



Panoramas and Image Stitching

by Match Grun

Panoramas and Image Stitching

- Why Stitch
- Equipment
- Making the Photograph
- Stitching
- Post Processing

Why Stitch?

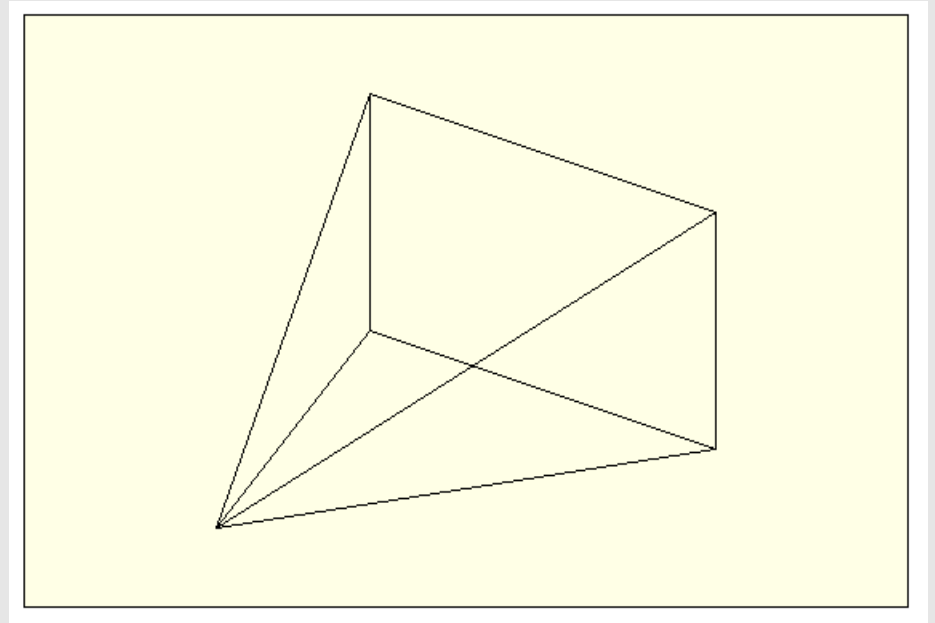
- Scene is too wide
- Scene is too high
- Increase image resolution

The Problem

- We are attempting to capture a scene that is too large for the camera and lens.
- When we look around us, by panning left/right, the world is cylindrical.
- When we look up/down (tilt) and pan, the world is spherical.

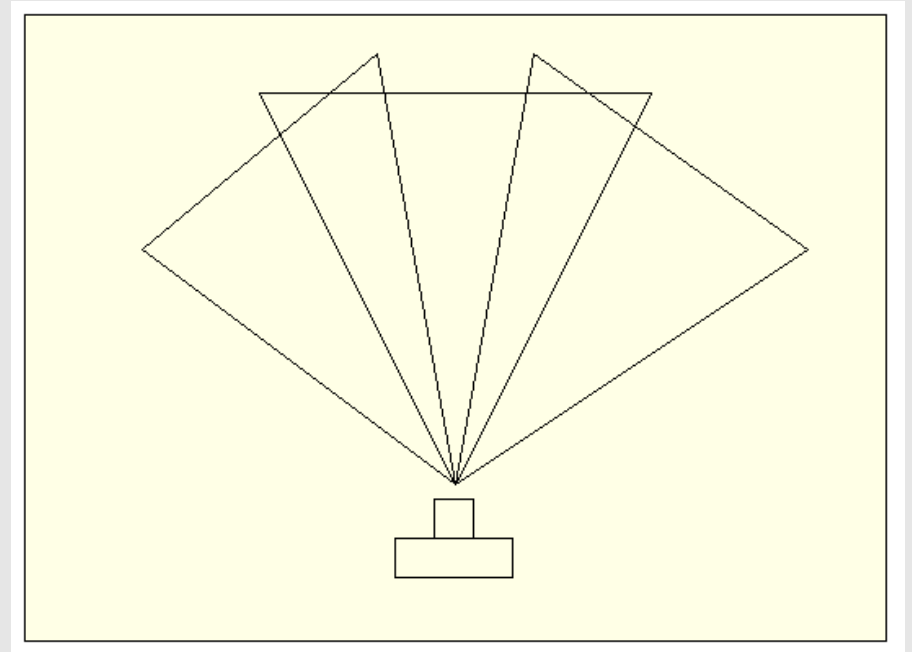
Some Theory

- Lenses are designed to project the world onto a flat plane.
- Wide angle lenses attempt make image rectilinear.
- Fisheye lenses make images spherical.



Panoramic Projection

- When we shoot a simple single-row panorama, we create several images like facets on a jewel.



What does Stitching Software do?

- Stitching software was written that converts the facets of an image into a single “flat” image.
- Step 1: Remap all images using a selected projection type. This process distorts the image to fit.
- Step 2: Blend the image exposure values at the facet seams.

Projection Types

- Four projection types exist:
 - Cylindrical
 - Spherical
 - Rectilinear (perspective)
 - Flat Images

Equipment Available

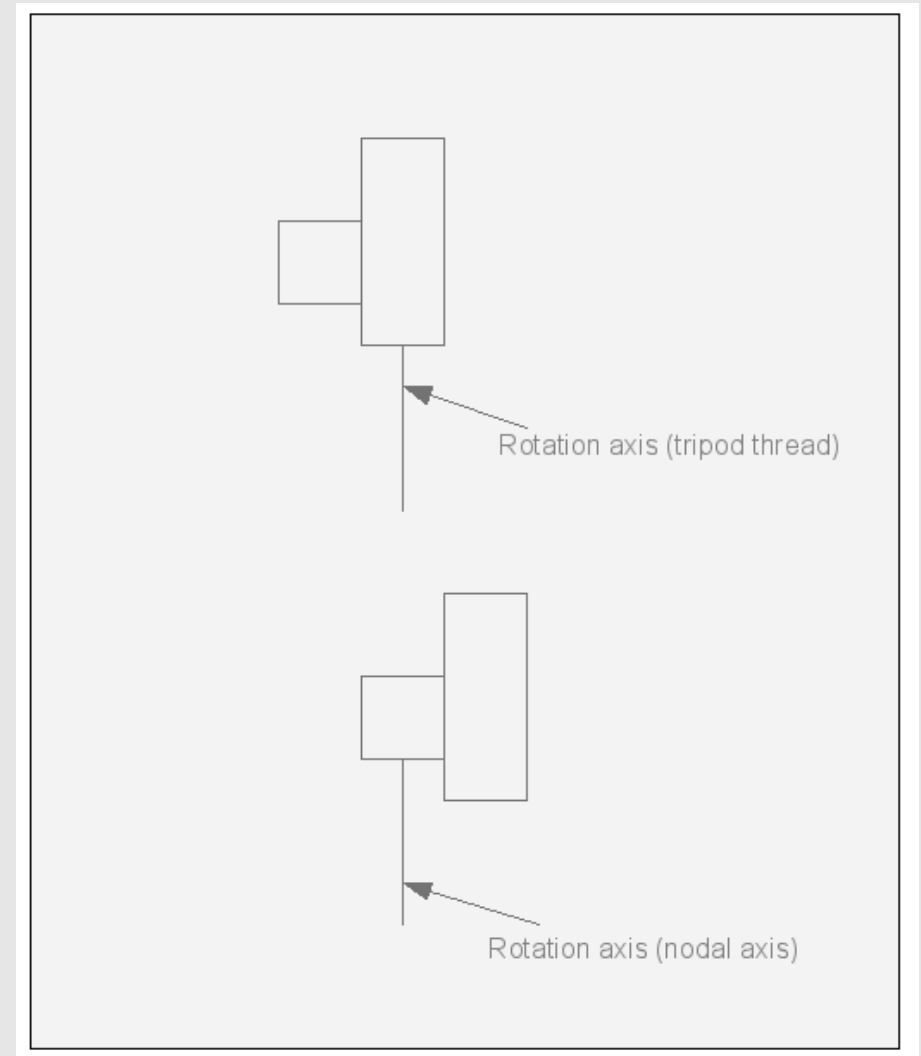
- Tripod
- Tripod Head
- Nodal Slide
- Gigapan robotic mounts

Tripod Heads

- Horizontal panoramas
 - Ball head with panning
 - Pan/tilt head with pan
- Vertical panoramas
 - Pan/tilt head with tilt
- Panoramic Heads
 - Indexed rotation

Nodal Slide

- When camera and lens are rotated about pivot point, there can be parallax errors.
- A nodal slide can be used to rotate around the nodal axis.



Required Equipment

- Tripod
- Tripod Head, either ball head or pan/tilt.
- Cable Release.

Gigapan

- Platform for mounting Point & Shoot and lightweight DSLR's.
- Controlled by Palm or Pocket PC's.
- Program rows and columns in panorama.
- Gigapan does the rest.

Panorama Setup - 1

- Mount camera on tripod.
- Level tripod head.
- Vertical orientation for horizontal.
- Horizontal orientation for vertical.
- Set to RAW.
- Manual exposure.
- Manual white balance.

Panorama Setup - 2

- Set aperture for depth of field.
- Set shutter speed.
- Set ISO.
- Take test shot(s) for exposure.
- Check histogram and adjust exposure.
- Take white balance test shot (eg, Whibal).

Make Images

- Make first image.
- Index horizontal (pan) or vertical (tilt).
- Adjacent images should overlap by 20-40%.
- Make next image.
- Repeat until done.

Image Pre-Processing

- Import all images into Lightroom or Bridge.
- Adjust white balance from Whibal test shot.
- Apply white balance to ALL images.
- Adjust exposure/recovery setting.
- Apply to ALL images.
- Export all images as TIFF or PSD into one directory for the image set.

Stitching from Bridge - 1

- Select all images in Bridge (have preview).
- Tools | Photoshop | Photomerge...
- Choose Layout:
 - Auto
 - Perspective (vanishing point correction)
 - Cylindrical (preferred)
 - Reposition (use for flat images)
 - Interactive (you become the expert)

Stitching from Bridge - 2

- Photoshop will open each file onto separate layer.
- With non-interactive options, Photoshop will perform remapping and blending.
- When complete, each layer will contain each image with a layer mask.
- Mask controls visible portion of each image.

Stitching from Photoshop

- File | Automate | Photomerge...
- Choose files (image preview not available)
- Choose Layout
- Remaining steps as for Bridge

Post-Processing

- Image rotation, if required.
- Crop image.
- Flatten image.
- Save PSD file.
- This completes the panorama steps.

Printing

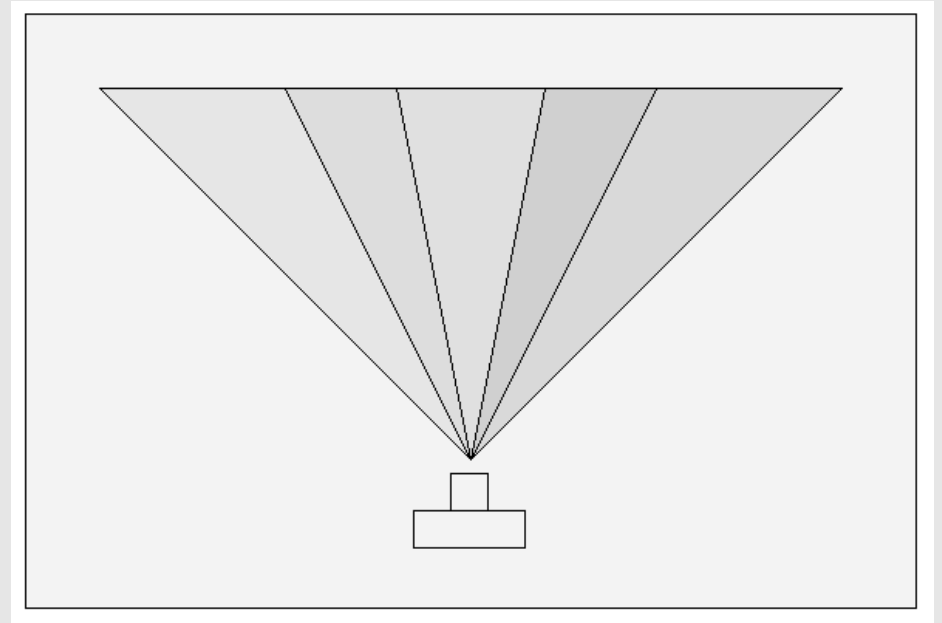
- Epson 24xx has roll feed, 13" width.
- Epson 4xxx has roll feed, 17" width.
- Epson 7xxx and 9xxx roll feed, 24" and 40".
- Epson 38xx has cut-sheet, 17" width. Cut a sheet from the roll. 37" maximum length.

Presentation

- Mount.
- Mat.
- Frame.

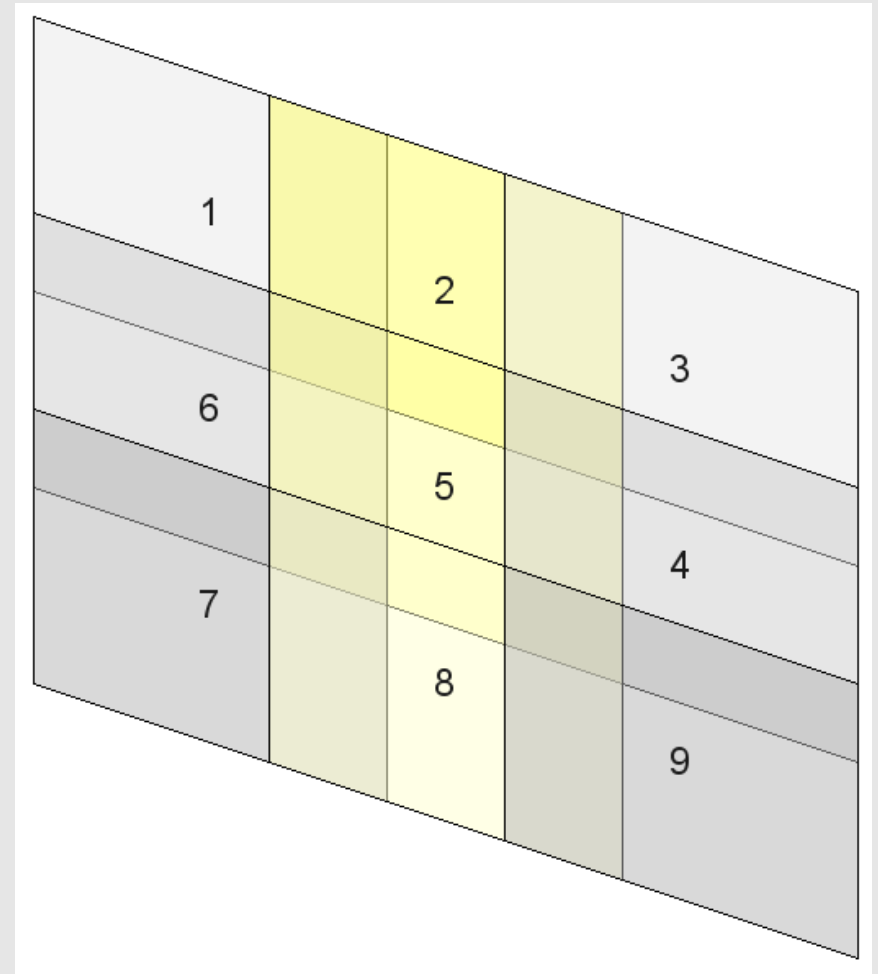
Panorama with Tilt/Shift Lens - 1

- Lens shift capability is like having a wider angle lens.
- Lens is shifted laterally or vertically for each image.



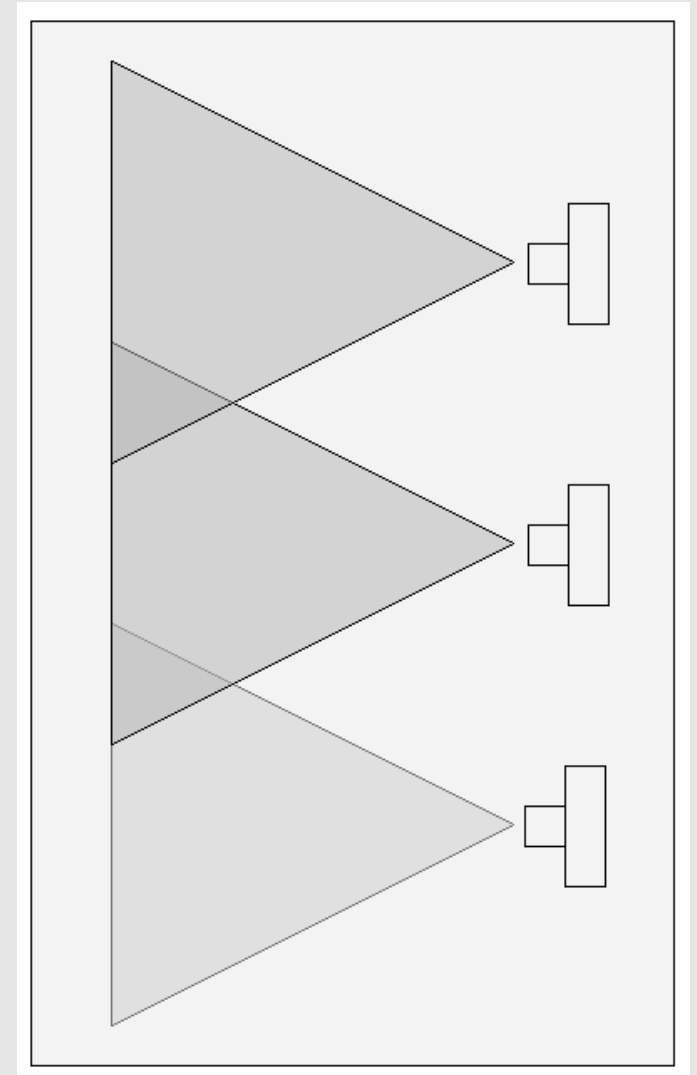
Panorama with Tilt/Shift Lens - 2

- Image layout for multi-row panorama with tilt/shift lens.



Panorama with Lateral Shift - 1

- Make image 1.
- Move camera.
- Make image 2.
- Move camera.
- Make image 3.



Panorama with Lateral Shift - 2

- This can be effective to capture long thin subjects.
- Examples:
 - Subway tunnel.
 - Large Mural.
- Subjects should be flat or parallax problems will become apparent.

Stitch with Lateral Shift

- This method would use the Photoshop “Reposition Only” layout option.
- If you had a image larger than scanner, you would make several scans of the image.
- Then stitch into one large image with this option.

Other Stitching Software

- There are several other stitching applications available:
 - Hugin (open source)
 - PTAssembler (\$)
 - PTGui (\$)
 - PTMac (\$)

Hugin - 1

- Hugin is probably the most powerful and versatile application for stitching.
- Control points can be specified manually on adjacent pairs of images.
- Control points can also be automatically generated with autopano-sift.
- Provides many more projection types.

Hugin - 2

- Has image preview with horizon straightening.
- Can correct perspective by removing vanishing points.
- Can do some really cool effects.

Software Links

- Hugin
 - <http://hugin.sourceforge.net>
- PTAssembler
 - <http://www.tawbaware.com>
- PTGui
 - <http://www.ptgui.com>
- PTMac
 - <http://www.kekus.com>

Panorama Links

- Max Lyons Image Galleries
 - <http://www.tawbaware.com/maxlyons/>
- Hugin Tutorials
 - <http://hugin.sourceforge.net/tutorials/index.shtml>
- Extreme Resolution Images
 - <http://www.xrez.com/>