HW4 Supplement

Local Feature Matching and Image Stitching

Due: 23:59 12/22/2016

Office Hour

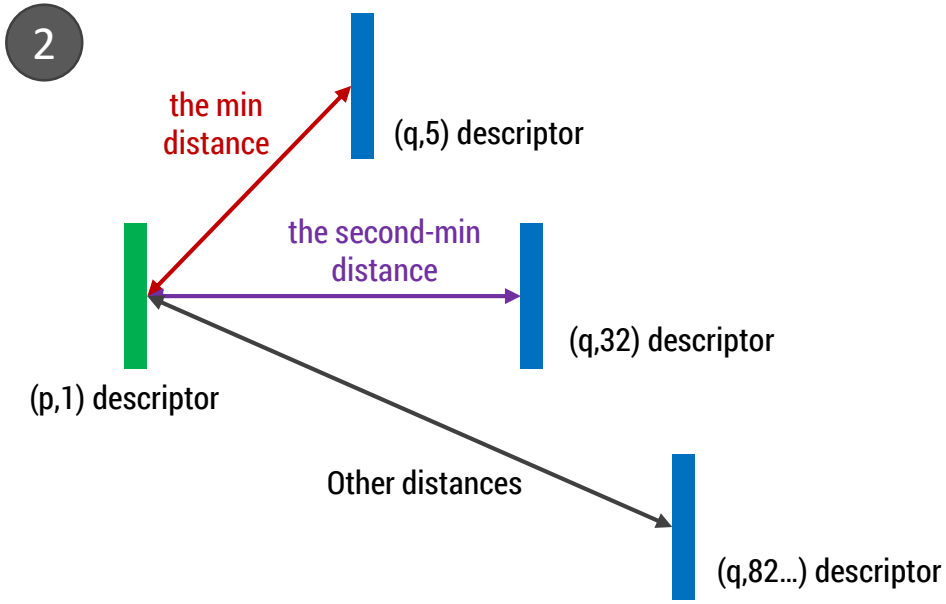
(Mon) 7:00 p.m. – 8:00 p.m.

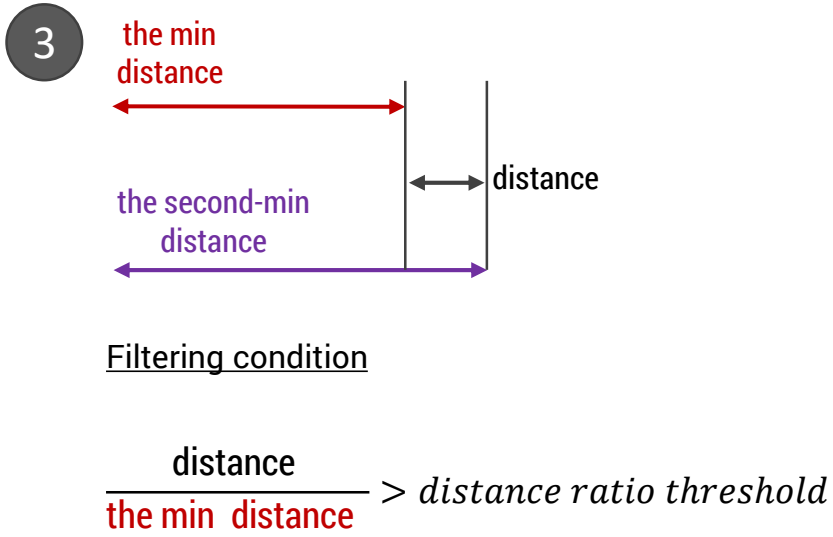
(Wed) 7:00 p.m. – 8:00 p.m.

@Delta 721

Part 1 Problem A

- Filter matching correspondences with distance ratio?
  1. For image p and q, where p has m descriptors and q has n descriptors
  2. You can use Euclidean distance to find closest matching
  3. The **distance** of (the min distance) and (the second min distance) between SIFT descriptor should be large enough
     - Ex:





Part 1 Problem A

- Filter matching correspondences with distance ratio?
  - For image p and q, where p has m descriptors and q has n descriptors
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  - Ex:

$$distVec(p1, q1 \dots qn) = dist\big(\, p_{descriptor}(1, 1{:}\,128), q_{descriptor}(1 \dots n, 1{:}\,128)\big)$$

$$if\ \frac{1^{st}\min(distVec)\ - 2^{nd}\min(distVec)}{1^{st}\min(distVec)} > distance\ ratio\ threshold,$$

keep this matching correspondances under NN strategy

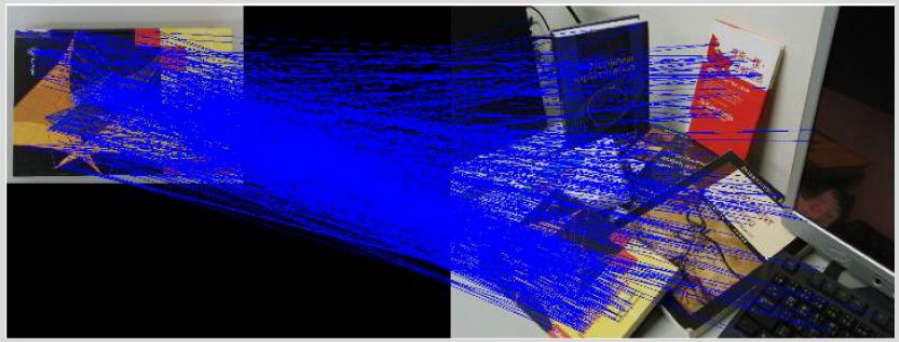
$$else,$$

abandon this matching correspondces.

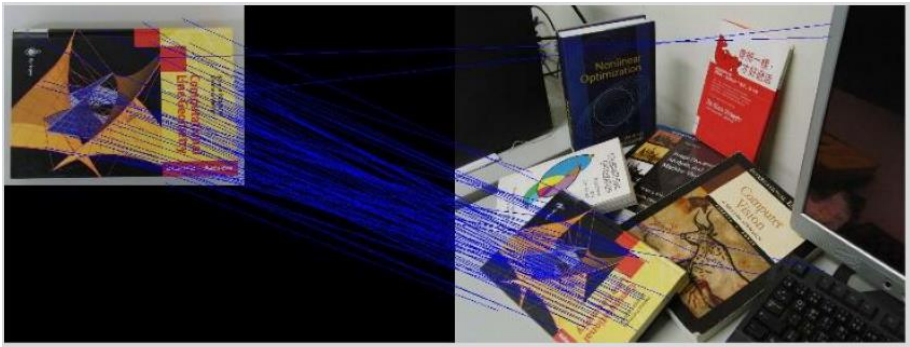
  - Test to determine the **distance** threshold

Part 1 Problem A

- An example of showing results (use green line in your figures)



Correspondences in low distance threshold



Correspondences in high distance threshold

Part 1 RANSAC

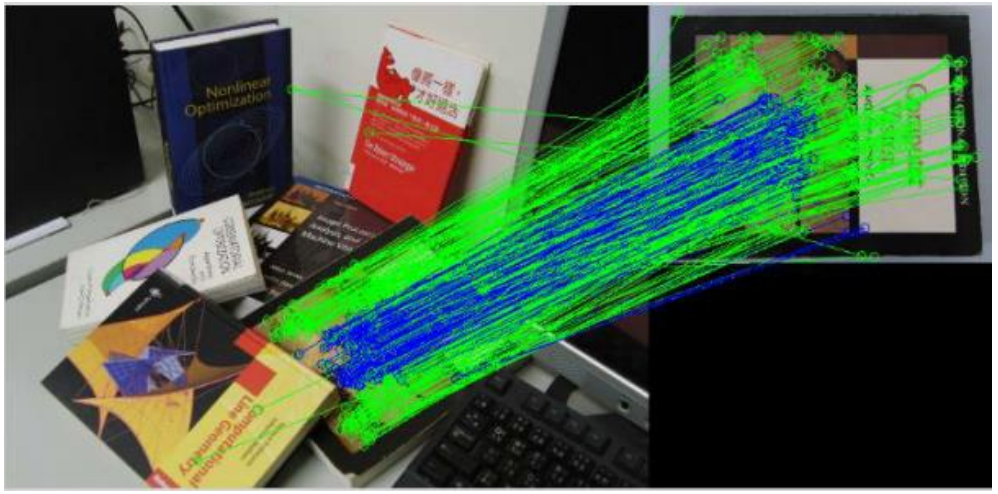
- Steps
  1. Randomly select a seed group of points on which to base transformation estimate (e.g., a group of matches)
  2. Compute transformation from seed group
  3. Find inliers to this transformation
  4. If the number of inliers is sufficiently large, re-compute least-squares estimate of transformation on all of the inliers

- Parameters settings
  - Set a threshold to find inliers (step 3)
    - **Euclidean distance of (Transformed points and Target points) < Threshold**
  - Max iterations (1 iteration / step 1 to 4)

Part 1

Problem B

1. Plot the inliers(red) and outliers(green). **(3 images)**



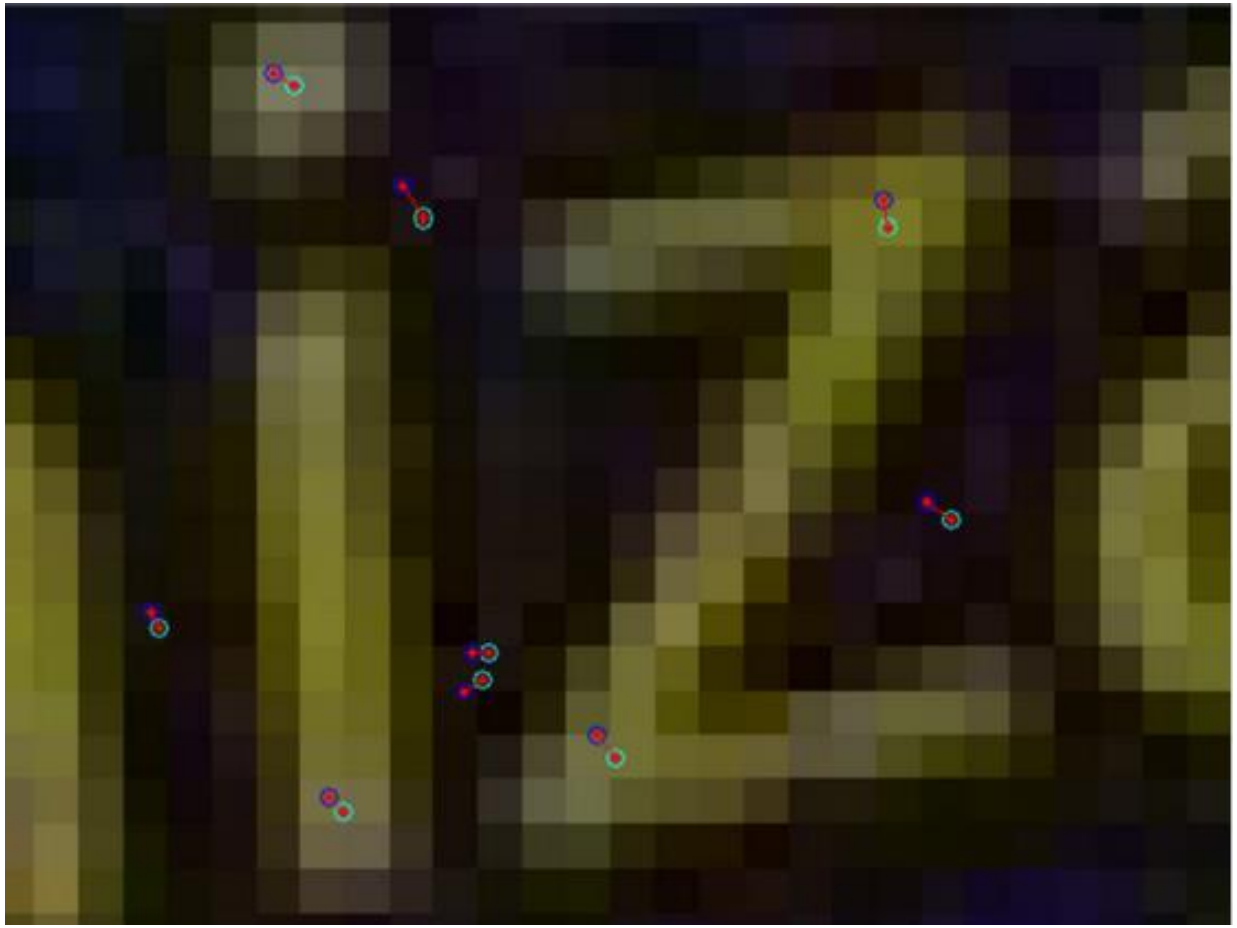
2. Plot the human labeled boundary of each book image and transform them into cluttered-book image. **(3 images)**

Hints: Use "clicker.m" to get the books corner and draw "line" on the edges

Part 1

Problem D

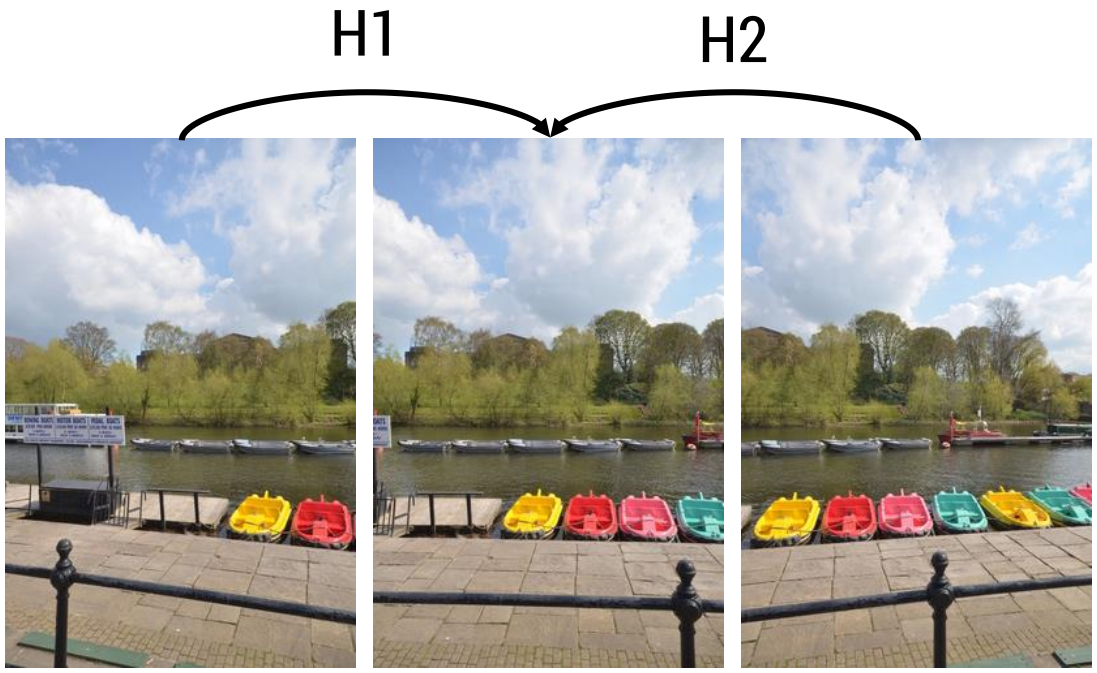
- Plot the deviation vectors of the inlier correspondences. (3 images)



Part 2

Goals

- We are stitching left and right images to the center image
- Similar to Part 1. Extract features with defined distance ratio and apply Homography using RANSAC
- Show the stitching result

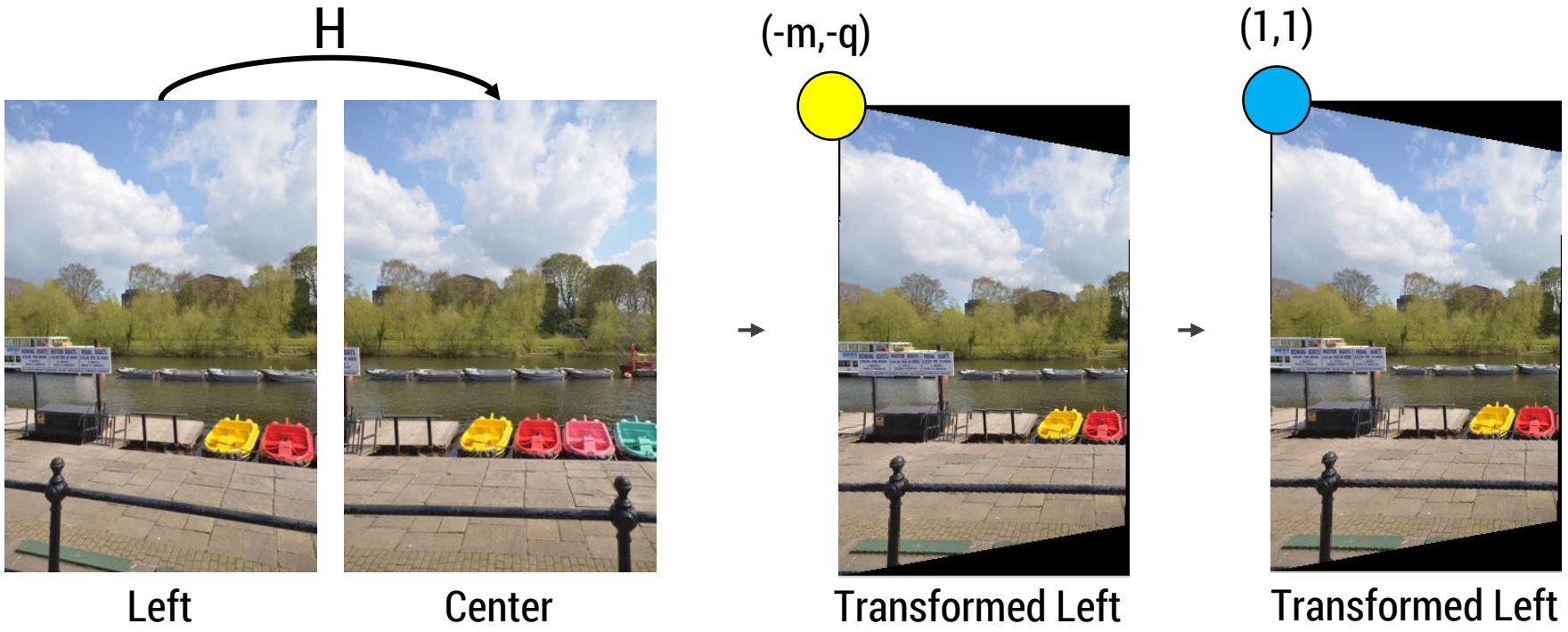


Stitching Result

Part 2

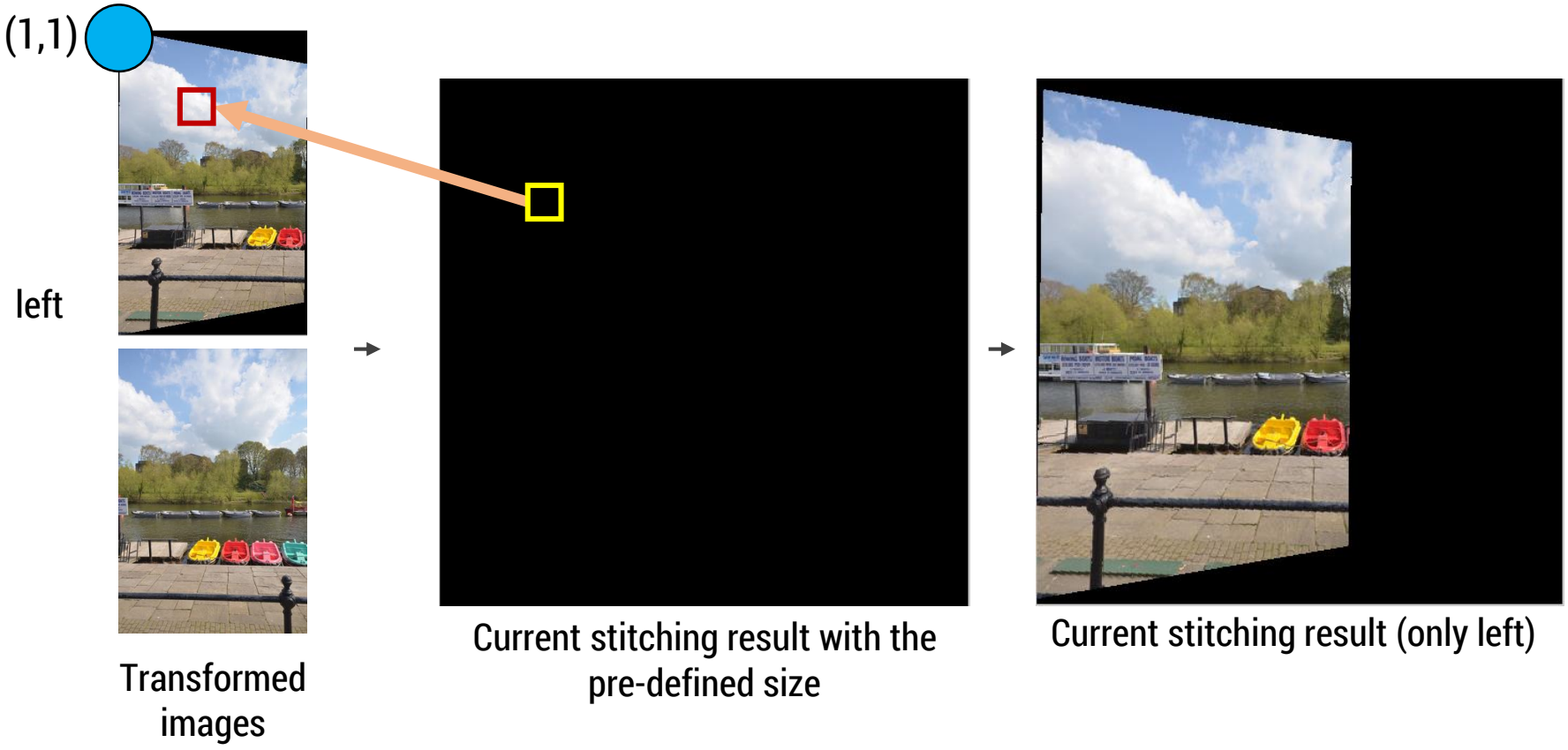
Problem C

- Shift the transformed image coordinates to proper ranges (1,1) – (H,W)
  - The final size of stitching image can be determined by (H,W) from shifted coordinates



Part 2 Problem C, D

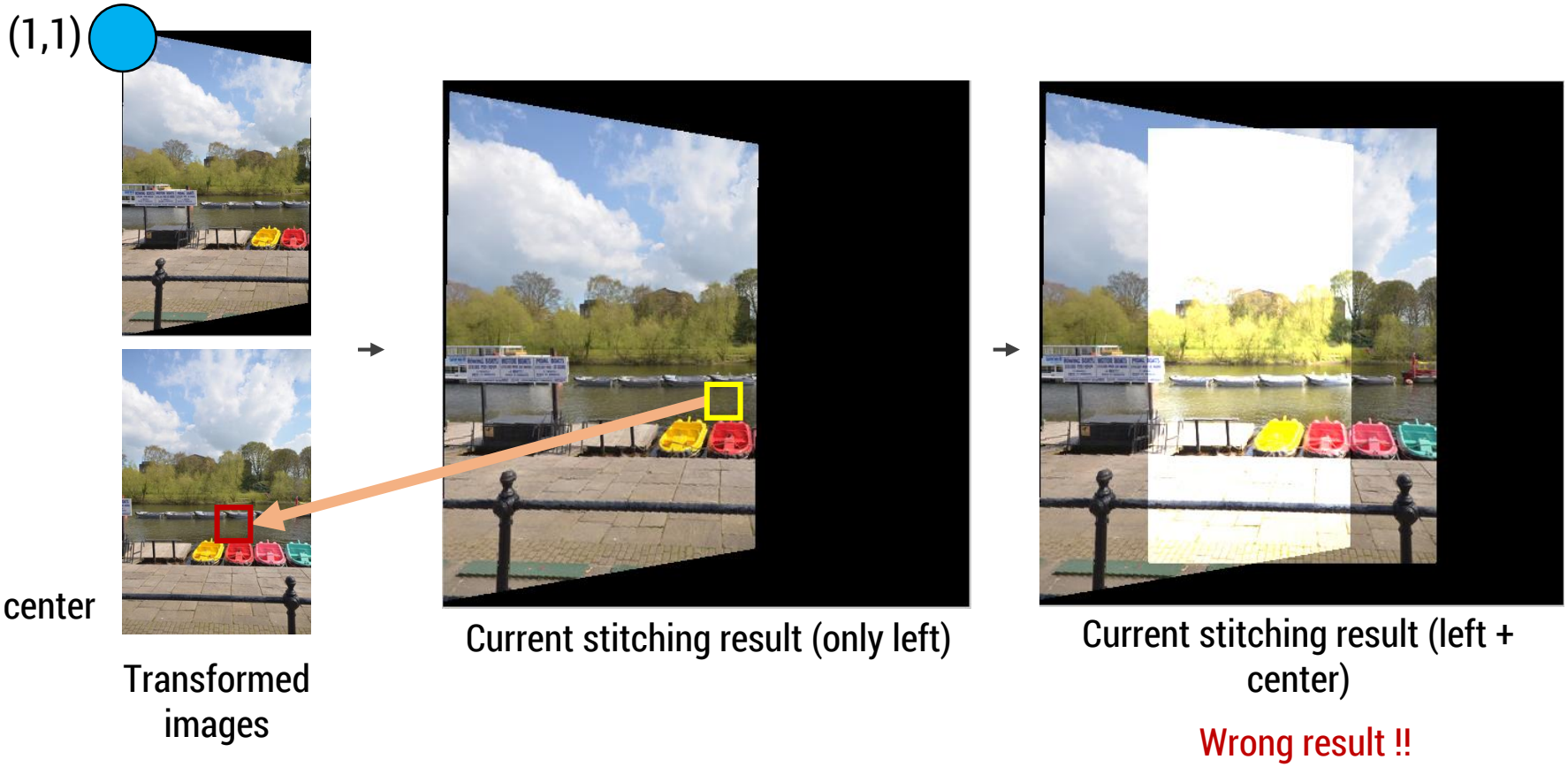
- Warp the transformed images to a map with pre-defined size
- Using backward warping (learned from HW2)



Part 2

Problem C, D

- Warp the images in order
- How to deal with overlapping regions ?



Part 2

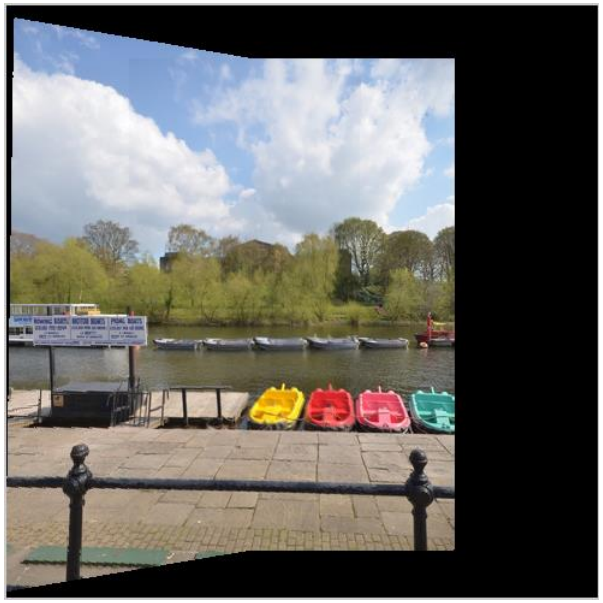
Problem C, D

- Alpha blending – blend the overlapping regions with weighted average
  - Set alpha = 0.5
  - For overlapping regions from left and center image

$$overlappings = (1 - alpha) * \boldsymbol{transformed}_{\boldsymbol{overlap}} + alpha * \boldsymbol{current}_{\boldsymbol{overlap}}$$

Transformed image (center)

Current stitching result (only left)



Final stitching result (left + center)