A 12-frame Photoshop stitch, shot from a moving boat on the Rhine

Shooting and Processing Panoramic Images – Ron Cork

Setting-up

- Because you are making a panoramic image of the scene you are looking at, it is obvious that it is the entire vista that has grabbed your attention. But, as with all good compositions, there should be at least one primary area that will be the main point of interest.
- Choose your main point of interest, the spot that will have the highest level of importance in the final composition.
- Set the camera to A, Av, or aperture priority mode.
- Set the ISO to between 100 and 400. For most cameras, from the smallest compact to the bigger DSLR's, (not phone cameras), this is the range that will generate the least amount of digital noise. DSLR's can bet set up to 800 ISO but unless you really know your gear, I would recommend keeping the setting to 400 or below. Full-frame sensor cameras with low pixel counts, (like the Nikon D3, D700) can use much higher ISO settings without fear of intrusive noise in the image – ain't modern technology great. BUT be aware that high pixel count full frame sensors are just as prone to high noise at high ISO settings as APS sized sensors. While a low ISO setting will probably mean that longer shutter speeds will be necessary, the final image will benefit from this. Shooting hand-held will require a compromise in order to keep the shutter speed high enough to eliminate camera shake, say 1/120s or higher. Some compact cameras may have to be set to ISO 200 or less to keep digital noise at bay. Preferably use a tripod.
- For broad and distant vistas, (in fact for most subjects that are at a fair distance from the camera), dial in an aperture setting of f/11. Compact cameras can be set to around f/5.6. Their smaller lenses have greater depth of field than DSLR's. One reason why they work great in a Gigapan setup. Smaller apertures (f/22, f/32) will not improve sharpness or depth of field by much and often make it worse. For relatively close scenes or architecture, depth of field should not be a big issue either.
- As a general rule, for DSLR's with APSc or full frame sensors, an aperture of between f/8 and f/16 will give the sharpest image, regardless of lens or focal length. For distant landscapes, f/11 is fine. However, for subjects closer to the camera, f/16 may be required for full DoF and you may need to consider using the hyperfocal distance as the point of focus. The important thing is, don't change focus once it is set.
- Generally, panoramas are more suited to landscapes, where most of the interest and detail is more than 10m/33ft from the camera, rather than architectural studies, where the verticals and horizontals are more obvious and therefore more critical.
    - Closer detail tends to be distorted due to parallax error, especially if shooting hand-held or without accurately determining and setting up at the nodal point of the lens.

- Due to the nature of stitching, in most instances, this close stuff will need to be discarded later anyway, so compose accordingly, leave space at the top and bottom of the frame for the crop or at least remember that there will be inevitable cropping later.
- You should also have some *unimportant* space at the left edge of the first frame and right edge of the last frame, for the same reason, assuming you are shooting from left to right.

Setting the Exposure and Focus

- Point the camera at the main point of interest, zoom in until the area fills the frame (don't over-zoom), meter for that area by half-pressing the shutter button. Make a note of the numbers in the viewfinder (or on the little screen on the back of the camera), particularly the shutter speed.
- Set the camera to manual everything i.e. set the camera dial to M.
- In general, using auto white balance is OK with most modern cameras, but a better choice would be to decide on a white balance setting to use, (daylight or cloudy), take a few frames to test the settings, then leave it at that setting for that entire sequence. This will help keep a consistent colour balance across all frames in the set.
- Set the shutter speed to match the meter reading you just took. Make sure the ISO is still set at your preferred (lowest noiseless) setting and the lens aperture is still f/11.
- Zoom out to somewhere between 80mm and 200mm. You can zoom in as much as you like but be prepared to shoot a lot more frames to get the 'big picture' and maybe a little more distortion to fix later.
- At this point you now must decide if the panoramic you are creating needs lots of foreground and sky, or will be just a broad vista. For the second option, you can either zoom out to include everything, cropping out unwanted areas of foreground and sky to suit later, or better still, zoom in a little and turn your camera sideways to portrait mode & grab everything from (say) 10m in front all the way up to spacecraft.
- Shooting portrait mode is often, (but not always), best. The vertical rectangular frame will see more of the up-n-down vista and give you more cropping options later on. As we know, cropping an image causes loss of detail, because you will be 'magnifying' a smaller area when the image is enlarged to full screen or paper size. Shooting more frames with a narrower field of view, as when using a longer focal length, increases the amount of detail captured. The impressive Gigapan images are testament to this.
- The most impressive Gigapan panoramas are made by zooming in as tight as can be, with the sharpest lens f-stop setting, then hundreds, sometimes thousands, of frames are captured and stitched to form an image that preserves the smallest detail. Check out their website.
- When you have set the focal length of the lens to the required view, turn off auto focus and DON'T TOUCH the focus ring on the lens barrel.
- All that's left to do is shoot, well almost.

Preparing to Shoot

- A good tip is to take the first frame of something useless, like a blurred close-up of your hand (remember, do not refocus). This helps to keep this panorama set separate from any other. When shooting multiple panoramas of similar looking areas, especially on the same day, it is sometimes difficult to separate the previous set from the one you are about to shoot when you start your processing later. The blurry hand separator shot helps.

- Another tip... don't use a polarising filter.
    - As much as it might be a great help in controlling glare, deepening the blue of skies, brightening green foliage and enhancing other colours in bright sunlight for single shots, it makes stitching of multiple polarised frames a rather laborious task, for both the software and you.
    - Polarisers tend to create dark vignetting around the edges of the frame which would need to be removed from each frame before stitching. Whilst some software might cope reasonably well with polarised frames, some can't and you could finish up with an image with multiple dark patches that will have to be fixed with patching, cloning or content-aware fills, etc. Keep your processing operations as simple as you can.
    - Not only but also... if shooting a wide vista that has you swinging through a 180 degree arc or more, the polariser will only be effective for half the time or less. They work best when facing at right angles to the sun and are ineffective parallel to the suns' rays.
- If using a tripod, (that should read WHEN using a tripod), make sure the tripod head/camera is level, in both directions – North-South, East-West.
- Using a tripod will help to keep your images level and relatively shake-free. You will need a spirit level accessory on the tripod or camera to ensure you get the camera level.
- Using a tripod with a 'proper' panoramic head can be of great benefit, as it not only allows you to set the levels accurately, but using the in-built click-stops on the head will also ensure the rotation of the camera is done in precise increments and when setup correctly, the rotation will be around the 'nodal point' of the lens. A 2-way macro rail with forward/backward/sideways movement is an alternative to a dedicated panorama head. They work fine and can be bought cheaply on eBay.
- The biggest advantage of using a dedicated panoramic head, whether purpose-built or home-made, is when correctly setup, there is no parallax error in the captures. This makes stitching much easier and faster, it also makes for better, less-distorted final images, without the need for too much warping and fiddling during processing.
- If you are shooting hand-held, you will be rotating from the hip, so the important thing is to keep the camera as level as you can while rotating.
- A lens wider than 50mm (35mm equivalent), or 35mm on an APSc/DX/compact camera, is not recommended for creating a pano set. The barrel distortions inherent at the frame edges make it very difficult for the pano software to get an accurate stitch. Also, many wide-angle lenses suffer from edge/corner vignetting, again problematic for software.
- It's also a good idea to use a lens hood. This will help to eliminate, or at least minimise glare.

Now for the Actual Shooting Part...

- The aim is to capture as many frames as necessary to encompass the full vista, whether it be 60, 90, 180 degrees or even as far as a full 360 (hand-held?).
- To give the software a decent chance of an acceptable outcome, you should overlap each frame by at least 30%. Between 33% and 50% is recommended.
- The amount depends on the subject matter (the amount of high detail or not), and the landscape or portrait mode of shooting. Less is needed for high textured subjects that give the software lots to focus on and more required for even-toned areas like skies. For portrait mode shooting, around 40% is best

- With everything set and ready, shoot a sequence-start reference (blurred-hand) shot then rotate to the left (or right), frame your first composition and press the shutter to make the capture.
- Try and keep the horizon level. The less level you are, the more you will have to crop later.
- Rotate to the next position, making sure the required overlap is there, shoot your next frame.
- Continue rotating and firing until the vista has been captured.
- When done, shoot a blurred-hand sequence-end reference frame.

Processing the Panoramic Set

Photoshop – hereafter referred to as PS

- After shooting and transferring the files to your computer, all that's left is the processing.
- My only experience is with PS, so....
- You can either start from within **PS** and go to File/Automate/Photomerge...
- When the dialogue opens, use the browse button to navigate to your folder of images, select the first image of the set and shift-click on the last to select the entire set for this stitch and click on OK. Don't include the blurred-hand reference shots. The selected file set will show in the list panel. This works with RAW, JPEG and every other image file format that PS recognises (and there are dozens).
- Now select which method you prefer to use for the stitch. If you are not sure, try Auto first, but for very wide vistas, cylindrical could also be good.
- Click OK and let PS do its work of importing, layering, merging, twisting and masking.
- PS will load all the images into layers. It will then match pixels and tones then apply masks to each layer to achieve a (near) perfect blend. Each image of the set remains as a separate layer, but now has a mask attached to help it blend (almost) seamlessly with its neighbours.
- This is the time when you can create a stamped merged layer on top of the stack, or flatten the stack and then do your thing. You will most likely need to straighten the horizon, crop to remove the ragged edges, fix and/or boost contrast, saturation, colour casts, remove spots, blend patchy areas, add a vignette, etc.
- You can then save the multi-layered working file as a PSD (as you should). Finally you could flatten, resize and sharpen the image to suit whatever your display method is... print, projection or PC.... **OR**....
- You can start from within **Bridge**, select your image file set then go to Tools/Photoshop/ Photomerge.... check the file list is correct (no further browsing required), and press OK to proceed as above.
- To fix wavy horizons, stamp a complete merged layer (shift-ctl-alt-E), turn on the ruler and drag down a guide, or turn on the grid, select the Free Transform tool (ctl-T), right-click inside the bounding box and select warp. Now you can push-n-pull any part of the image in any direction to fix leaning verticals and wavy horizons or even create a Dali-esk image, if that's how your mind works.

If you are creating a panoramic print of considerable size, it is recommended that shoot in vertical portrait mode, zoom in to ensure good sharp details are captured, shoot lots of

images with around 50% overlap and if the light range is more than 5 stops between the darkest shadow and brightest highlight, bracket your exposures, to ensure the full dynamic range of the scene is captured. This means capturing a full sequence for each exposure bracket of 2 under, 1 as measured and 2 stops over the metered exposure reading. For a nine shot panned sequence, this will create 27 separate images.

Bracketing of the exposure will help keep bright highlights and deep shadows under control during your post processing. You could even use the merge to HDR option on each bracket trio, saving them as separate PSD files, (getting you back to just 9 images), then selecting them for your Photomerge. Also, remember to set the PS default printer resolution to 300dpi before you start. A 72dpi image isn't much good to a printer.

Finally, Photoshop and Elements are not the only systems capable of stitching. You might also try PTGui, or any number of panoramic stitching programs available on the Web. Each has its strengths and weaknesses.

Ron Cork