example when all the cars are stopped at the traffic light. Or if you can try to wait for people to walk away from you a bit. Generally, if you are not so sure, it is always better to shoot more pictures than not enough, and overlapping more than not enough. It is always possible to select the pictures to use and the ones to discard later if needed. Here is an example of the Jatun Sacha forest in Ecuador, showing the different pictures composing the panorama: The most intuitive way to do it would be to stay where you are, turn on yourself and take pictures all around you. The result can be acceptable, but remember what I said earlier? All the photos should be taken from a single precise position â€" the no parallax point. That means that you should be turning around your camera instead of having your camera turning around you! Your camera should remain at the no parallax point, and you turn around it to take all the pictures. This way, keeping the string taut, you can turn around this point where the heavy object touches the ground. As for the cropping, if you plan to convert this cylindrical panorama into an interactive format, make sure that the horizon is in the center of the image. Otherwise it will appear curved. A significant part of the image would be lost. However, if kept as a still image, the higher horizon looks better respecting the rule of thirds. For this one, your technique will depend on what equipment you have. It is possible to shoot panoramic images with any camera, even your iPhone is fine. But you understand that since you have to cover the whole sphere around you, if your lens is not a wide angle, you will have to take many, many photos! The more handheld photos you take, the more challenging it is for your stitching software to create a really perfect image. Moreover, stitching images is not a small job for a computer, it takes quite a lot of RAM resource and stitching 10 images is not as easy as stitching of them. Fortunately, nowadays stitching software are very powerful and able to stitch properly a great number of images. The limit is basically the RAM resource of your computer. Since then, I got myself more adapted equipment â€" wider lenses. If you are serious about creating panoramas, invest in a fisheye lens. I am glad I did. Your panoramas will be done with 4 or 5 pictures! Serious panorama photographers usually have their camera on a tripod and mounted on a panoramic head. The little trick with the taut string that I talked about for cylindrical panoramas, is also applicable here. I take a series of photos from my feet to the sky, then I turn a little, shoot another series, etc. I do this all around me. All images in a column overlap each other, and all columns overlap each other. Look at this example for a better understanding: This is the best method I found to shoot pictures for a spherical panorama when you only have a not-so-wide lens. If you can think of a better a way, just leave a comment, I would be happy to hear about it! Once you have shot all the series of pictures all around you, you are just left with a picture up above

you and one where you were standing. You just walk one step back and take a picture of the ground from above. This last picture is called the nadir. This is already enough to create a panorama, but there is a much easier way with a bit of equipment. Click on the link below to know more.

Chapter 5 : Known No-Parallax Point, a table: Nikon SLR Lens Talk Forum: Digital Photography Review

It's more correctly referred to as the No-Parallax point, a point around which the lens can be rotated and not produce parallax in successive views. Really Right Stuff has a good set of tutorials on Panorama Shooting made simple.

The approximation is far more accurate for parallax errors that are small relative to the parallax than for relatively large errors. Then, eventfields in spacetime can be deduced directly without intermediate models of light bending by massive bodies such as the one used in the PPN formalism for instance. Measurements made by viewing the position of some marker relative to something to be measured are subject to parallax error if the marker is some distance away from the object of measurement and not viewed from the correct position. For example, if measuring the distance between two ticks on a line with a ruler marked on its top surface, the thickness of the ruler will separate its markings from the ticks. If viewed from a position not exactly perpendicular to the ruler, the apparent position will shift and the reading will be less accurate than the ruler is capable of. A similar error occurs when reading the position of a pointer against a scale in an instrument such as an analog multimeter. Photogrammetry[edit] Aerial picture pairs, when viewed through a stereo viewer, offer a pronounced stereo effect of landscape and buildings. Measurements of this parallax are used to deduce the height of the buildings, provided that flying height and baseline distances are known. This is a key component to the process of photogrammetry. Photography[edit] Contax III rangefinder camera with macro photography setting. Because the viewfinder is on top of the lens and of the close proximity of the subject, goggles are fitted in front of the rangefinder and a dedicated viewfinder installed to compensate for parallax. Failed panoramic image due to the parallax, since axis of rotation of tripod is not same of focal point. Parallax error can be seen when taking photos with many types of cameras, such as twin-lens reflex cameras and those including viewfinders such as rangefinder cameras. In such cameras, the eye sees the subject through different optics the viewfinder, or a second lens than the one through which the photo is taken. As the viewfinder is often found above the lens of the camera, photos with parallax error are often slightly lower than intended, the classic example being the image of person with his or her head cropped off. This problem is addressed in single-lens reflex cameras , in which the viewfinder sees through the same lens through which the photo is taken with the aid of a movable mirror , thus avoiding parallax error. Parallax is also an issue in image stitching , such as for panoramas. Sights[edit] Parallax affects sighting devices of ranged weapons in many ways. On sights fitted on small arms and bows , etc. A typical hunting rifle. In some reticled optical instruments such as telescopes , microscopes or in telescopic sights "scopes" used on small arms and theodolites , parallax can create problems with aiming when the reticle is not coincident with the focal plane of the target image. Some firearm scopes are equipped with a parallax compensation mechanism, which basically consists of a movable optical element that enables the optical system to shift the focus of the target image at varying distances into the exact same optical plane of the reticle. Many low-tier telescopic sights may have no parallax compensation because in practice they can still perform very acceptably without eliminating parallax shift, in which case the scope is often set fixed at a designated parallax-free distance that best suits their intended usage. Scopes for airguns are very often found with adjustable parallax, usually in the form of an adjustable objective or "AO" for short design. These may adjust down as far as 3 yards 2. At finite distances eye movement perpendicular to the device will cause parallax movement in the reticle image in exact relationship to eye position in the cylindrical column of light created by the collimating optics. Therefore, when aiming its guns at the target, the fire control system must compensate for parallax in order to assure that fire from each gun converges on the target. Parallax theory for finding naval distances A coincidence rangefinder or parallax rangefinder can be used to find distance to a target. The apparent displacement, or difference of position, of an object, as seen from two different stations, or points of view. In contemporary writing parallax can also be the same story, or a similar story from approximately the same time line, from one book told from a different perspective in another book. Sure the picture is in my eye, but I am also in the picture.

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Chapter 6 : www.nxgvision.com : No Parallax Point Finder : Camera & Photo

The no-parallax point is also the "center of perspective", but this term is not commonly used and does not describe why the no-parallax point is important. The entrance pupil is the image of the limiting aperture or diaphragm, as seen through the front of the lens.

Chapter 7 : How to set the no parallax - nodal point of your panorama head.

For setting a no-parallax point and for guessing the necessary length of rails of your panoramic head for a specific combination of your lens and camera you can use the Nodal Ninja database (very old, now deleted, an archive link provided).

Chapter 8 : Finding the nodal point in panoramic photography?

Open in Photoshop and make the opacity of the top layer 50%. You can now check how well the centre point of the head (rotation point) is aligned in the two images. There should be no parallax shift relative to the floor below. The attached images shows the sort of view you get.

Chapter 9 : Known No-Parallax Points

The no parallax point, or the front entrance point, or the so called front nodal point, are all various names for the point in the lens that you want to pivot around while doing a panorama, to minimize or eliminate any parallax created issues.