# Project 2

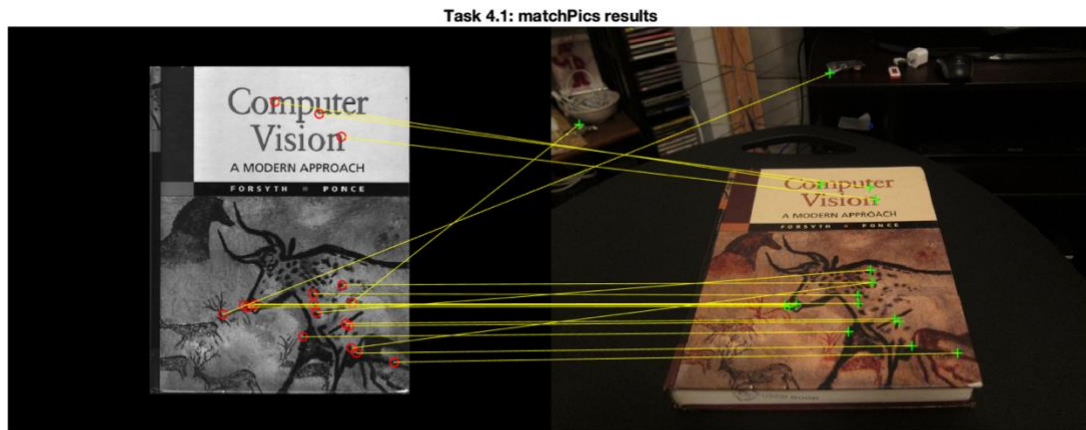# Augmented Reality with Planar Homographies

Computer Vision - CMPT 762

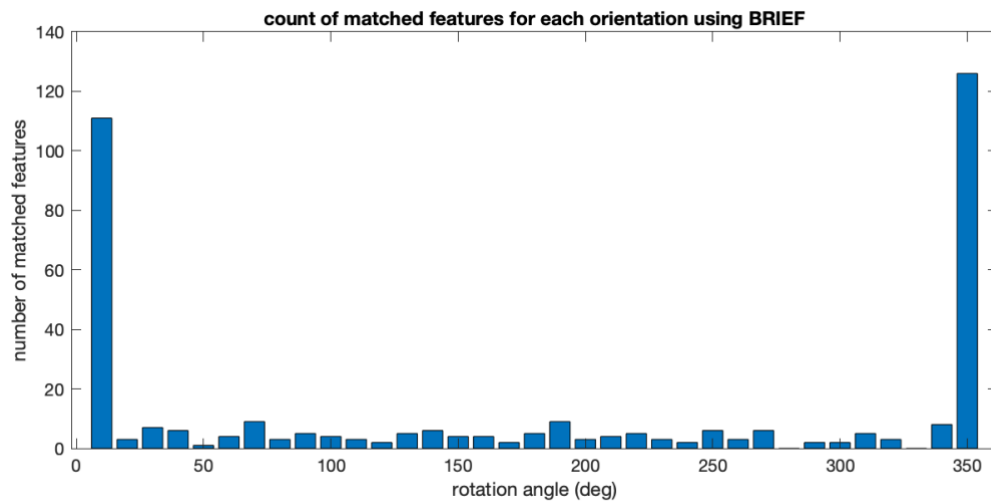# 4. Tasks: Computing Planar Homographies

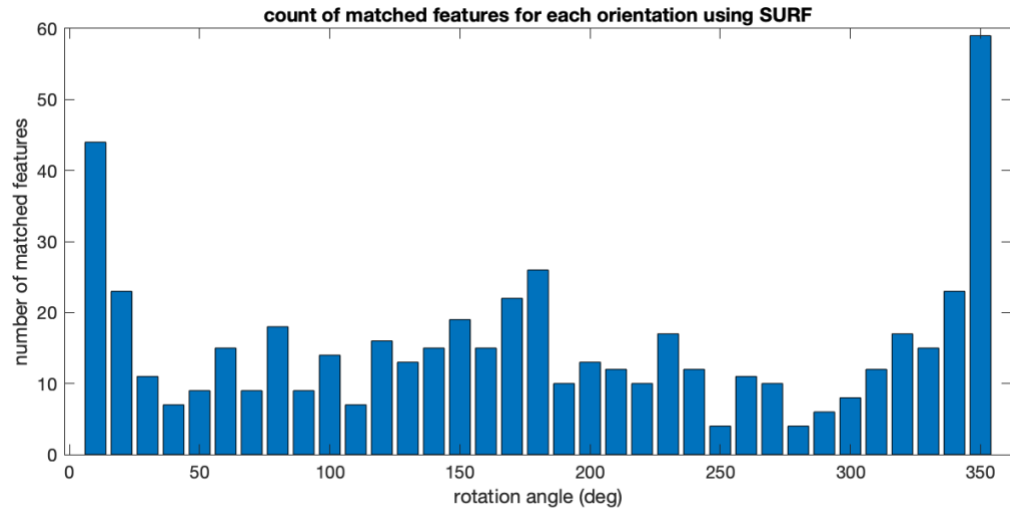## 4.1. Feature Detection, Description, and Matching

Run test.m to see the results.



## 4.2. BRIEF and Rotations

Run briefRotTest.m to see the results. Here you can see the count of matched features for each orientation using BRIEF and SURF.
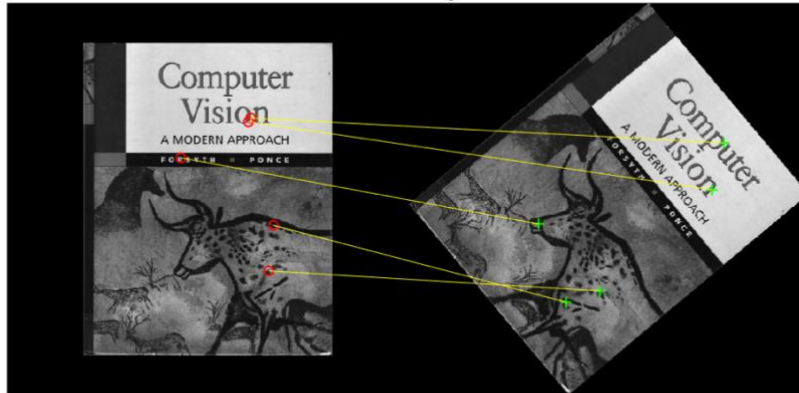
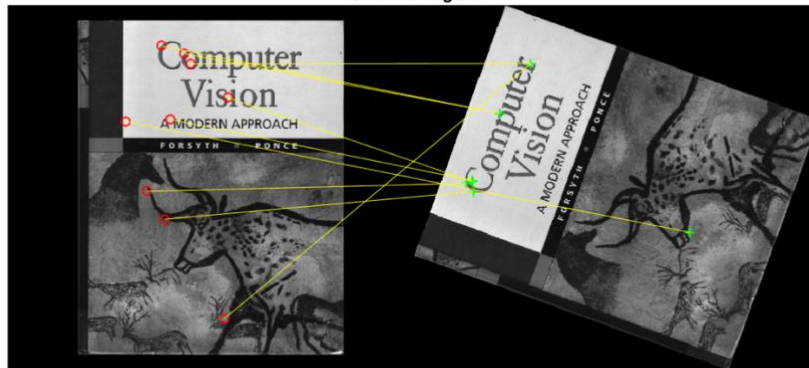count of matched features for each orientation using SURF

Here you can see feature matching result at three different orientations using BRIEF and SURF (70, 150 and 310 degrees):
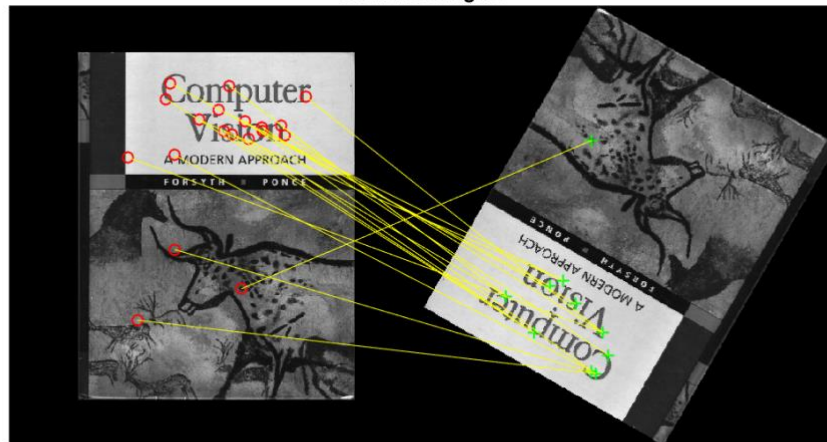

BRIEF:70 degree
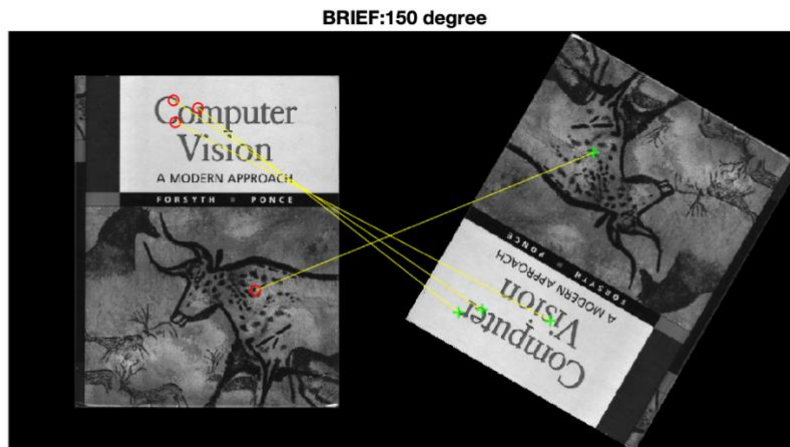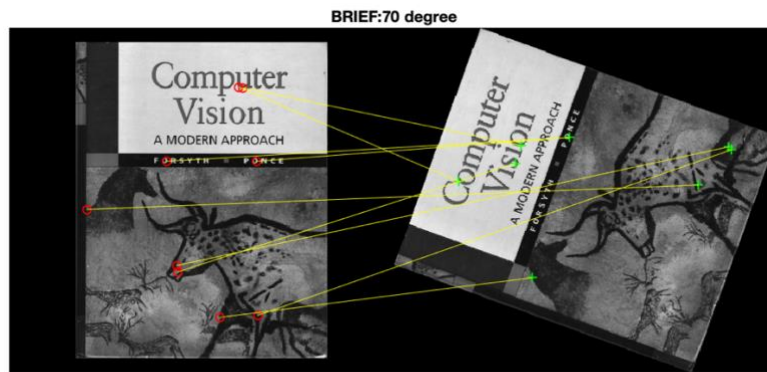

BRIEF:150 degree
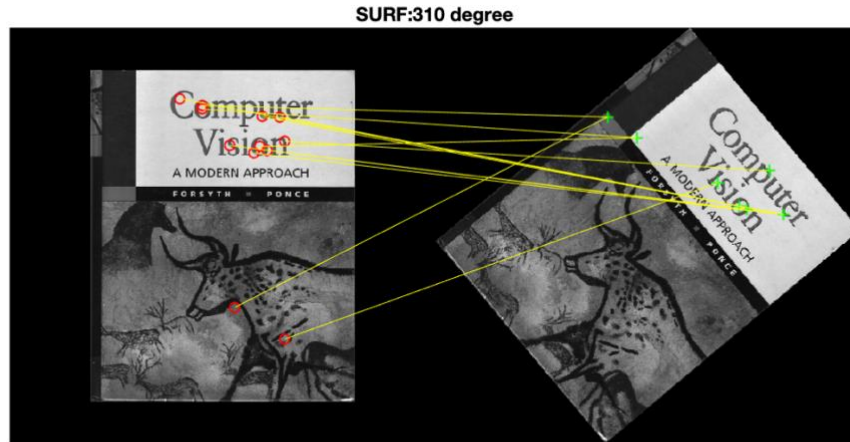
**BRIEF:310 degree**



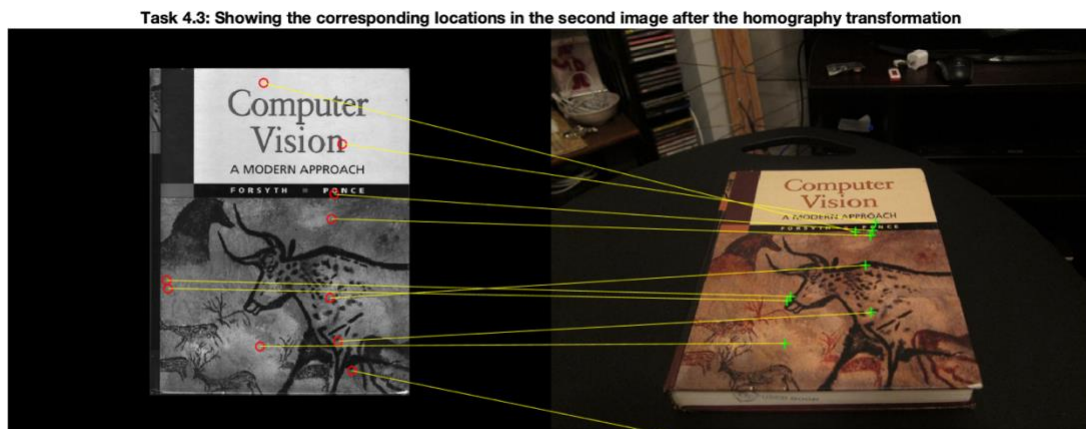**SURF:70 degree**



**SURF:150 degree**

SURF:310 degree

As you can see, BRIEF is not rotation invariance, but it can tolerate small in-plane rotation.

BRIEF descriptor uses FAST feature extractor and FAST does not compute the orientation and is rotation variant. It computes the intensity weighted centroid of the patch with located corner at center. The direction of the vector from this corner point to centroid gives the orientation. So, the descriptor BRIEF poorly performs if there is an in-plane rotation. But surf can perform better when we have large in-plane rotation. [paper](#)
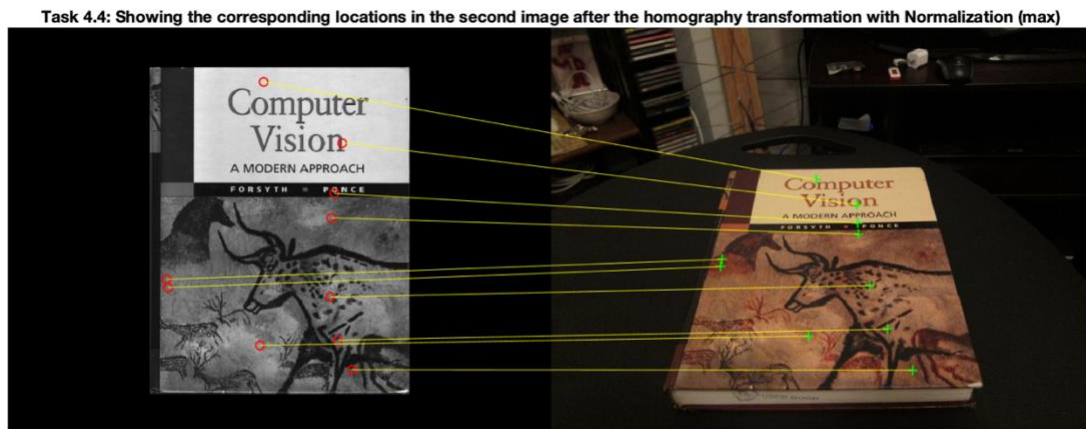
## 4.3. Homography Computation

Run test.m to see the results. The number of random points from the first image is 10. As you can see the result is not perfect.


Task 4.3: Showing the corresponding locations in the second image after the homography transformation
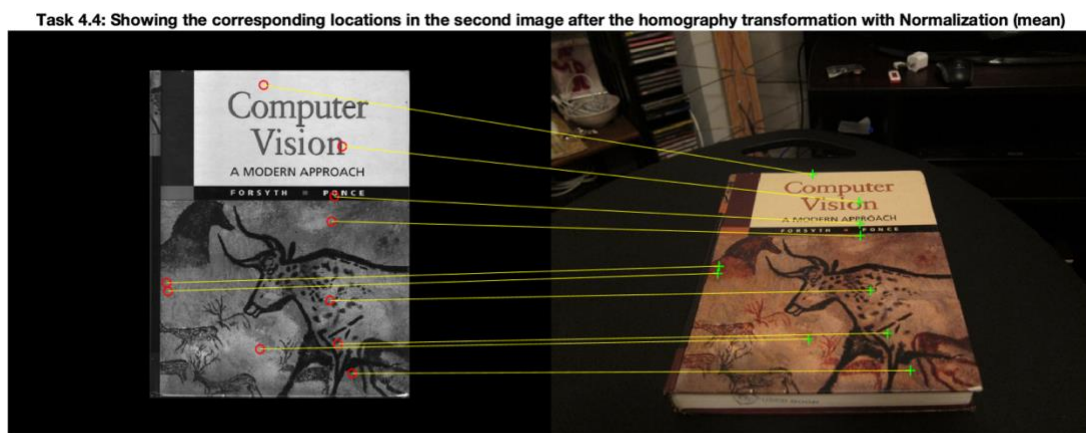
## 4.4. Homography Normalization

Run test.m to see the results. As you can see the results with normalization are much better.

Using the largest distance to the origin:



Task 4.4: Showing the corresponding locations in the second image after the homography transformation with Normalization (max)

Using the average distance to the origin:



Task 4.4: Showing the corresponding locations in the second image after the homography transformation with Normalization (mean)
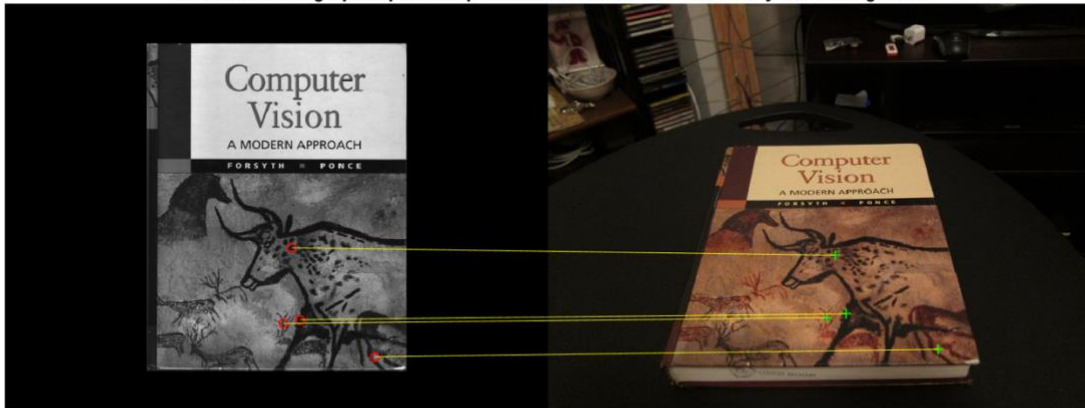
## 4.5. RANSAC

Run test.m to see the results. You can see 4 point-pairs that produced the most number of inliers and the inlier matches that was selected by RANSAC algorithm.

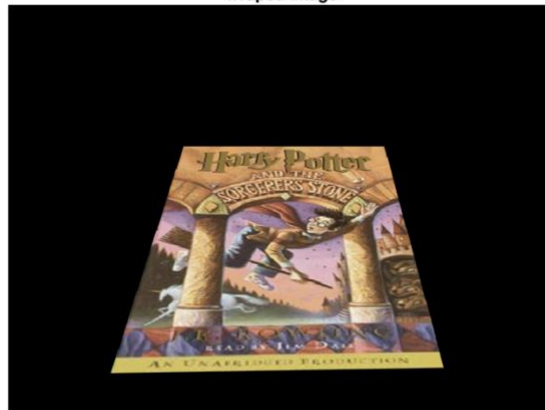Task 4.5: the inlier matches that was selected by RANSAC algorithm
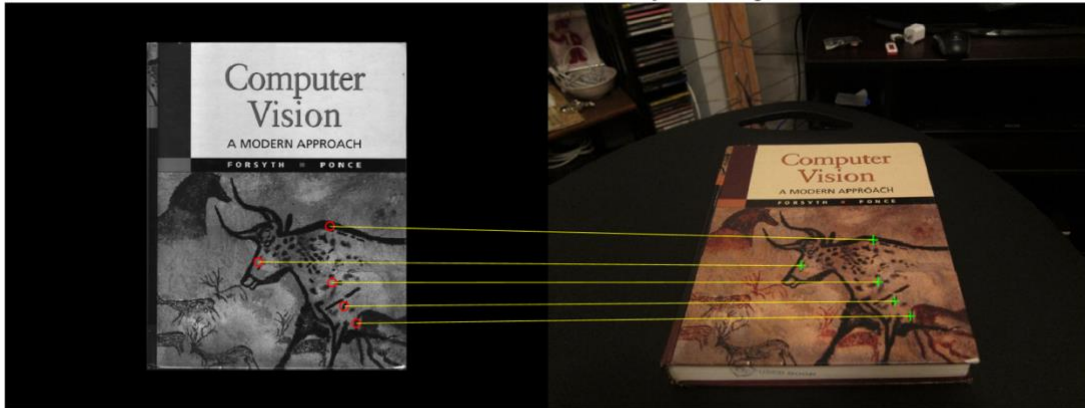

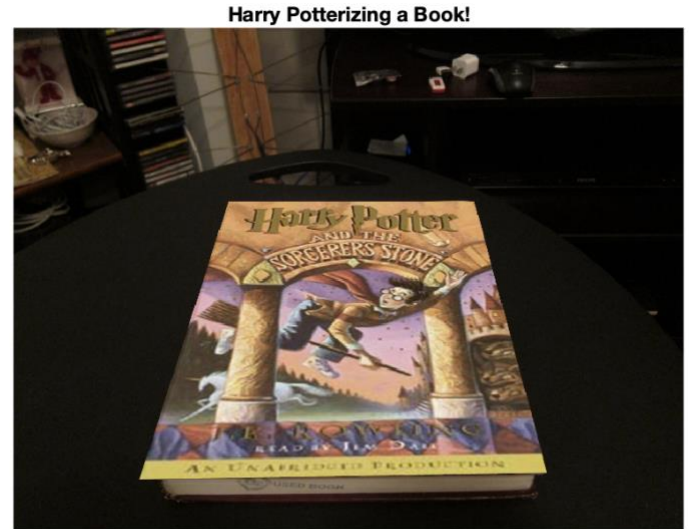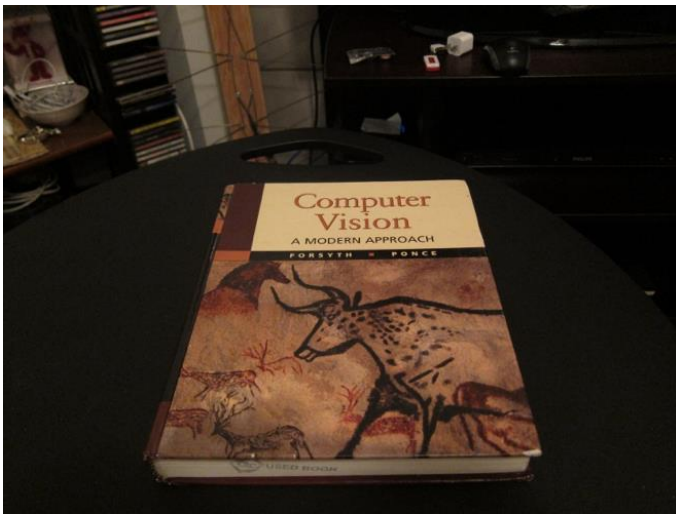Task 4.5: visualizing 4 point-pairs that produced the most number of inliers by RANSAC algorithm

# 4.6. HarryPotterizing a Book

Run HarryPotterize.m to see the results.


wraped image

Harry Potterizing a Book!

# 5. Creating your Augmented Reality application

Run ar.m to see the results.