Expanding Camera's Capabilities

- Cameras are very good and getting smarter with every new release.

- But have limitations or are unable to perform some often used functions

- We will explore three of these

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Best Done in Post Processing

- Panoramas
  - Use when want wider image than your widest wide angle lens can capture or higher resolution than can obtain with single image
  - Stitch together adjacent images to expand the field of view
  - Some in-camera capabilities with jpg output
- High Dynamic Range (HDR)
  - Use when dynamic range of scene exceeds camera dynamic range
  - Combine images with range of exposures to increase dynamic range
  - Some in-camera capabilities with jpg output
  - Auto exposure bracketing helps take source images
- Focus Stacking
  - Use when don't have DOF to capture entire image
  - Combine images taken at different focal distances to increase depth of field
  - In-camera image sequence capture common in latest generation of cameras
  - No in-camera stacking available yet
- HDR Panorama
  - Combines HDR and Panorama
  - Must shoot HDR sequence at each Pano position for source images

Post Processing

- Individual images are captured in-camera that address shortcomings – FOV coverage, exposure limitations or DOF limitations

- Specialized software is used in post-processing to assemble these images into a single image

- Outputs will normally be in uncompressed formats (psd, tiff, dng…) that can be further manipulated

Panoramic Image

- Panorama – A photograph containing a wide view.
- All panoramas are not the same!

What is a Panorama

- Panorama – Comes from Greek *pan + horama* which translates to *all + view*

- Panoramic photos are often created by taking a series of photographs and merging them together using special software

- They tell a more complex story and draw the viewer closer to the feeling of what it was like to be there.

- Panoramas are typically horizontal, but can be vertical

Digging a Little Deeper

- Panorama image is generally defined as having an aspect ratio greater than 2:1
  - Around 3:1 aspect ratio is thought of as classical standard
  - Greater than 3:1 is certainly a panoramic image, but it is a little cumbersome to view and display and hard to sell. Doesn't present well in digital format
  - Can buy standard sheet paper and frames for 2:1 and 3:1 images

- Panoramic images are often
  - Trying to get detail of distant subjects
  - Using normal to short telephoto lenses in 40 to 100mm* range
  - Providing normal to slightly compressed perspective
  - Balance foreground with distant objects
  - Provide high resolution that can be printed in large sizes with lots of detail

    * 35mm equivalent

So What?

- I am at Grand Tetons NP wanting to take photo of the mountain range that more than fills the frame
- My cropped, wide angle shot includes bold foreground, but the mountains recede into the distance
- I really wanted mountains to be dominant with more detail to provide a sense of the vast landscape
- I need a longer lens to get mountain detail and suppress foreground, but that only covers a small part of the mountain range
- How about taking several pictures and combining them
- That will work, so I get out my tripod, zoom in on the mountains and take a sequence of images panning to cover the entire mountain range
- These images are then combined to provide the vast landscape I was seeing and wanted to capture

A Little History

- In the film days, making a pano was tedious and often employed
  - Spliced negatives
  - Special cameras were made that moved film as camera or lens pans

- Digital made to much easier
  - Extremely high quality, high resolution images can be made without any special gear
  - Most cameras and lenses that photographers already have can be used
  - Special software readily available to stitch multiple images together
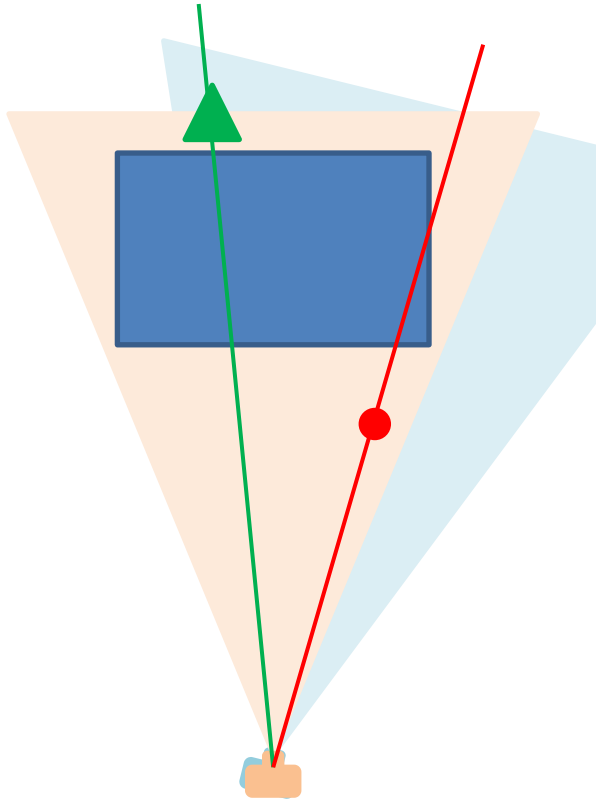 - Cameras with built in pano provide capability for a quick grab

Conventional Panorama Photo

- Photographed from fixed position on a tripod

- Pan to cover scene

- Pano constructed with software

Conventional Panorama
Maintain spatial relationships as pan from one position

Merging Images to Form Pano

8 images, merged to 20,567px X 4478px pano, 1.01 GB file
Almost 7' X 1.5' at 300 ppi

Making the Images

- Mount camera vertically to provide vertical working space
- Set up tripod and level the base
- Overlap images by 30 to 50% so can be registered in post
- Turn off autofocus. Focus on subject. Stop down so near subjects and foreground are within DOF. Focus at hyperfocal distance or infinity for distant subjects
- If hand holding – use viewfinder, hold camera level, plant feet and rotate your body, follow horizon

What's Important
Camera setting that impact image size, perspective and exposure need to be kept constant

- Focal length (Set by zoom. Watch out for zoom or focus creep)
- Point of focus (Turn off autofocus)
- Aperture (DOF)
- ISO (Noise)
- Aperture priority or manual mode (Fixed aperture to maintain perspective)
- Do not use polarizing filter (Effect changes with location of light source)
- So what is left
  - Shutter speed used to determine exposure
  - Insert dark frame (hand or fingers) so you can easily determine where sequence starts and stops in post processing. Very useful if shooting several pano sequences and test images of same subject
  - (Oh yes, be careful when it windy or using a long exposure)

Setting Exposure

- Exposure setting can be tricky because illumination can vary significantly over scene
- Meter brightest area and check histogram to ensure highlights are not blown out as you pan through the scene
- Don't worry about point light sources
- Take test shots to confirm exposure
- Make sure main subject is well within exposure range
- In extreme lighting, can use HDR/Pano stack – LR supports

Some Thoughts on Composition

- Tight framing allows selectivity that panos cannot. Pano must have desired aesthetics in its whole and inspire the viewer.

- Each individual shot should contribute to whole. Several blah frames suggest weak final pano

- Eye tends to go to center first unless other object really stands out. Then typically scan side to side. Not much vertical eye movement

- Place most important features in the middle third of image

- Key elements must not be too small in final image. Using a telephoto lens to compress perspective can help

- Some classical composition rules can work well – rule of thirds, leading lines, diagonals, detail, texture, repetition…

- Try to have interesting sky with clouds. Reduce amount of dull, gray sky

- Extend the foreground into the middle of the frame to create interest.

- Frame the shot with elements at each end to hold eye within the image. Try not to push vertical elements into the outer thirds

- Watch out for distractions and objects that run top to bottom dividing the frame

What Happens If You Cannot Pan

- When photographing long linear subject (block of houses, motel, street scene...), you may not have room to pan.

- Move the camera holding as much constant as possible.

- Would like to capture each photo as orthographic projection

- But, each photo has its own perspective (vanishing points) causing distortion of scale front to back

- Relationship of objects change as you move

Camera Is Moved Between Photographs
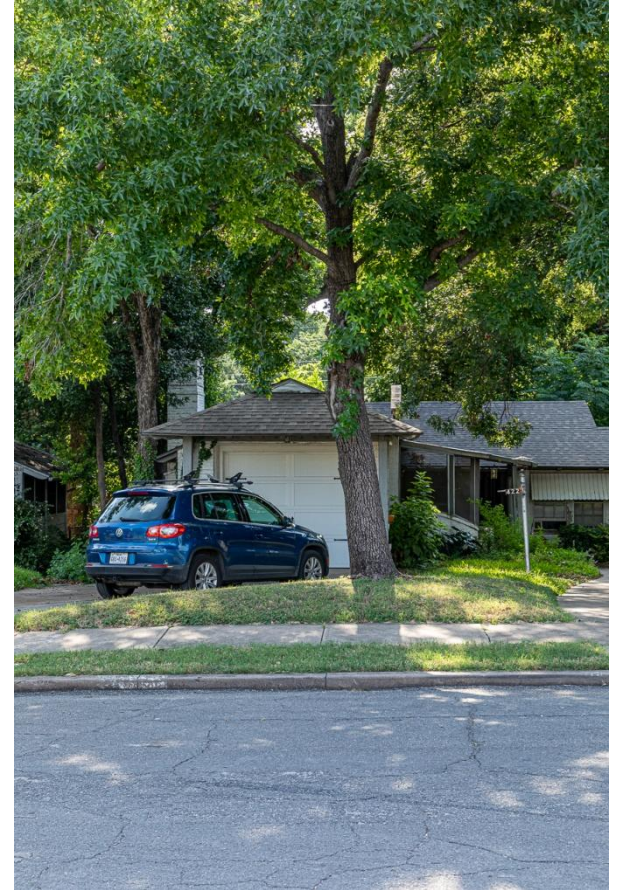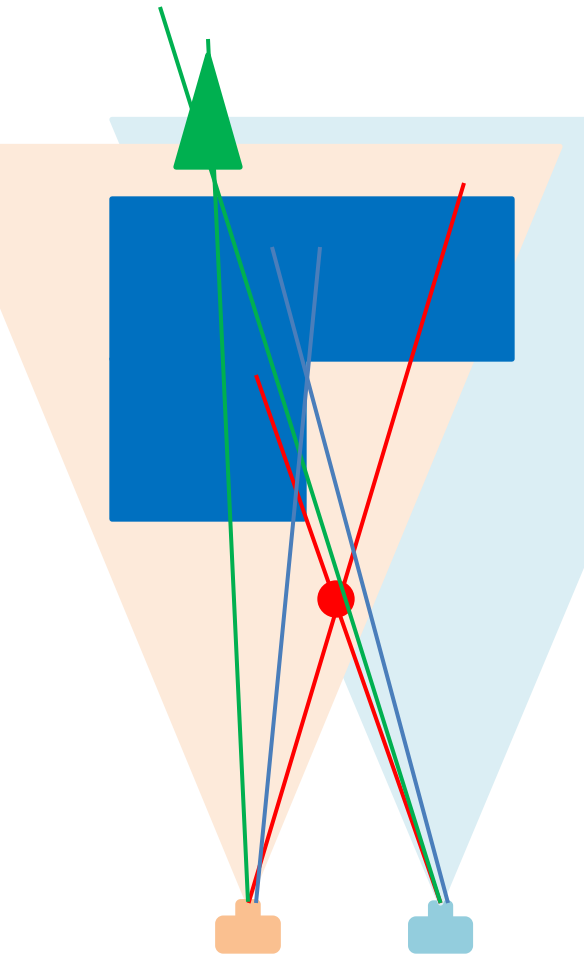
Parallax - the position or direction of an object appears to change when viewed from different positions, e.g. through the viewfinder and the lens of a camera.
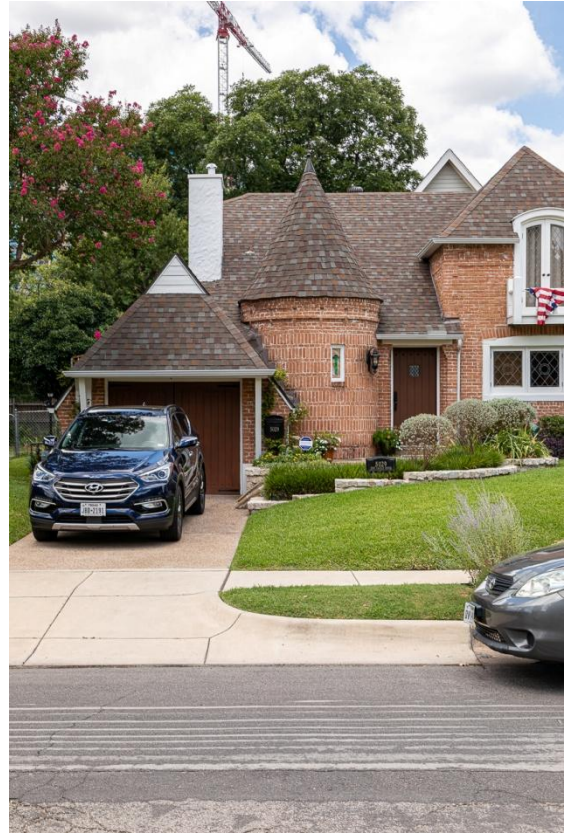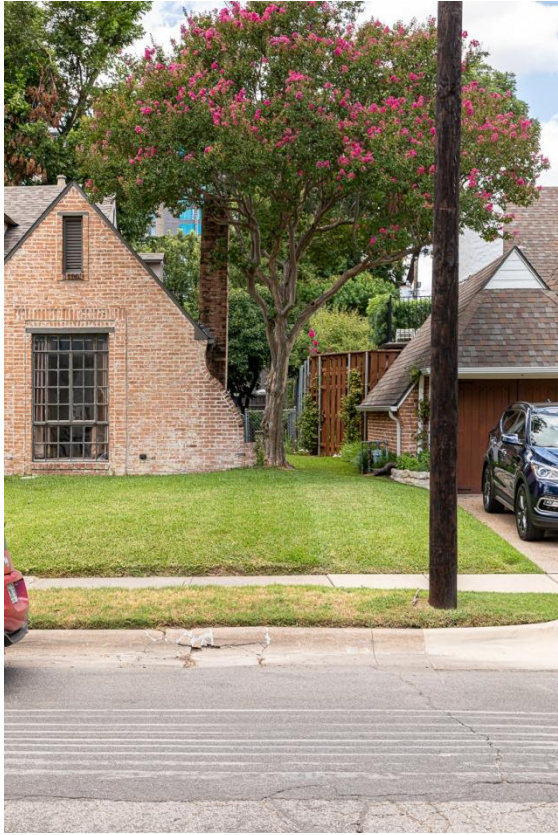
What's Important
When Camera Is Moved

- Constrain camera settings as discussed previously
- Multi-point perspective distortion and parallax are problems
  - Subject with depth is problematic
  - Planar subject is okay
- Some things help simulate an orthographic projection
  - When moving camera, maintain constant distance to subject. Level camera for each shot. Shoot perpendicular to plane of subject
  - Shoot with longest lens that covers desired field of view
  - Shoot many closely spaced photos
  - Center walls and other features in a frame when depth is an issue
  - Don't shoot into sides – don't use front and both sides in the same frame
  - Consider placement of objects in front and behind subject plane
    - Parallax can be used to remove objects in foreground and background

What's Important
When Camera Is Moved

- Pay attention to shooting conditions
  - Try to photograph when clutter is minimal – avoid residents coming and going, cars on street, people mowing yards, trash pickup day…
  - Choose overcast or clear day. Broken clouds move, change exposure and cast shadows.
  - Look for calm day if trees and shrubs are involved
- Post processing
  - Most pano software does not handle changing camera location
  - Manually stack image layers to make pano - scale, rotate, perspective correction, match exposure, feather to blend edges

Fixed and Moving Camera

Equipment

- Can shoot panos with about any camera
- Lens focal length in 40 to 100mm range generally works well. Better to go longer than shorter
- Do not use filters – especially polarizer
- Sturdy tripod and panning head with level base
- Bubble level on base, in-camera or bubble level on-camera to align with horizon
- Timer, cable or remote release to reduce camera shake
- Mount camera vertically and rotate about lens nodal point. L-bracket mount or nodal plate (costly pro add-on)

Processing Software

- Merging involves scaling, rotating, aligning and stitching the individual images in software

- Lightroom and Photoshop are among the best and use the same engine. PS keeps layers so can adjust image-to-image intersections and exposure. You can also solve problems and retouch individual images after merge. LR does a good job and is easy to use, but cannot work with layers so limits control over the process

- Other good pano software options include Luminar Neo Panorama, AutoStitch, PtGui…

- For still more options, checkout - https://fixthephoto.com/best-photo-stitching-software.html

Processing LR and PS

- Select images for pano
- Make sure color temperature of all images are the same
- Don't make any other edits to the individual images prior to merging
- Merge - LR pano file will be *dng* and PS will be *psd.* Both provide post processing latitude
- Post processing – make global and local adjustments as required
- Fill in irregular boundary – crop or use Boundary Warp slider in LR
- Panos files can be large – 3:1 pano might be 15-20K px long and the filesize exceeding a GB.

Displaying Panoramas

- Digital display is problematic – especially if aspect ratio is approaching 3:1 or greater

- Most photo inkjet printers can make panos
  - Roll paper may be used with most printers to make panoramas of almost unlimited length
  - Cut sheet paper is also available in pano sizes
  - Both Canon (length 26.6" max) and Epson inkjet printers can utilize extra long sheets of paper - perfect for printing your own panoramic images

Printer Paper and Frames for Panos

- Red River has the best selection sheet paper in pano sizes that I am aware of
  - 8.5"X25" (Gloss 1, Satin/Luster 3, Matte 1, Fine Art 2, Metallic 1)
  - 13"X38" (Gloss 1, Satin/Luster 5, Matte 2, Fine Art 6, Metallic 2)
- Hahnemühle has 2 sheet papers in 8.5"X24" pano format
- If you have a favorite paper, take a look and see if it is available in pano sheet stock

- Frame Destination has several standard frames in sizes for panos with aspect ratios of 2:1 and 3:1

Next Two Sessions

- High Dynamic Range
- Focus Stacking