Assignment 2
Computer Vision

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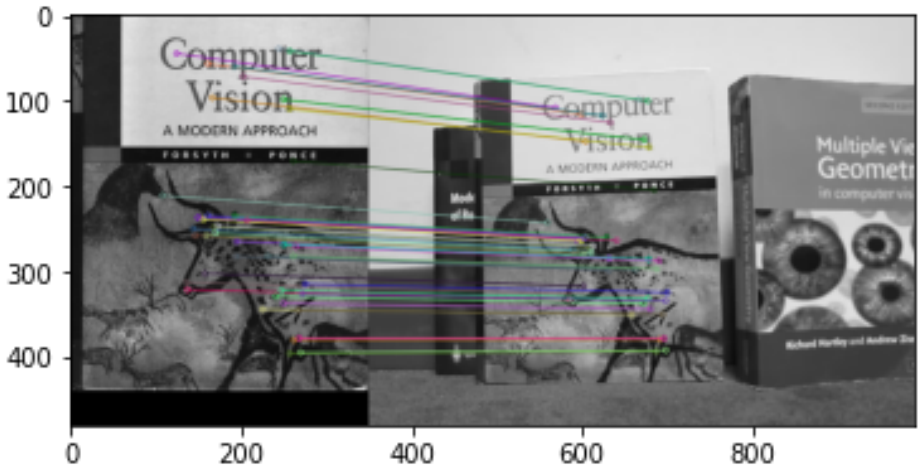
Part 1

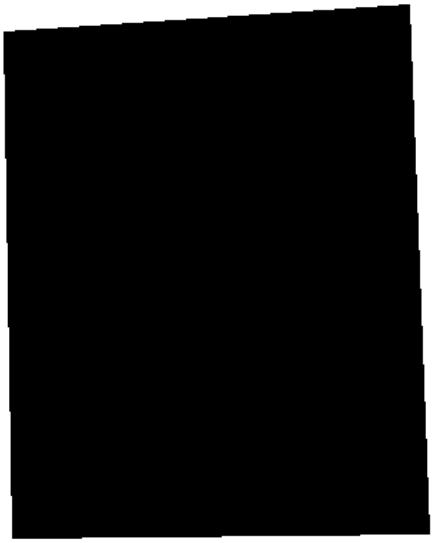
- Loading the videos and book image
- Getting Correspondences
    - We used the SIFT descriptor from opencv library to find keypoints in each image and then used the brute force matcher from opencv to get the correspondences using the matching way as KNN with size 2, then we did ratio checking between the best 2 matches to filter the good correspondences.
      Then chose 50 correspondences and plotted the book image, the first video frame and the matches as shown below.



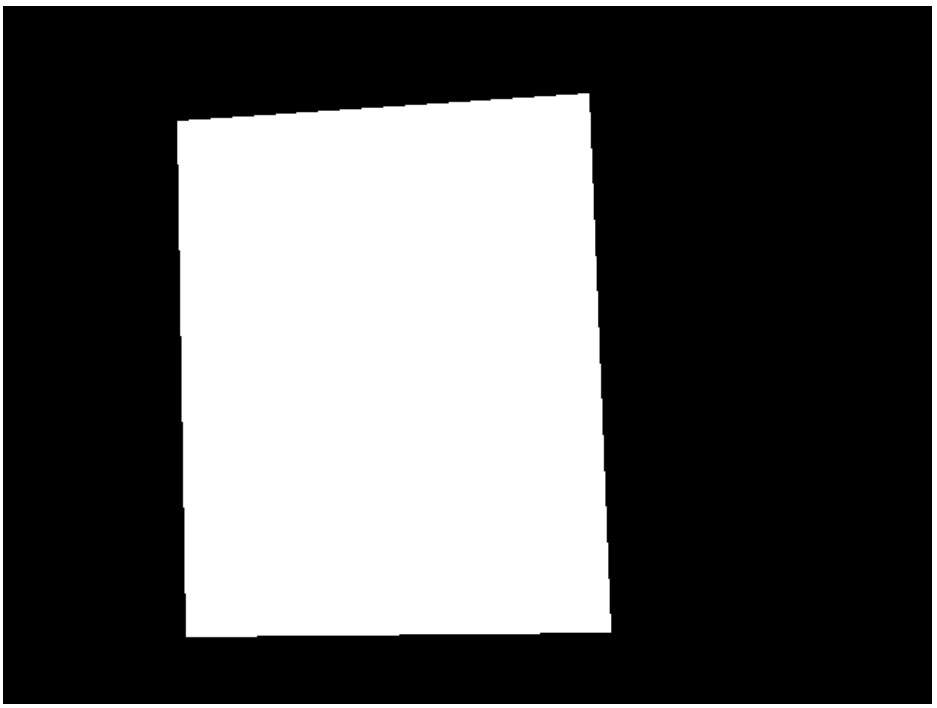
- Compute the Homography Parameters
    - We used matches got from previous step to get homography matrix
    - Here we used the RANSAC algorithm → Every time we choose 4 random points and get a homography matrix then get the number of inliers w.r.t total number of matches → if it is <= required ratio so this is our best homography matrix.Our final homography matrix can be got from those inliers.

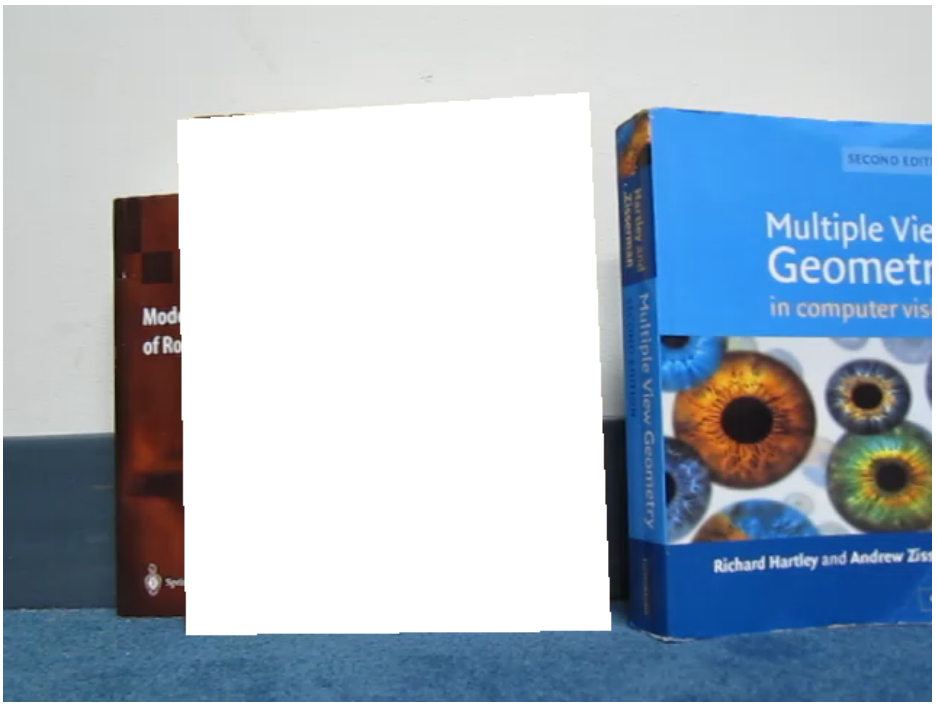
- Calculate Book Coordinates
    - We did this by mapping the four corners of the book image (cover) to the first frame in the book video using the homography matrix calculated previously
    - We computed the difference between the center of the book in the video and the center of the ar video
    - using the difference computed above we found the corners of the frame in the ar video that we wanted to crop around.

- Crop AR Video Frames
  - mask to extract the wanted frame from the ar video



- mask to remove book from book video using the coordinates computed above





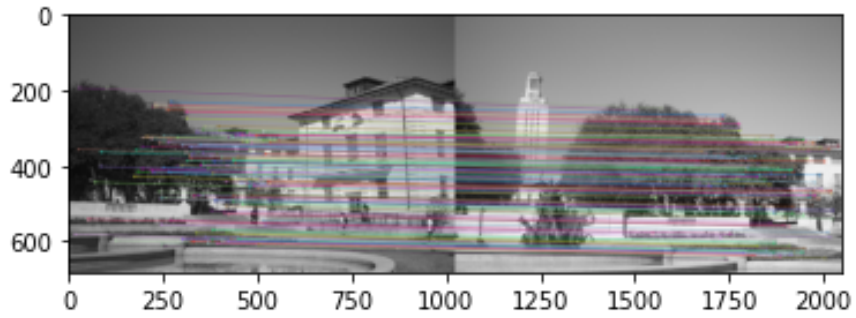
- using the difference to translate the modified ar frame to the new position

- Overlay the First Frame of the Two Videos

- Creating AR Application
  - We looped the previous steps on each frame in the ar video
  - Video Link: https://drive.google.com/file/d/1-F3Vqf0BfashWH8fYQG_onvK4PiY2zk8/view?usp=sharing

Part 2

- Reading images
- Getting Correspondences and Compute the Homography Parameters as done in part 1



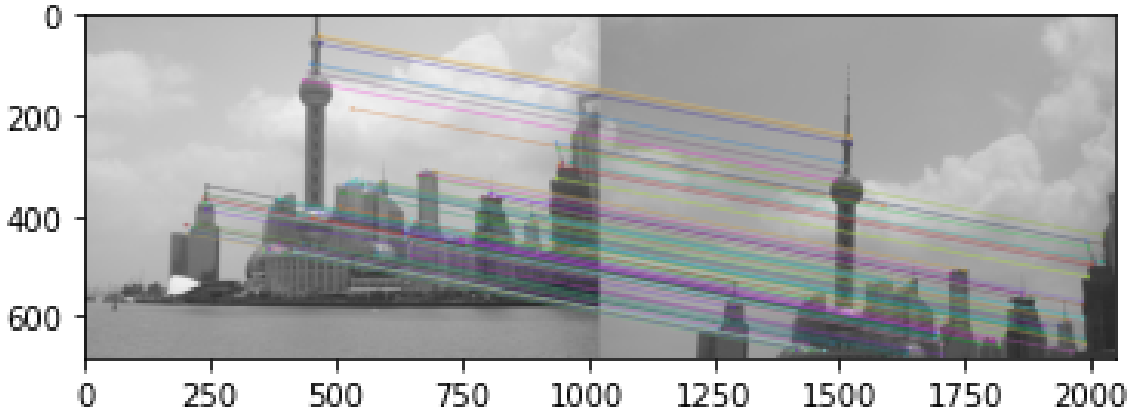
- Warping Between Image Planes
  - Forward Warping
    - Here we used Homography matrix computed above to rotate the right image to be able to overlay the 2 images on each other

- Inverse Warping
  - After image is rotated in the warping we will see some black pixels in the rotated image between colored pixels
    - To help to overcome this problem we looped on pixels of rotated image and found the pixels corresponding to them in the source image → if their corresponding pixels are fractions → We used linear interpolation to solve this.

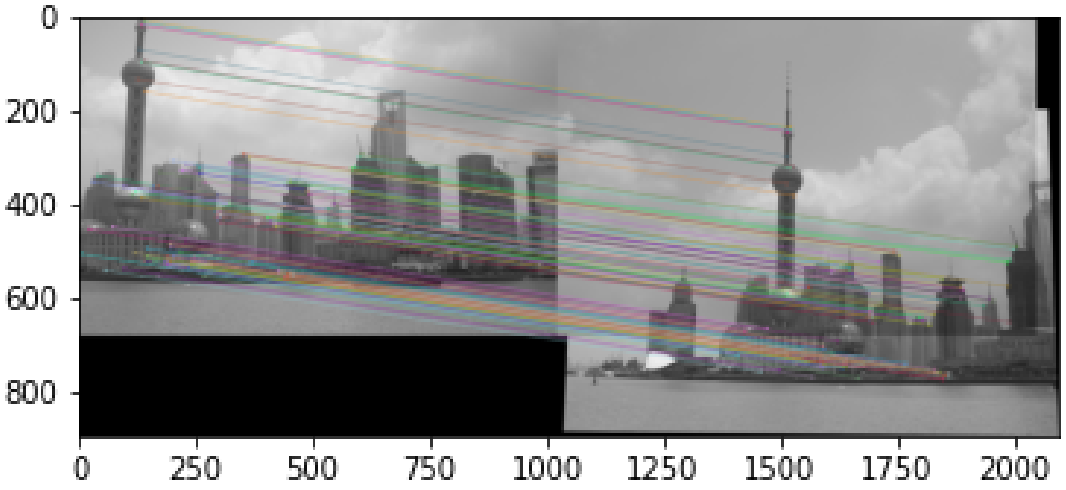
- Create the output mosaic
  by overlaying one view onto the other, and leaving it black wherever no data is available.

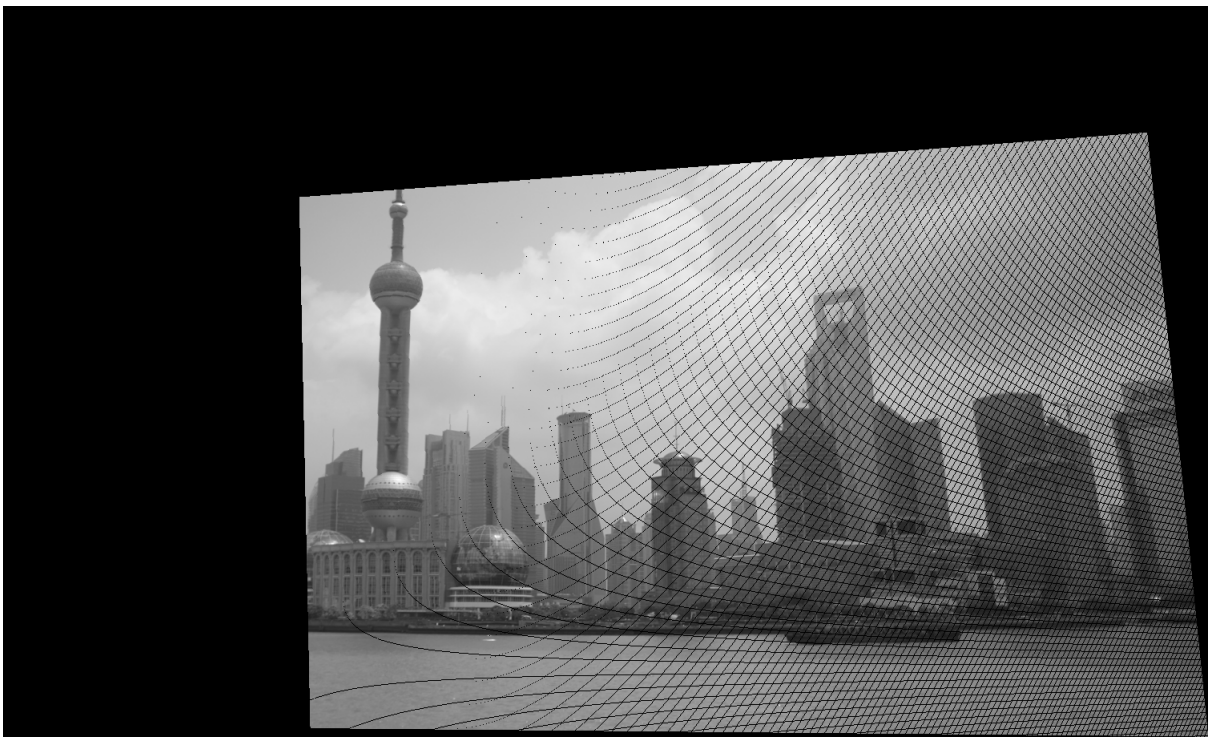
Bonus

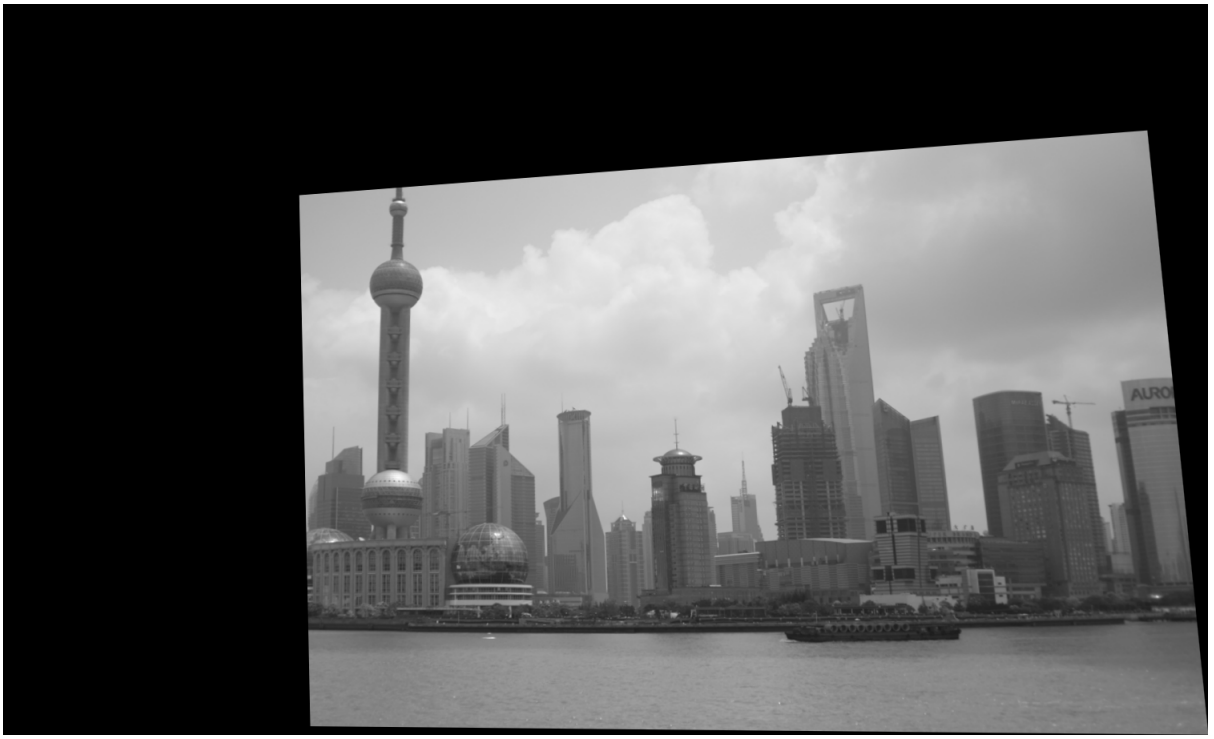
- Stitching Image 21 with 22



- Stitching the result from above and image 23







Colab links

Part 1:
https://colab.research.google.com/drive/1Tn7BviM-JZwkOtSk0wwvJlKaJYHBAYoT?usp=sharing

Part 2:
https://colab.research.google.com/drive/1g4hvnTbzEA_dUsK9y4BecwKLyJ3GSwgq?usp=sharing

Bonus:
https://colab.research.google.com/drive/1XSLow5rCRA0AQF3LQjtsJ_QAVgFZM9-b?usp=sharing