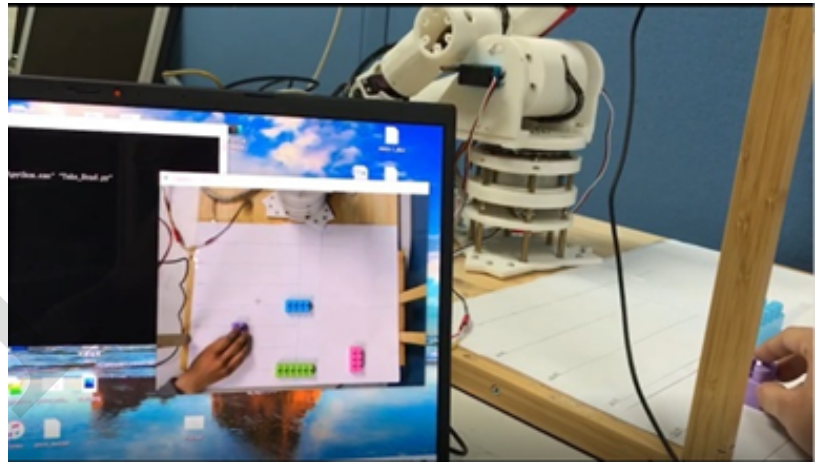
Operation Manual

Step 1:
Double-click project.bat(lower image) to start the YOLOv5 environment and activate the camera for real-time image capture.

```
C:\Users\a12\Desktop>echo "activate YOLOV5 Env & open camera"
"activate YOLOV5 Env & open camera"

C:\Users\a12\Desktop>cd C:\Users\a12\Desktop\Project

C:\Users\a12\Desktop\Project>"C:\Users\a12\anaconda3\envs\YOLOV5\python.exe" "Take_Read.py"
time1.111270 :
press s to capture image
```

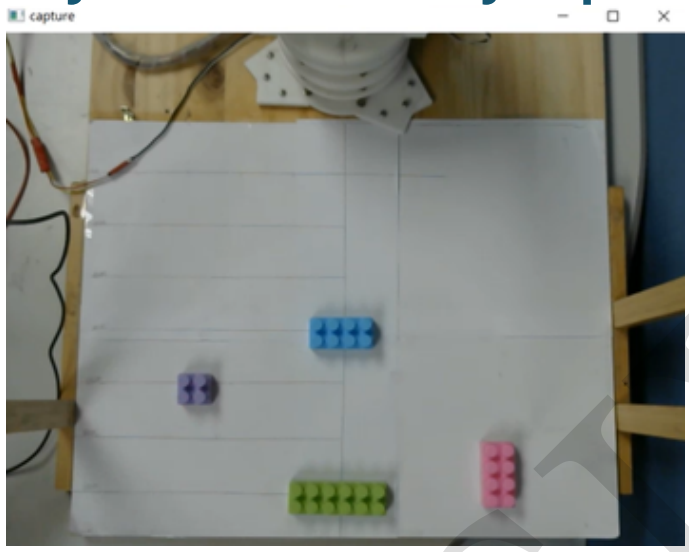


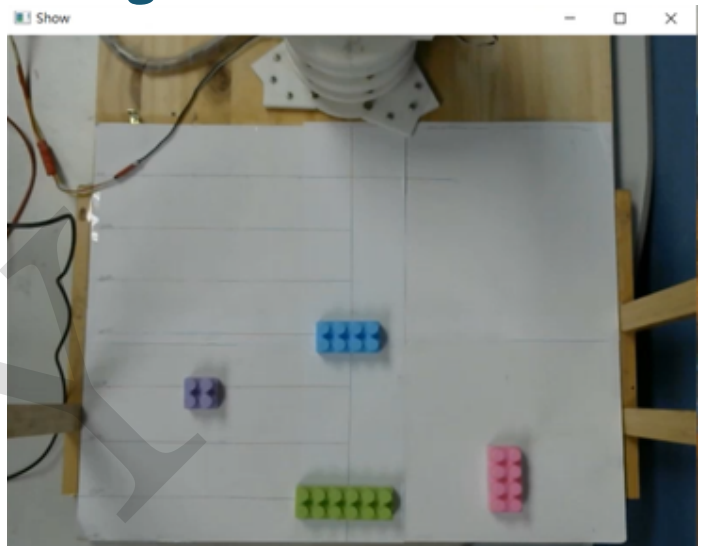
project - 記事本

檔案(F) 編輯(E) 格式(O) 檢視(V) 說明

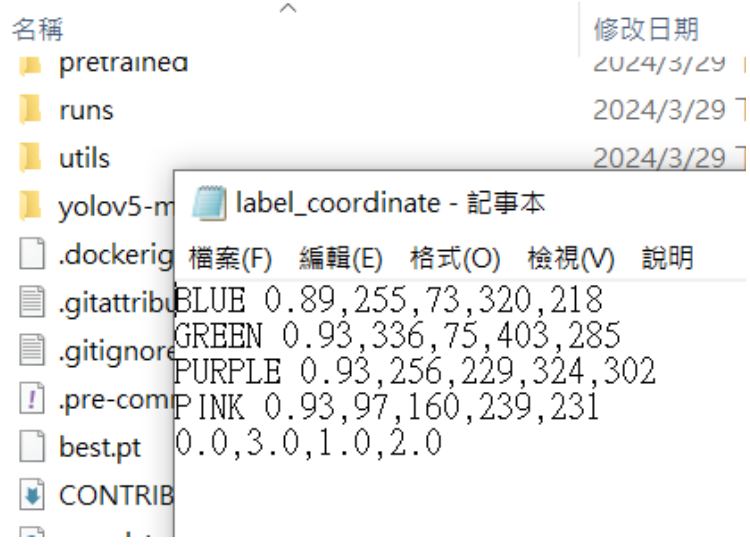
```
echo "activate YOLOV5 Env & open camera"
cd C:\Users\a12\Desktop\Project
"C:\Users\a12\anaconda3\envs\YOLOV5\python.exe" "camera_capture.py" ::2024year, Rename Take_Read.py as camera_capture.py
echo "Copy 1000.jpg"
copy C:\Users\a12\Desktop\Project\1000.jpg C:\Users\a12\Desktop\YOLO_V5\data\images
echo "run detect.py"
cd C:\Users\a12\Desktop\YOLO_V5
C:\Users\a12\anaconda3\envs\YOLOV5\python.exe detect.py --weights runs\train\exp11\weights\best.pt --img 640 --source data\images\1000.jpg
pause
cd C:\Users\a12\Desktop\YOLO_V5\runs\detect\exp4
start 1000.jpg
pause
echo "show picture"
cd C:\Users\a12\Desktop\YOLO_V5
"C:\Users\a12\anaconda3\envs\YOLOV5\python.exe" "coordinate_conversion.py"
pause
"C:\Users\a12\anaconda3\envs\YOLOV5\python.exe" "motor_movement_control.py"
echo "Copy pwm.txt"
copy C:\Users\a12\Desktop\YOLO_V5\pwm.txt C:\Users\a12\Desktop\controller\pythonEx
```

Step2:
Press ‘s’ on the keyboard to capture an image.
The "Capture" window (left) will close, and the "Show" window (right) will display the successfully captured image.

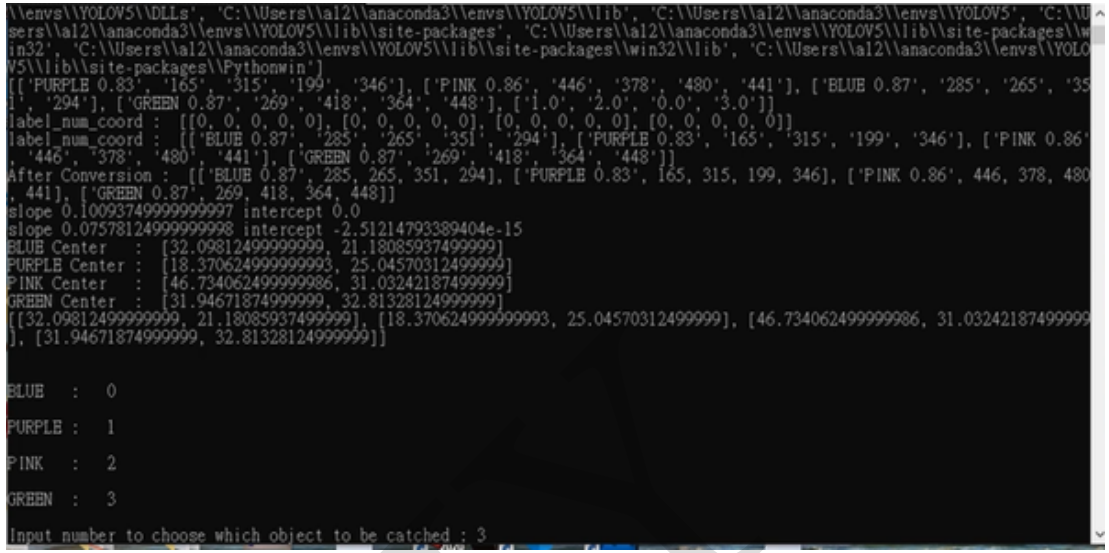




Step3:
Use the pre-trained model for image detection. In this step, the corresponding coordinates for each detected color are written to label_coordinate.txt. (right image)



Step4:
The user selects the target object (to be gripped). In the example, entering '3' to select GREEN.



Step5:
Use inverse kinematics to calculate the coordinates of GREEN in robot coordinate system. ex: (X, Y, Z) = (32.81, -16.2, 0.35), and write the PWM values to pwm.txt.

Step6:
A window displays the robot arm's position in the coordinate system.

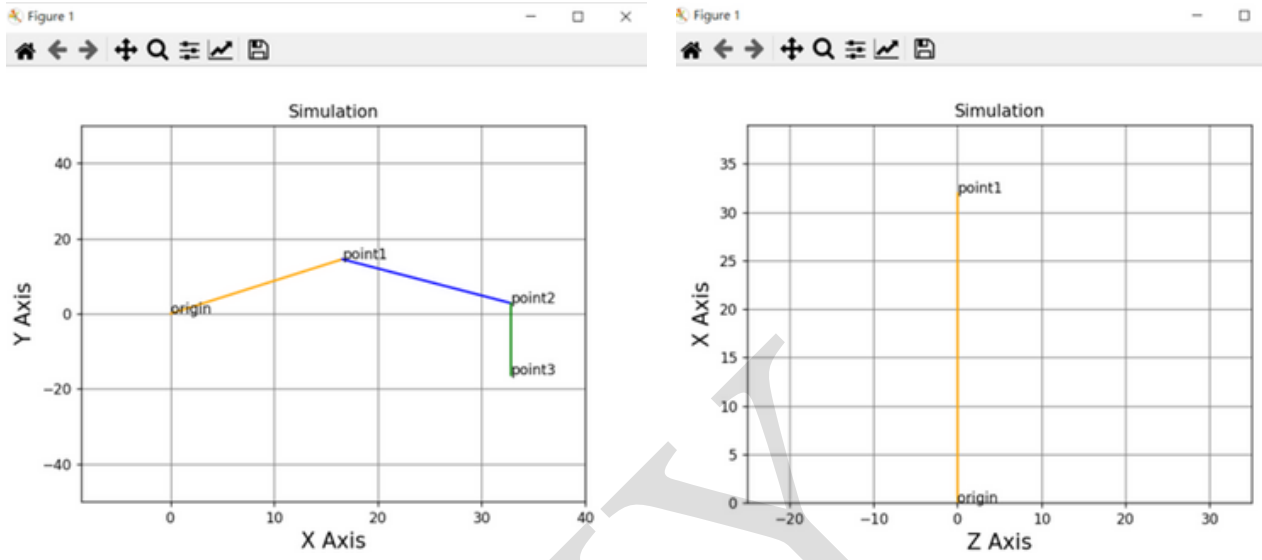


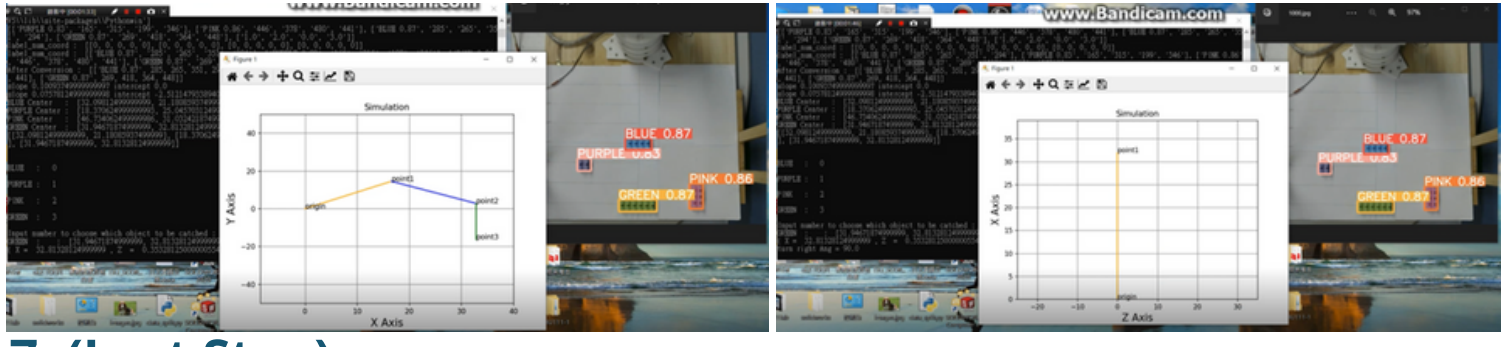
Image Description

Left: XY plane illustrating the Origin (Motor2), point1 (Motor3), point2 (Motor5), and the gripping point (Motor7).

Right: XZ plane depicting the camera's perspective of the table, highlighting the angle that Motor0 must rotate.

Upper: Enlarged view for enhanced detail and analysis.

Lower: Real-time demonstration of the robotic arm in action.



Step7: (Last Step)
PWM values are sent to the controller for motor movement.