



# Panorama Techniques



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## Equipment:

- Camera:
  - Capable of manual settings
- Lens:
  - Low distortion
  - Minimal vignetting (stop down)
- Tripod and head:
  - Panning base
    - Engraved with degrees
  - Level the legs
    - Spirit level on the base of the head or top of the legs
  - Level the head
    - Spirit level on the camera hot shoe
  - Panoramas can be made without a tripod!



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## Scene:

- Shoot wider than you think that you'll need
  - Severe cropping may be required
- Avoid the sun striking the front of the lens (lens flare)
- Don't use a polarizer (uneven effect across the scene)
- Do use a hood
- Overlap images 25%-50%
  - Less distortion



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## Exposure:

- Manual settings:
  - Exposure on “M” (*not* Av, Tv, Sv, P, etc)
  - All images shot with the same shutter speed, aperture and ISO
- Stop-down:
  - Some lenses exhibit “vignetting” when shooting wide-open

## White balance:

- White balance on daylight or cloudy (not AWB)
  - If shooting RAW, then convert to the same WB (post-processing)



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## Focus:

- Manual focus setting
- Don't change the focal length (zoom) during the sequence

## Parallax error:

- Rotate on the entrance pupil axis
  - Usually not the front element of sensor plane
  - Special panorama heads allow this adjustment
    - Entrance pupil must be determined for each lens *and* each focal length
- Not an issue, except when there are objects near the camera
- Parallax issues can be mitigated by centering near objects in the center of specific frames



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## Camera Orientation:

- Better when the camera is in vertical orientation:
  - Less lens distortion
    - Distortion can be severe with ultra-wide angle lenses
  - Minimizes vignetted problems
    - Vignetting can also be minimized by stopping-down
  - Minimizes sensor sensitivity gradient
    - Newer DSLRs seem to have more uniform sensitivity
  - More height to the panorama
    - Typically, you can shoot as wide as you need to



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## Software:

- Most photo software comes with a stitching application
- Image Composite Editor (ICE) is free and very good
  - <http://research.microsoft.com/en-us/um/redmond/groups/ivm/ice/>
- Stitching is a CPU-intensive operation
  - Can take many minutes
  - Can halt other computer operations
- Post-stitching:
  - Level the horizon
  - Fixing out-of-phase water waves
  - Clouds are easily fixed using the Photoshop “healing” tool
  - Remove duplicate objects (moving people, cars)
    - Or keep the duplicates for “effect”



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Sequence composites:

- Similar techniques to a panorama
- Sequences of a single subjects into a single image
- Avoid overlapping subjects
  - Difficult to cut
- Use layers
  - Use partial transparency to “register” each layer
  - Cut away outside of the subjects
- Need not be wide