EE - 368 Project Proposal

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Stereo Panorama Generation

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Project Description:

In this project we plan on generating panoramic stereo images using techniques cited in [1] and [2]. We plan to implement and compare two techniques:

1. The first in which we take a large number of images within a specific field of view and generate the panorama using these images. The algorithm involves rotating a camera around a vertical axis directly behind the camera and not passing through its optical center [2]. The images thus obtained are then processed as to simulate the effect of a single vertical slit which is not directly in front of the camera lens. This is done by taking strips from the images. This type of stereo imaging involves a cylindrical imaging surface from which both the left eye and right eye images are generated. The left eye projection uses rays in the clockwise direction which are tangent to the viewing circle, and similarly the right eye projection uses tangents in the anticlockwise direction. Hence the strips on the left side of the image form images for the right eye and vice versa. Families of projection lines tangent to the viewing circle give us the multi-view projections.

2. The second method involves taking a small number of images and using blending techniques to generate the stereo panorama by stitching the images together. In order to stitch the images a flow-based blending algorithm as described in [1] can be used. This becomes efficient as compared to the first method as a much fewer number of images is required to generate the panorama and hence simplifies the data collection process.

This method can be extended to form a complete 360° cylindrical panorama which can be displayed using virtual reality hardware such as the Oculus Rift and can allow an immersive user experience. If time permits, this method can then also be extended to generate stereo panoramic videos.

Implementation:
We do not plan to use an android phone for this project, but plan to use MATLAB and possibly openCV.

References:

1. Richardt, C.; Pritch, Y.; Zimmer, H.; Sorkine-Hornung, A., "Megastereo: Constructing High-Resolution Stereo Panoramas," Computer Vision and Pattern Recognition (CVPR), 2013 IEEE Conference on , vol., no., pp.1256,1263, 23-28 June 2013

2. Peleg, S.; Ben-Ezra, M.; Pritch, Y., "Omnistereo: panoramic stereo imaging," Pattern Analysis and Machine Intelligence, IEEE Transactions on , vol.23, no.3, pp.279,290, Mar 2001

3. Peleg, S.; Ben-Ezra, M., "Stereo panorama with a single camera," Computer Vision and Pattern Recognition, 1999. IEEE Computer Society Conference on. , vol.1, no., pp.,401 Vol. 1, 1999