

A guide to parallax and how to avoid it when shooting panoramas

Sometimes even the widest wide-angle lens is not enough. In those cases, you have to shoot multiple images and stitch it together into one extreme wide angle shot. You can go as far as 360° around, if you want. But you have to avoid parallax errors.

Shooting wide angle is fun. Almost every smartphone has the ability to make panoramic shots. But have you seen the stitch errors, often visible at the bottom of the image when there is something close to the camera? Those errors are caused by parallax errors. These errors also occur if normal cameras are used for panoramas.

Everyone has experienced parallax at some time. Even those people who don't take any pictures. Just look at something close by and hold your hand against one eye. Watch how the orientation against the background changes if you hold your hand against the other eye. Suddenly the object has moved a bit against the background. The closer the object is, the more extreme the change will be. If the object is far away, closer to the background, the effect won't be that obvious, or even invisible at some point.

This is similar to what happens with panorama photography. If you use your smartphone or camera to make a panorama with everything in the distance, there will be no stitching errors. There is no parallax error visible. This is one solution to avoid parallax; just make sure you don't have any objects that are significant closer compared to the background.

The other solution makes use of the entrance pupil of the lens, and how the light rays find their way through the lens. By choosing the rotation axis at the right location, parallax will be eliminated. This point is known as the entrance pupil, but we commonly use the term nodal point or no-parallax point.

The Parallax Error



When the relative position of a subject changes while rotating a camera, it is called parallax error. This can be best explained with some examples on the next page. The camera is on a tripod, just like we always do. The tripod is underneath the camera, with the lens sticking out. The rotation point when shooting panoramas will be approximately at the sensor location.

This great for most situations, when you don't need to pivot stitch your images into a panorama, but we must understand what happens when we do not have the lens pivoting at what is termed the Nodal Point Position, NPP. The solution for this, is to rotate the camera at this NPP or 'entrance pupil location', or nodal point in common tongue.

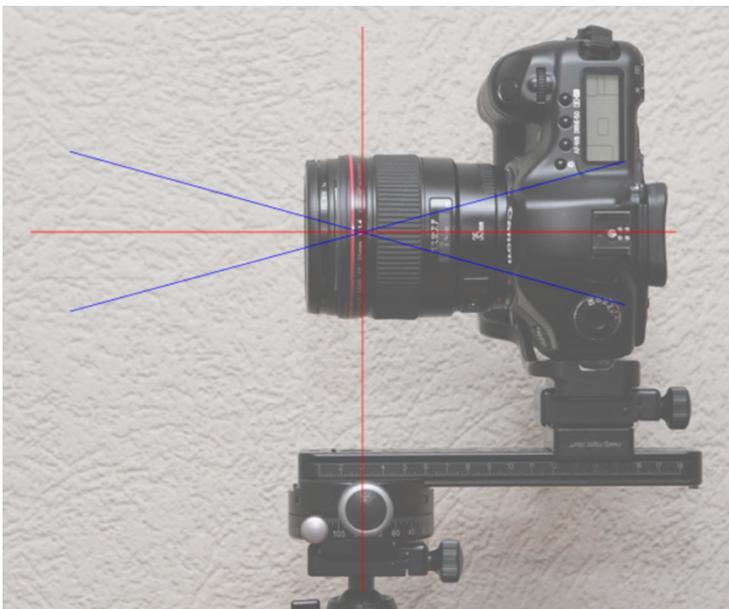


Two objects have been placed in line with the lens, and three shots were taken at different angles, as seen in the animation.

As you can see in the example, the two objects are aligned in the shot straight ahead, but not when the camera is rotated.

If you would try to align these three images, there would be a stitch error. The objects are not at the same place relative to each other, between each shot. This is a parallax error.

The parallax error has occurred because the rotation point is at the sensor location of the camera. The effect is the same as the experiment when holding your hand against each eye.



What Do You Need for Parallax Error Free Panoramas?

You already can guess by looking at the image. You need a way to change the position of the camera on the tripod. For this you need to buy a nodal slide. Or you can build your own, of course. It is a very simple and lightweight piece of metal, that can easily find a place in your camera bag. You only need to know where the nodal point of your lens is located.

The long Swiss Arca slide has been added to allow the NPP to sit vertically right above the centre axis of the tripod.



As you can see, the foreground and background have the same location relative to each other. There is no parallax error. Stitching software will have a much easier job, and stitching errors will be less likely to occur.

Lightroom and derivatives have powerful software that all but eliminates the parallax but doing this in exercise will afford you more of your image to remain. The portion of the image that needs to be bent, cylindrically, in post-production will mean the image will require some cropping as it 'bananas' as it is created into a panorama.



One Step Further

A nodal slide is perfect for horizontal panoramas up to full circle. But what if you want to shoot in multiple rows? The parallax error not only occurs with horizontal panoramas, but also when changing the vertical angle.

If you want to shoot multiple row panoramas, or even 360°/180° panoramas, you will also need a nodal slide

for the vertical rotation, which allows us to avoid parallax errors with vertical and horizontal rotation. It can be quite a challenge to set up the system, but it makes stitching a lot easier. Now you can also make vertical panoramas without the risk of parallax errors.



This is a multiple NPP slide. These can be purchased from specialised camera retailers, such as; DigiDirect, CameraPro and Digital Camera Warehouse. They range in price from a few hundred to many thousands of dollars. These will only interest the very professional landscape panorama shooters.