

360° PANORAMIC PHOTOS

See what's behind you,
and above you,
and below...



WHAT DO THEY LOOK LIKE

- × WWII memorial
- × B & O Roundhouse

- × Radcliffe Square
- × Mt Everest

HOW DO YOU DO THAT?

- ✘ A little Science
- ✘ A little money (or a fair amount of handy skills)
- ✘ A little Planning
- ✘ A lot of pictures
- ✘ A lot of patience

SCIENCE – OH NOOOOOOOO!

× Parallax

- + Hold your index finger in front of you
- + Close one eye and line up your finger with something further away such as a door, or window, even the edge of this screen.
- + Without moving your finger, Move your head back & forth
- + That's Parallax!

PARALLAX – HOW TO MINIMIZE IT

- × Make everything far away
 - + Mountains
 - + Landscape
- × Wide Angle Lens
 - + Accentuates perspective
 - × Makes everything *look* farther away
 - + Problem
 - × ground close to you gets in the way

PARALLAX - HOW TO ELIMINATE IT

Panoramic Heads-
This is the Money part



DIY PANO HEAD

Before building one of these you need to know the Nodal point OR the lens' entry pupil (or, to be precise, the point where the optical axis and the entry pupil intersect).



A simple explanation of it can be found here:
<http://www.worth1000.com/tutorial.asp?sid=161123&page=2>

OTHER STUFF YOU'LL NEED

- × Tripod
- × Spirit Level – optional for Spherical Shots
 - + It's important to be level
- × Remote Shutter Release
- × "Pano" Head
- × Wide Angle Lens

PLANNING

- × Subject
 - + Something that has lots of features to match up when you “stitch” (we’ll talk about that later)
- × Interest
 - + Make sure there is something all around you that is interesting
 - + Put some people in the shot – Movement give these shots some life
- × Composition
 - + Same rule apply as for all photos, but you have to see all the angles .

TAKING THE PICTURES

✘ How many do I need?

+ portrait HFOV = $2 * \tan^{-1}(12 / \text{focal_length})$

+ landscape HFOV = $2 * \tan^{-1}(18 / \text{focal_length})$

+ number of images to take = $36000 / (50 * \text{HFOV})$

TAKING THE PICTURES

- ✘ Start & stop at distinct point.
- ✘ Overlap 30-50 %
- ✘ Use large F stop for greater DOF
- ✘ Take more not less (not more than 50% overlap)
- ✘ number of images to take =
+ $100 * A / ((100 - P) * HFOV)$

APPROXIMATE # OF PICS

Focal Length (mm)	13	15	18	21	24	28	35	43	50	70	85	105	135	180
Diagonal (°)	118	111	100	92	84	75	63	53	47	34	29	23	18	14
Vertical (°)	85	77.3	67	60	53	46	38	31	27	20	16	13	10	7.6
Horizontal (°)	108	100	90	81	74	66	54	45	40	29	24	20	15	11

For Full frame camera

$$100 * A / ((100 - P) * HFOV)$$

For the 13mm lens - $100 * 360 / (100 - 50) * 85 =$

$$36000 / 4250 = 8.47 \text{ (9 pictures)}$$

THE PATIENCE PART

- ✘ Download pics to your Computer
- ✘ Import them into the Software
 - + PTGUI- <http://www.ptgui.com/download.html>
 - + AutoPano 2.0- <http://www.autopano.net/en/>
 - + Panotools – optional but useful for the geeks in the crowd -<http://www.ptgui.com/panotools.html>
 - + Pano2vr - <http://gardengnomesoftware.com/pano2vr.php>

PTGUI

- ✘ Import
- ✘ Align
- ✘ Cleanup Control points
- ✘ Make panorama – for 360 be sure to make width to height – 2:1
- ✘ Output to Quicktime VR