Image Stitching

cs482
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- Investigate and understand the methods used to develop panoramic and composite images (such as the one above)
- Adapt these techniques into a portable code library which could conceivably be run on a smartphone (such as an Android device).

- To that end, using a tripod and a digital camera, we collected 96 images of George Mason University's campus.
- We then built a routine to stitch images together, using this dataset of images to test the output.

Rotational Panorama Images

40 images were taken at 10° increments from the same fixed position along the path between the Research building and the Arts building.

Engineering Parallax

27 images were taken of the Engineering building from different vantage points, in order to generate parallax errors issues.

The Image Stitching Process

1. Take two images, A & B
2. Find keypoints for each image using SURF
3. For each keypoint in A, find closest match in B and pair up
4. Build a 'homography' for the two images using RANSAC
5. Warp image B using the homography and paste onto image A

Computer Vision Libraries to Speed Things Up

- Python & OpenCV
  - Built an OpenCV based program in using Python as a proof of concept
  - Used the SURF and RANSAC routines in the OpenCV library
  - Nearest neighbor implemented in Python (very slow!)
- Android & Boofcv
  - Built an Android application for everyday use
  - Again, used routines in the library
  - Due to memory and speed issues, best for small images ($\leq 640x480$)