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!

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

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, 2º view separation for objects with 0 disparity
  \[ r_{\text{min}} = s \cdot \sin \alpha \]
- 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

Experimental Results
Stereo Planar Panorama
Monoscopic Planar Panorama
Monoscopic Spherical Panorama
Stereo Spherical Panorama: On going

References: