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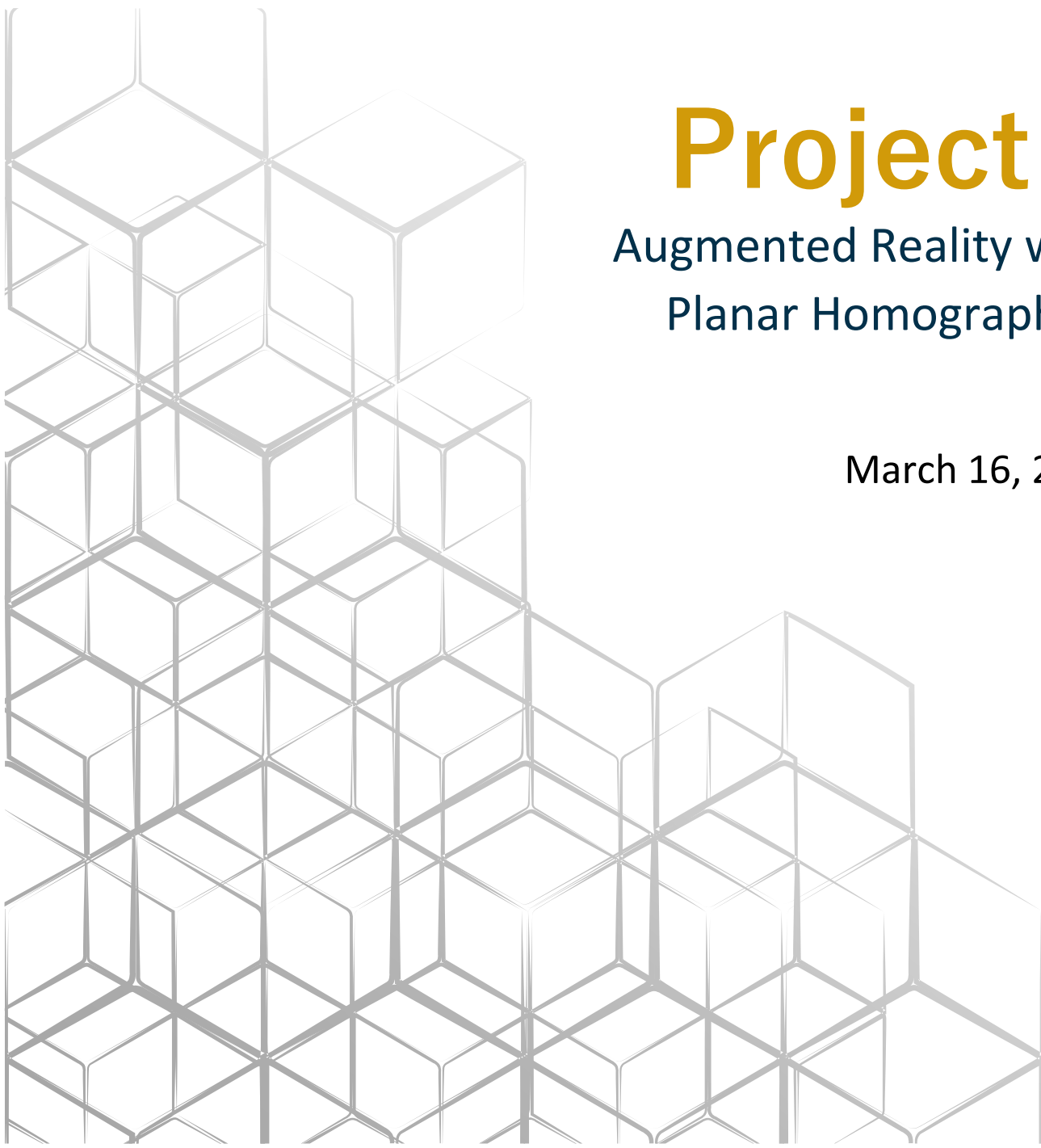
CMPT 412: Computational Vision

Dr. Furukawa

Project 4

Augmented Reality with
Planar Homographies

March 16, 2023



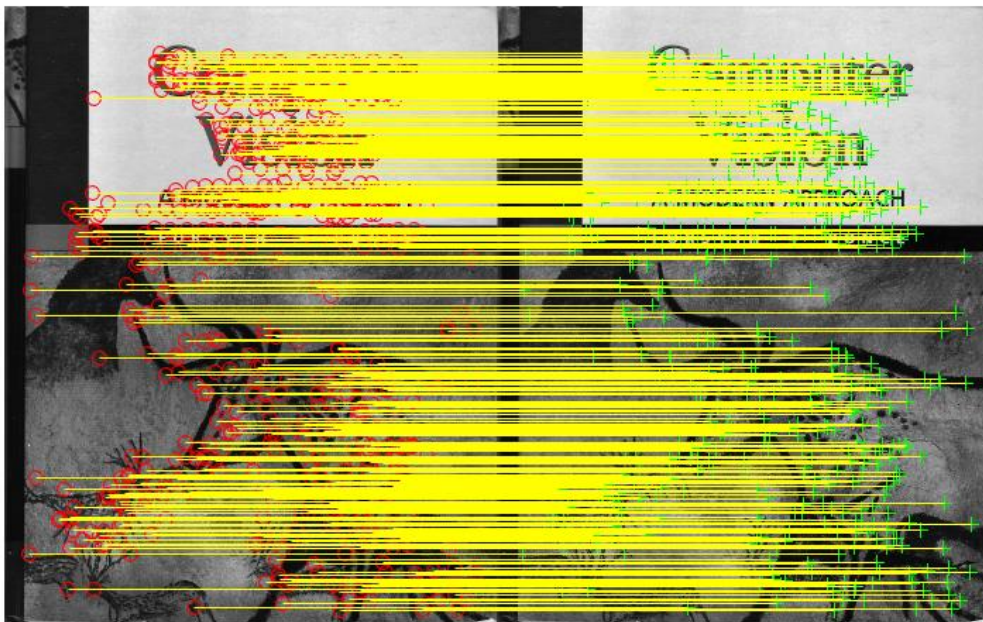
4.1 – Feature Detection, Description, and Matching

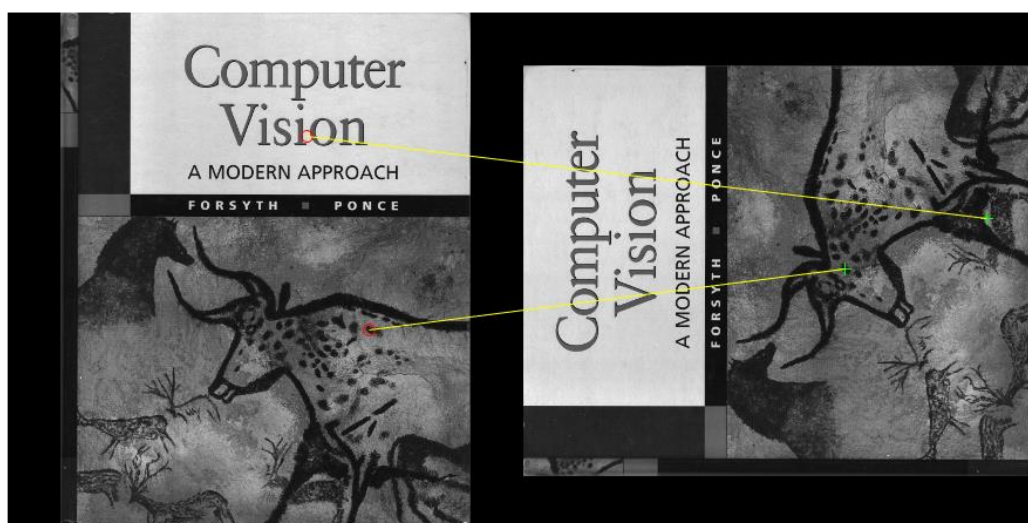
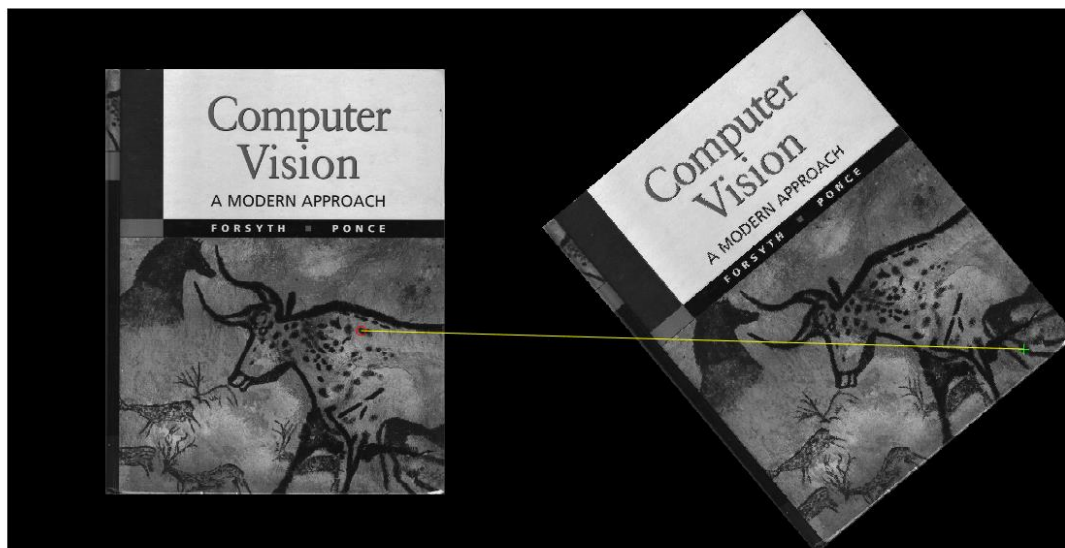
For the MaxRatio property, I went with the value of 0.688, since it gave the matchings closest to the example in instructions.

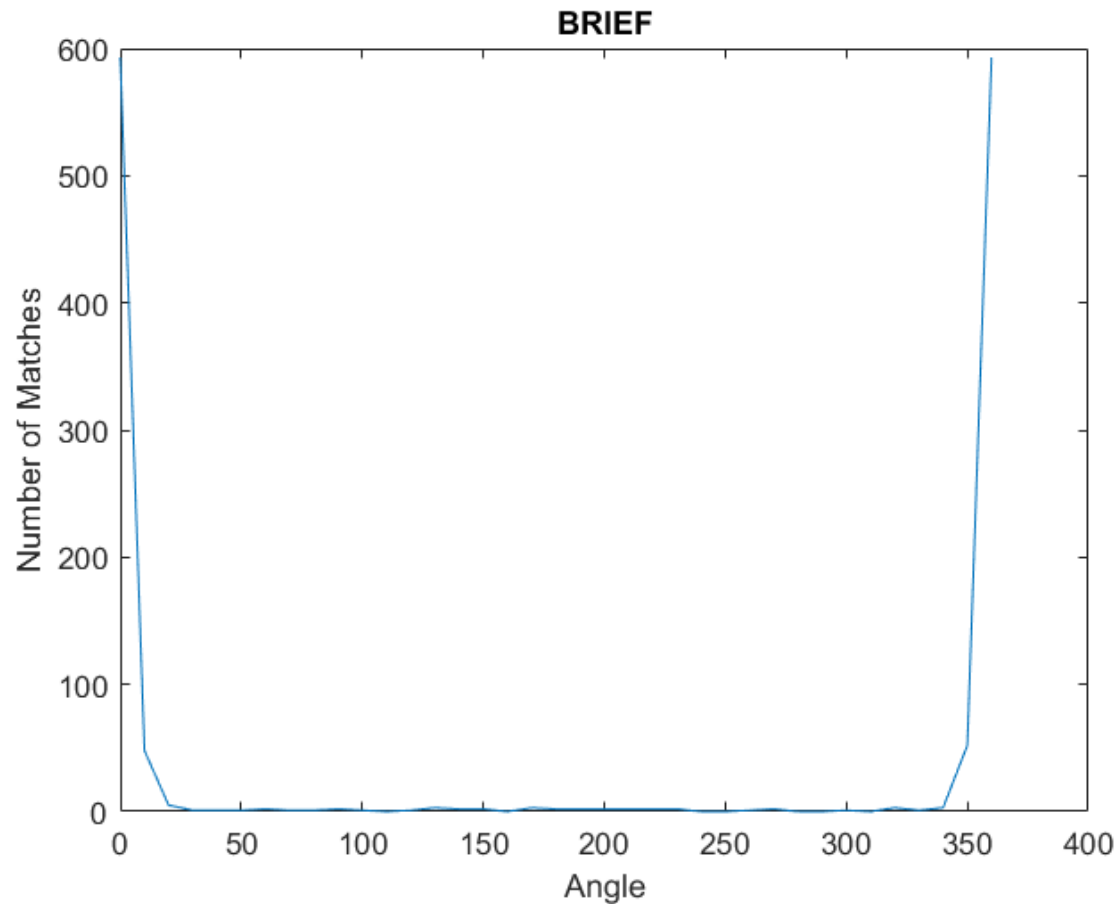


4.2 – BRIEF and Rotation

Matches for FAST features and BRIEF descriptors with MaxRatio 0.668 at 0°, 40°, 90° rotations.

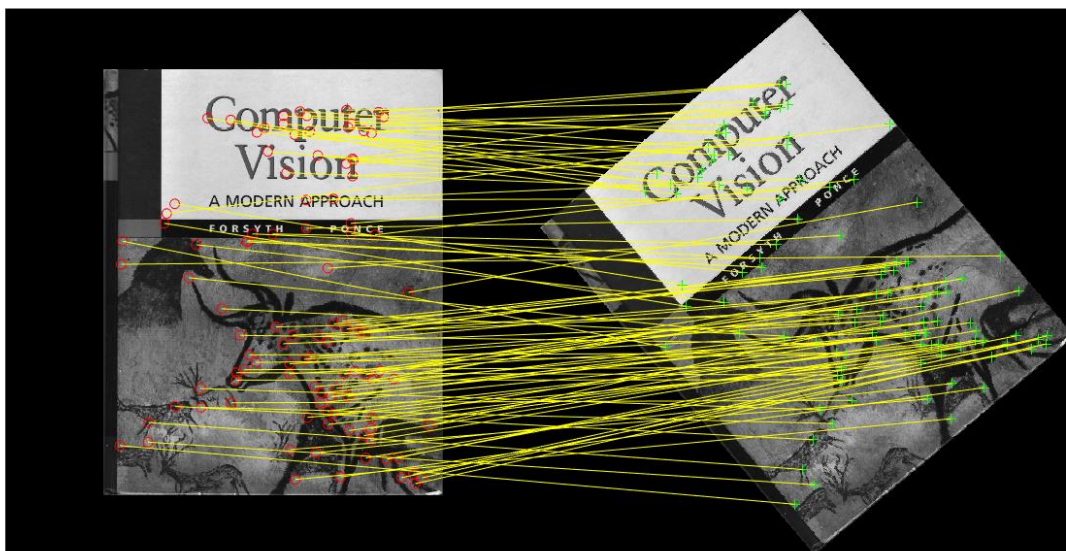
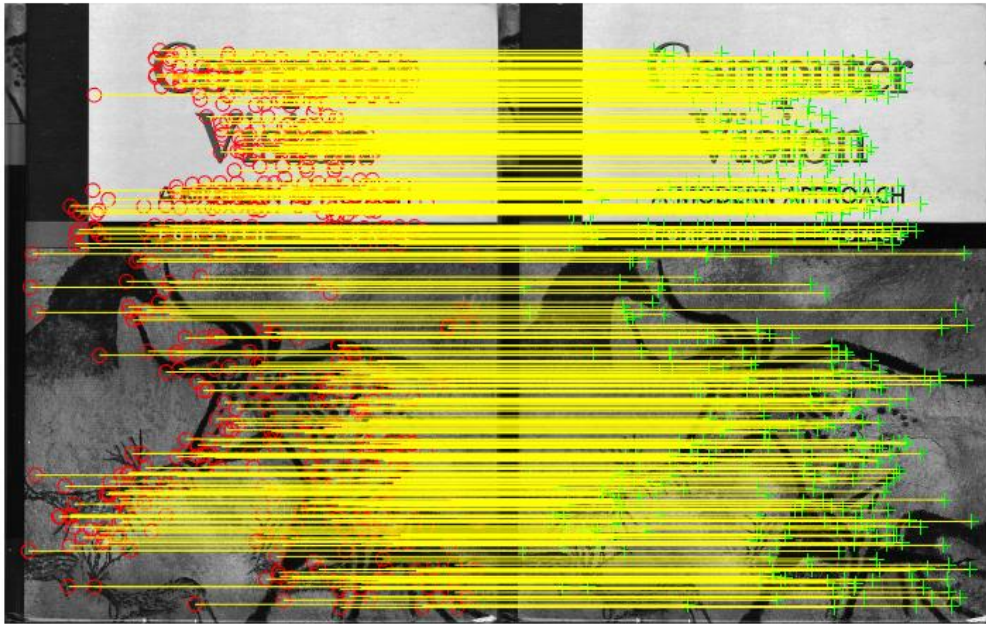


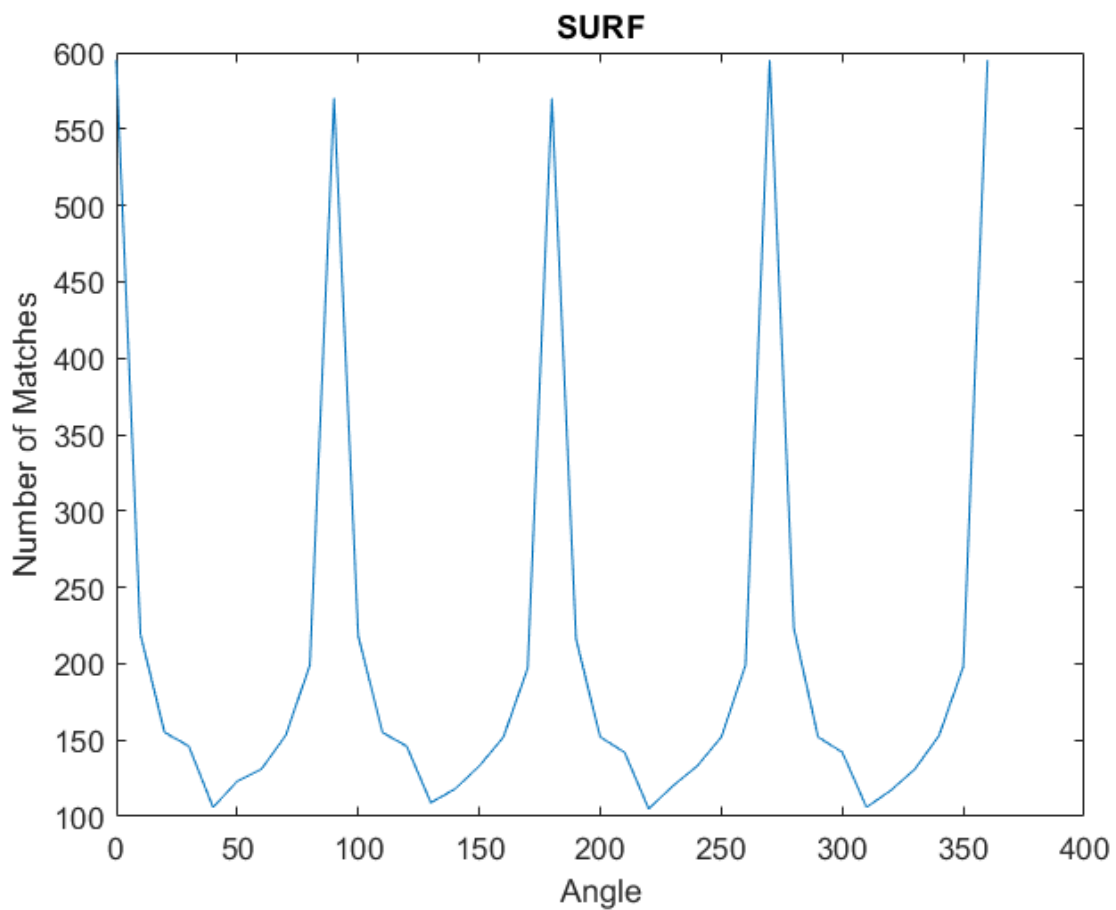
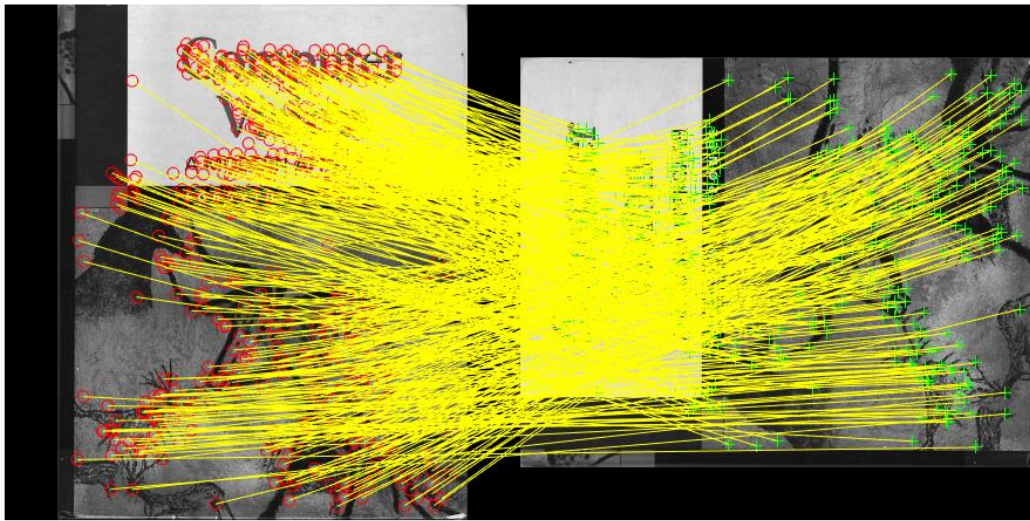




As seen on the plot, BRIEF descriptor gives good result only for image rotations at 0 (id est when image is compared against its exact copy), giving very few matchings for other angles. It behaves this way due to the fact that BRIEF compares the smoothed pixels against each other and thus doesn't involve any type of orientation coordinates, thus we can't even try to guess if the area descriptor tries to match is the same one but under a certain rotation. This is different from most algorithms that combine detection and description, since they do involve orientation and try to properly align described region, thus achieving rotational invariance.

Matches for SURF features and descriptors at 0°, 40°, 90° rotations.

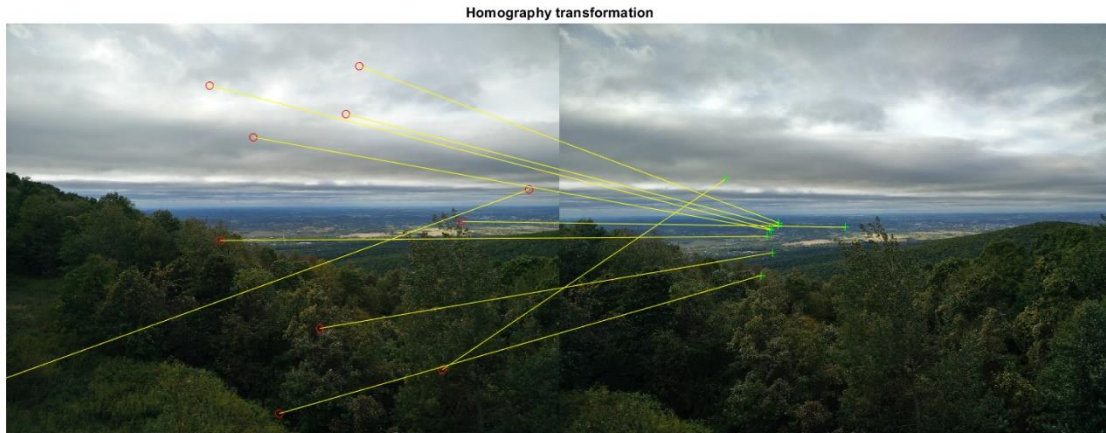




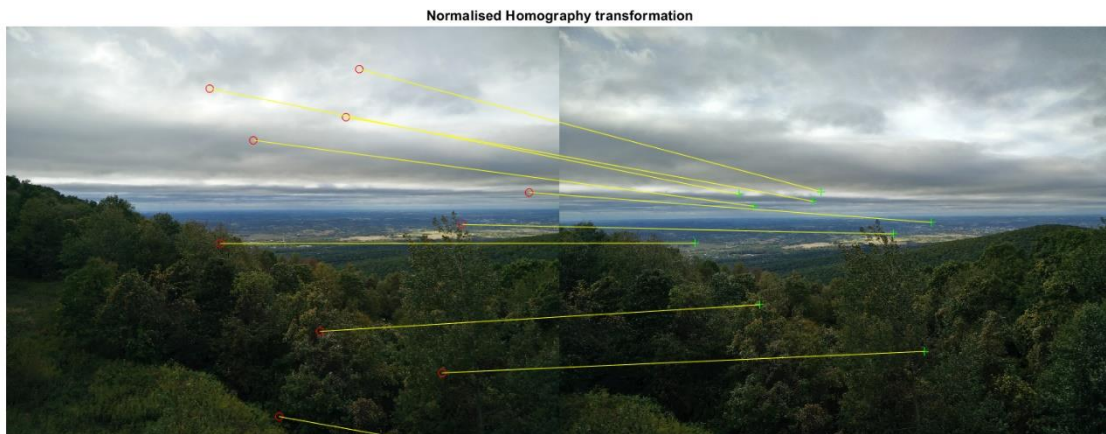
The results are significantly better. BRIEF descriptor was giving decent number of matches only when the rotated image was at the 0 degrees rotation (id est, images were identical). Meanwhile, SURF descriptor gives at least 100 matches across all

angles of rotation, additionally reaching almost the same number of matches as when the image was compared against itself when the angle of rotation becomes a right angle (90, 180, and 270 degrees).

4.3 – Homography Computation



4.4 – Homography Normalisation



4.5 – RANSAC

RANSAC 4 point-pairs



RANSAC inlier matches transformation



4.6 – HarryPotterizing a Book

