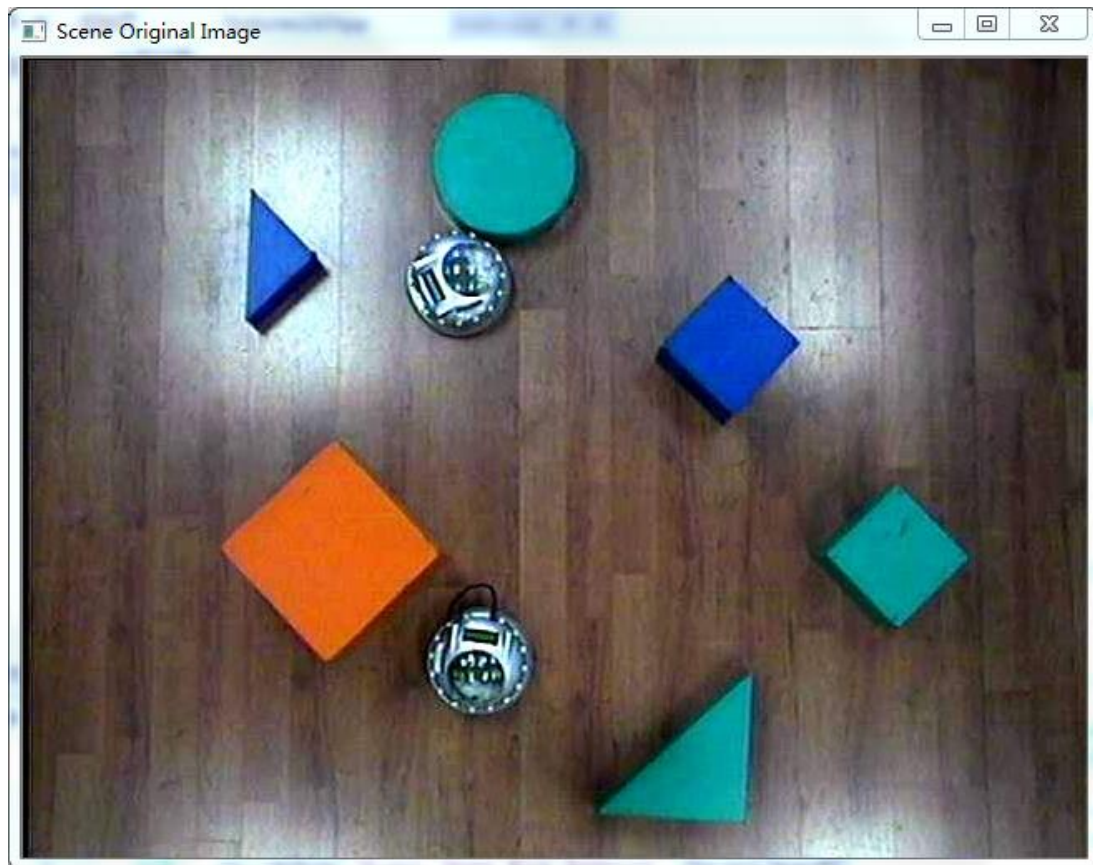# Assignment2

Liu Hongkun, April 29, 2015

Step 1: Input image

The object image and scene image are given. Firstly, input the two given images.

Object Original Image

Scene Original Image

Step 2: Color space conversion

Input The input color image ($m*n*3$ matrix), m is the width of the input image, n is the height of the input image.
Output $m*n$ matrix.
Converse the color space from RGB to GRAY.

Object Gray Image

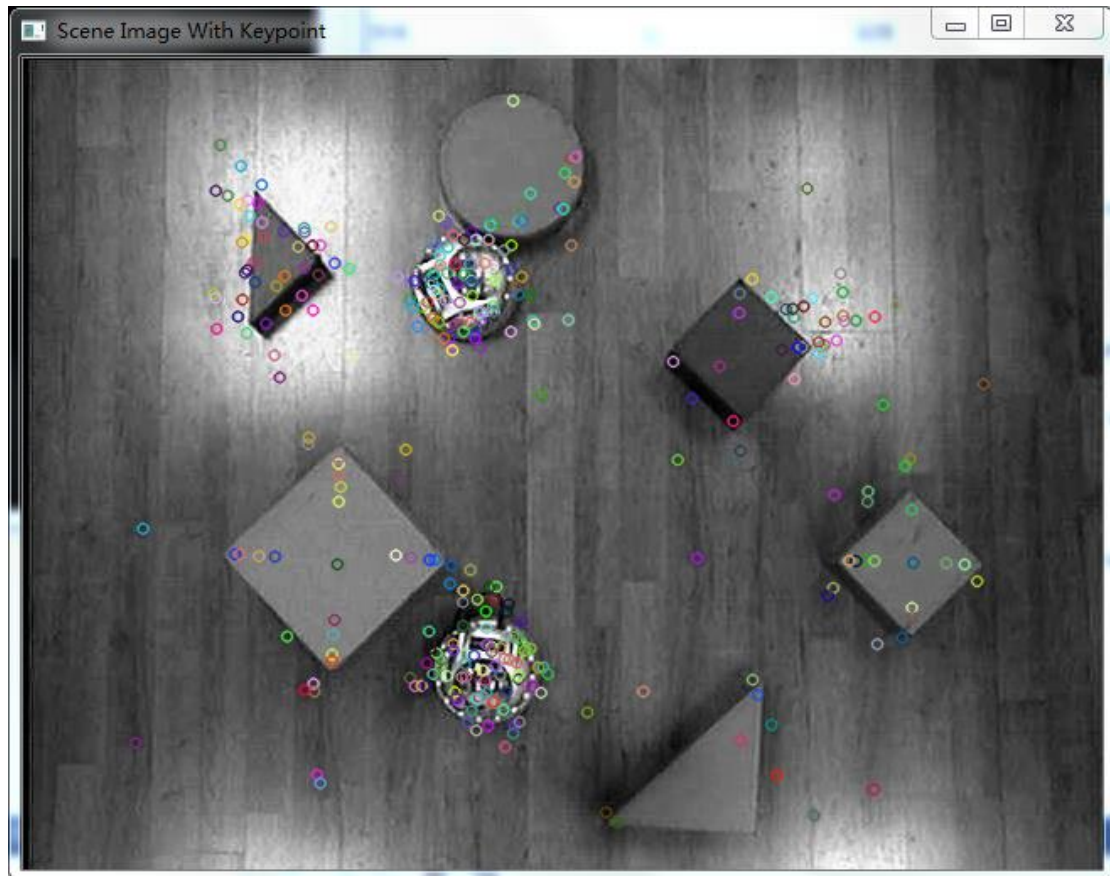Scene Gray Image

Step 3: Features2D detection (15 points)

Input The gray image ($m*n*1$ matrix), m is the width of the input image, n is the length of the input image.

Output Keypoints of object image and scene image.

Use SURF Feature2D detection algorithm, detect the key points of the object image and scene image, save them in the vector<KeyPoint>keypoints_object and vector<KeyPoint>keypoints_scene.

Object Image With Keypoints

Scene Image With Keypoints

Step 4: Calculate descriptors

Input The gray image ($m*n*1$ matrix), m is the width of the input image, n is the length of the input image. The keypoints detected in Step 3.

Output One matrix describes the keypoints in the object image and one matrix describes the keypoints in the scene image.

Converse the keypoints from the <vector> type to Mat type.

Step 5: Match descriptors

Input One matrix describes the keypoints in the object image and one matrix describes the keypoints in the scene image.

Output M good matched keypoints between object image and scene image.

Find the minimum distance between the keypoints in the object image and scene image, save it in the distance_min, if the distance of the elements in the matches is smaller than

the 3*distance_min, then push the elements in the good_matches.

Step 6: Find homography transformation

Input Keypoints of object image and scene image.
Output Matrix of homography transformation between two different point sets.
Calculate the matrix of homography transformation between the two point sets of good matches.

Step 7: Perspective transform

Input Four corners of object image.
Output Four points of scene image which are corresponding to the four corners.
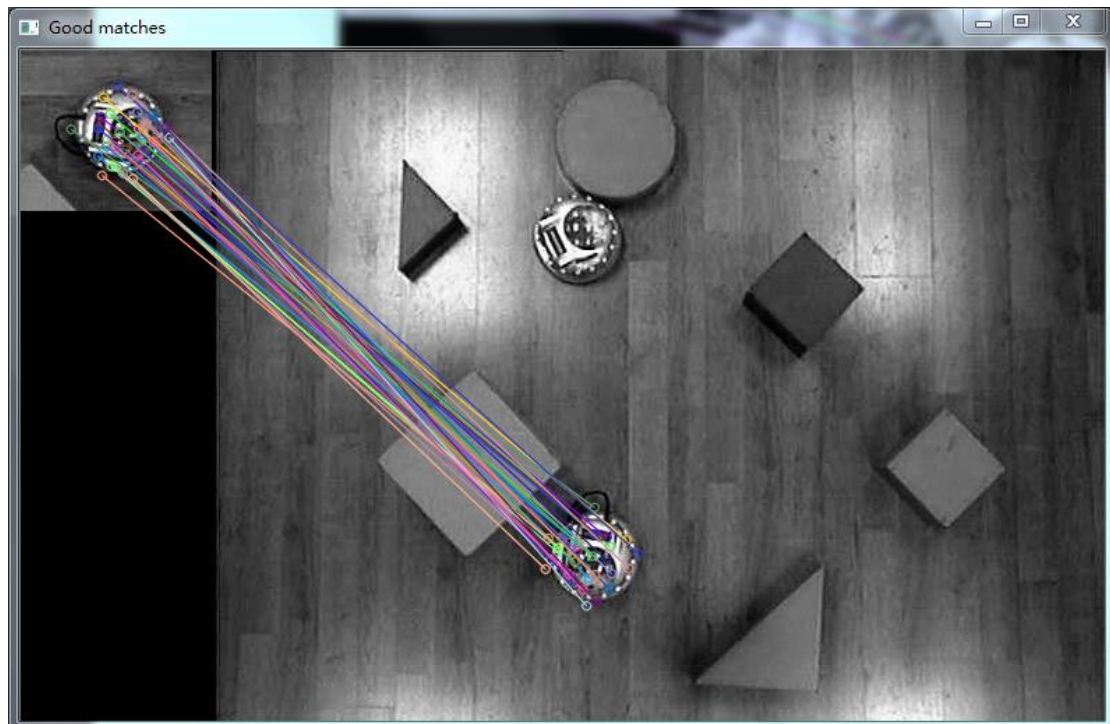
Good Matches

Step 8: Localize the object

Input The scene image which has four points (the mapped object in the scene image).
Output The matrix box in the scene image which contains the object in object image.
Draw the lines in the scene image depending on the four localized points in the scene.

Good Matches With Lines