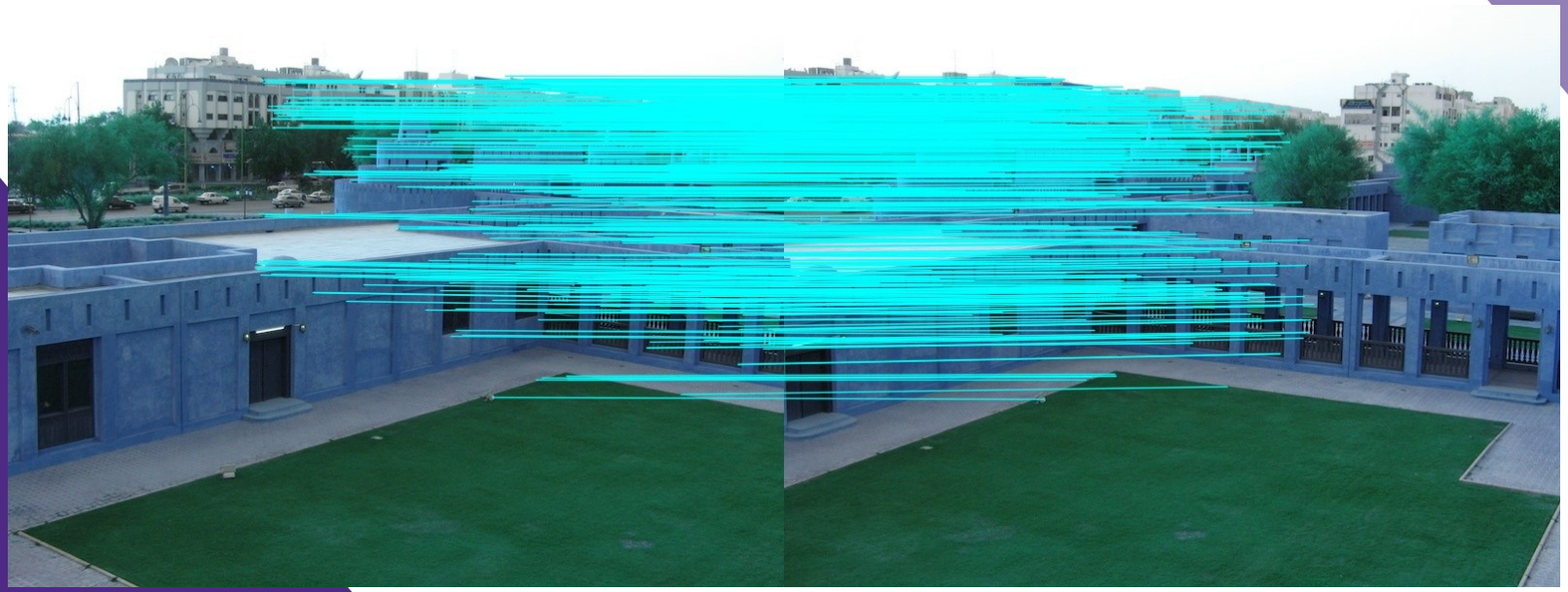
Image Stitching with SIFT and OpenCV2



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Outline

- Image Stitching Explanation
- Approach and Design
- Results
- Issues and Improvements

Image Stitching – The Goal

Source:http://richardt.name/teaching/supervisions/vision-2011/practical/

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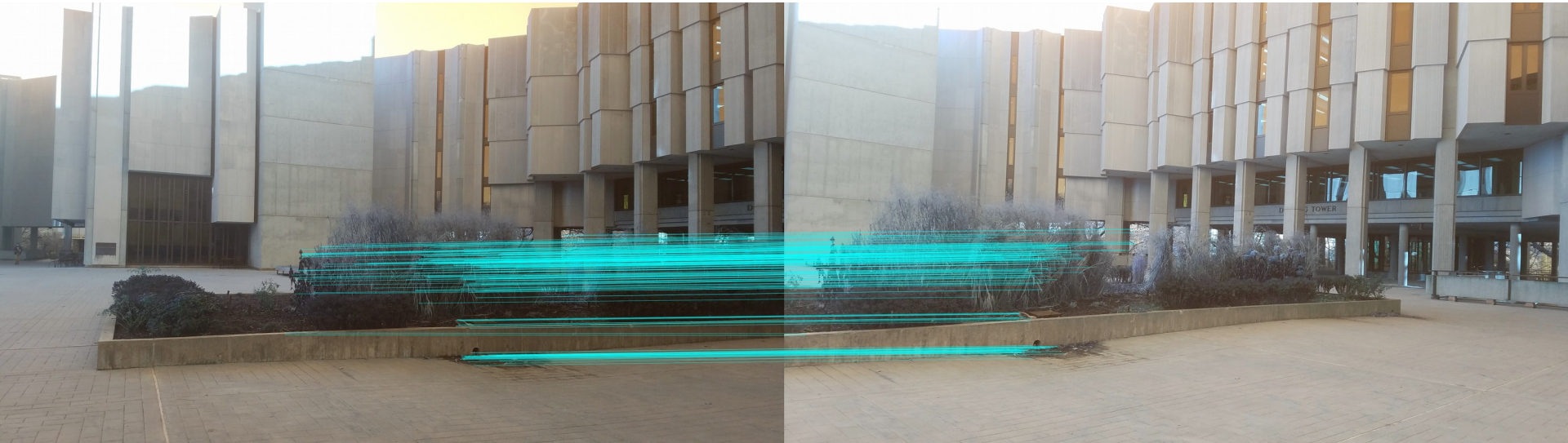
Approach

- Identify features in each image
- Mach corresponding features
- Filter outliers
- Find image homography
- Use homography to warp the second image
- Use transforms to stitch images together
- Crop empty space

Feature Identification and Matching

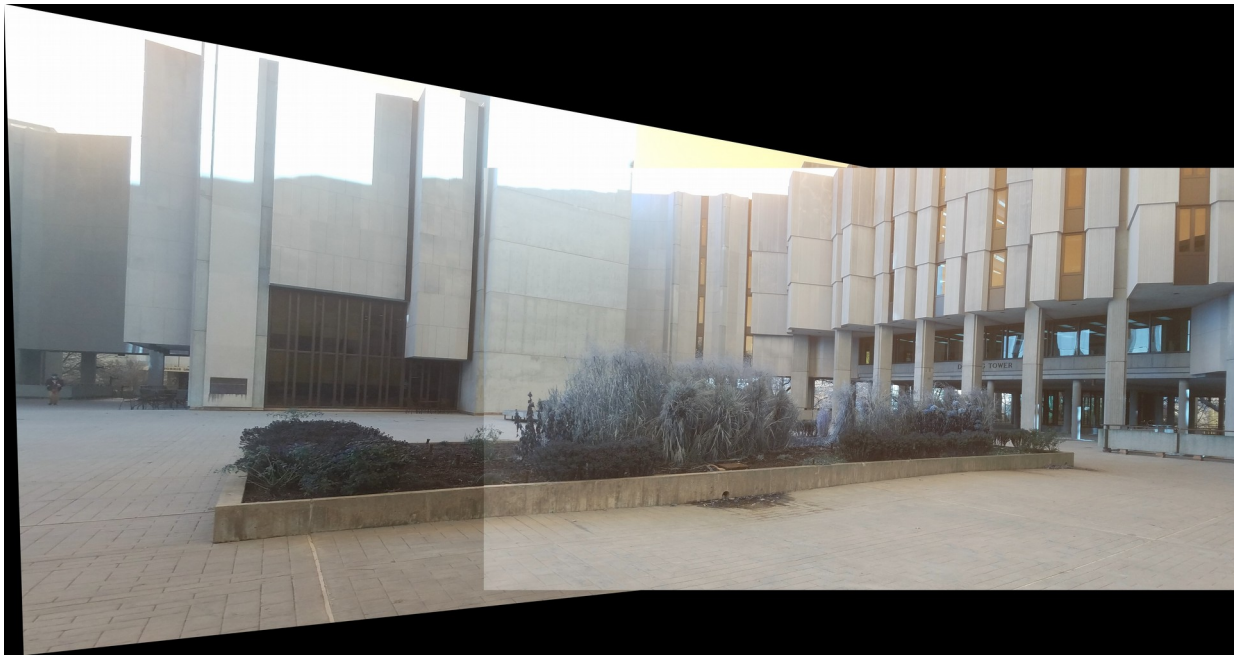
- Find keypoints and descriptors using Scale-Invariant Feature Transform (SIFT)

- Match corresponding keypoints using Fast Approximate Nearest Neighbor Search Library (FLANN)
  - Remove obvious outliers



Homography, Warping, and Stitching

- The transform of the image to be stitched is found using cv2.findHomography()
  - Used with random sample consensus (RANSAC)
  - Filters outliers and fits image to a transformation matrix

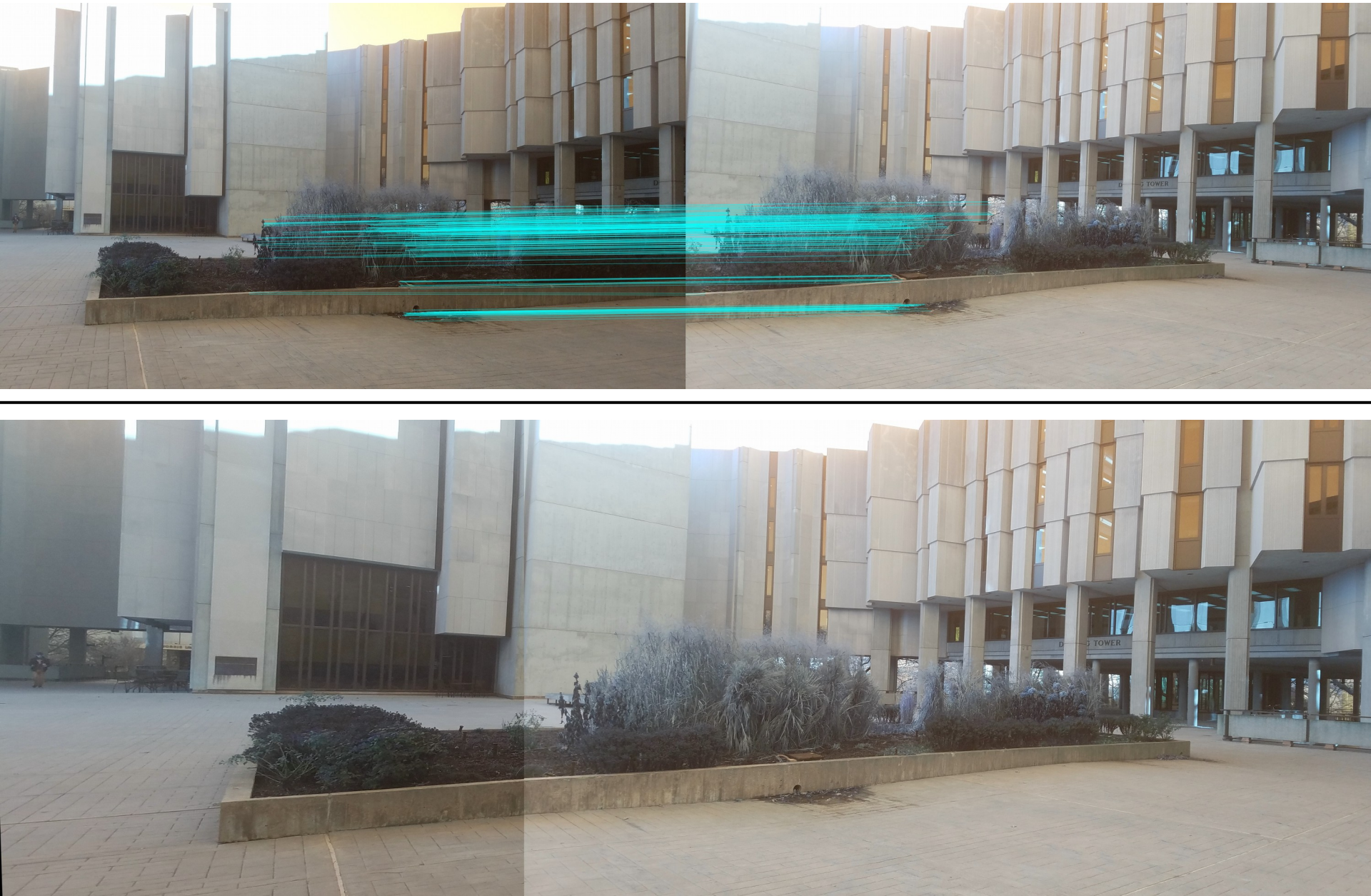


- To-be-stitched image is warped using this transformation matrix
- Matching points are used to then stitch the image

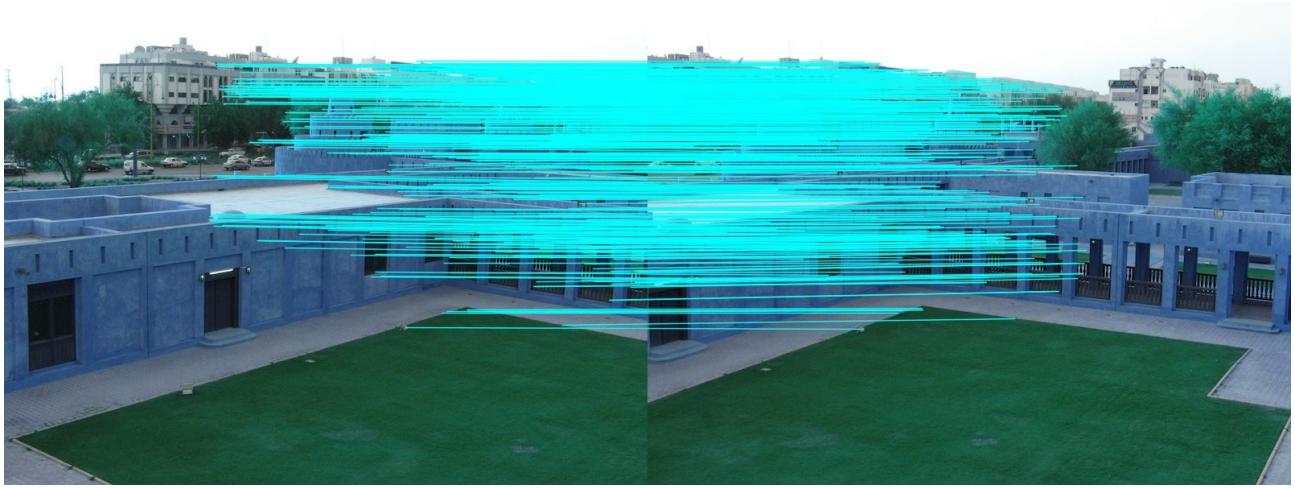
Image Cropping

- Stitched image has oversized ‘canvas’ to fit warped image
- Black space is removed by scanning the image rows and columns
- Cropped image dimensions are determined by the first rows and columns that meet a threshold black-imagedata ratio

Results – Library Courtyard



Results – Testing Images



Results – Lake from Norris

Results – Skyline

Issues and Room for Improvement

- Unable to get image blending to work properly
- SIFT is great with landscapes, but not so great with high detail

- Poor stitching/cropping performance with certain camera motions