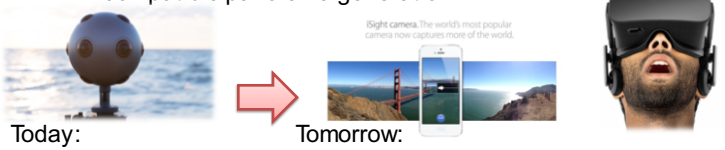
Spherical Stereo Panorama Generation by Single Camera with Regular Lens

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Motivation

- The evolution of virtual reality requires both hardware and plenty and easy-to-generate VR compatible contents
- Regular monoscopic, extended planar projection panorama is a mature technology but not good for immersive VR HMD experience
- Existing stereoscopic, spherical projection panorama generation methods require high-end designated devices and/or finely tuned control/calibration setup
- There remains much work to be done to enable easy access of VR compatible panorama generation!



Today:
Professional devices…

Tomorrow:
Spherical stereo pano solely by iPhone?

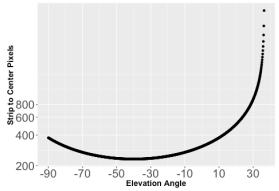
Technical Difficulties and Solutions

- Single camera with regular lens, must rotate with 2 degrees of freedom (azimuth and elevation) for spherical stereo-pano
- Just use regular tripod with 2 axis rotation
- Distance between optical center and axis changes following the change of elevation angle



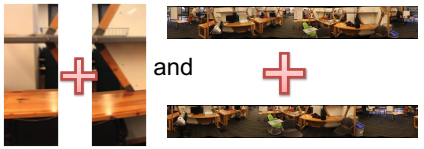
- Min axis distance: 3cm, for 1m image plane, 2° view separation for objects with 0 disparity

$$r_{\min} = s \cdot \sin\alpha$$



- Over maximum elevation, Zenith and Nadir: assume no disparities for ceiling and floor

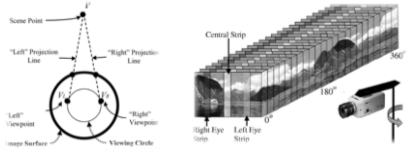
- No control and measurements needed for camera rotating
- No directly mosaicing slits based on rotating angles
- Singular transformation matrix, few features for narrow slits



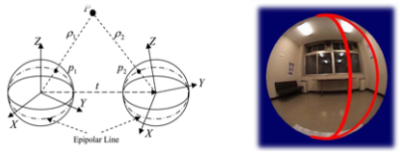
- SIFT for feature matching and RANSAC for robust estimation
- Disparity-Mosaicing trade-off for slit width

Related Work

- Single camera rotating about a behind axis and slits mosaicking for planar stereo-pano



- Single camera with fish-eye lens rotating about a behind axis for spherical stereo-pano



- Dual-camera with 2 degree of freedom rotation for spherical stereo-pano



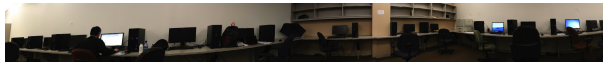


Experimental Results

Monoscopic Planar Panorama

Stereo Planar Panorama

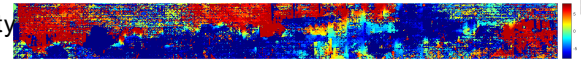
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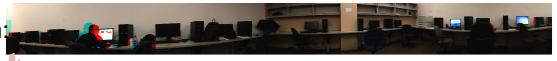
R:



Disparity map:

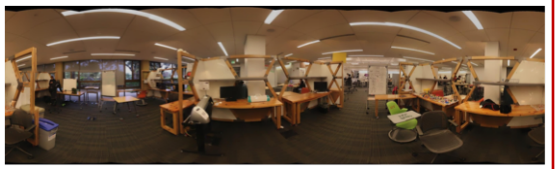


Anaglyph:



Stereo Spherical Panorama: On going

Monoscopic Spherical Panorama



- Special thanks to Professor Haricharan Lakshman for his kind advice

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