- Program design rationale
  - Image processing
    1. Binarize the received image by threshold 130
    2. Use Region growing algorithm to label different objects
    3. Calculate the centroid and principal angle of the objects (ignore region with area < 200)
  - Arm controlling
    1. Set three point in physic and send script to let gripper move to that point
    2. After gripper move to that point put a box in the center of gripper
    3. After put three boxes use camera to take this picture and use function of object detection to calculate three box picture position
    4. Use three physic position and picture position to calculate transform matrix
- Problem and solution
  - Image processing
    1. Had difficulty in converting a ROS image to an OpenCV image
       ⇨ We turn the ROS image into a NumPy array and change the shape of it to (height, width, -1)
    2. Wrong centroid and principal angle
       ⇨ Mistake the coordinate x and y in cv2 function, so we exchange these two values.
    3. Inappropriate threshold for binarizing
       ⇨ Originally, we set 198 as our threshold but it was too high to deal with some blocks. Therefore, we adjust the threshold to 130 instead.
  - Arm controlling
    1. Offset between gripper and camera should be considered
       ⇨ At first, we didn't consider this criterion so the transform matrix has a little error. Hence, we change another way that we use three physic position and picture position to solve 3 equation of three free parameter.

- Work distribution
  - Image processing: 鄧遠祥、張禾妗
  - Arm controlling: 吳峻銘、謝賀淇