



UNIVERSIDAD DE ANTIOQUIA
FACULTAD DE INGENIERÍA
LABORATORIO DE ROBÓTICA INDUSTRIAL
PRÁCTICA # 5
ROBOT PICK AND PLACE

OVERALL GOAL

To study and identify the particularities of control of Dobot robot arm with tools like Gripper

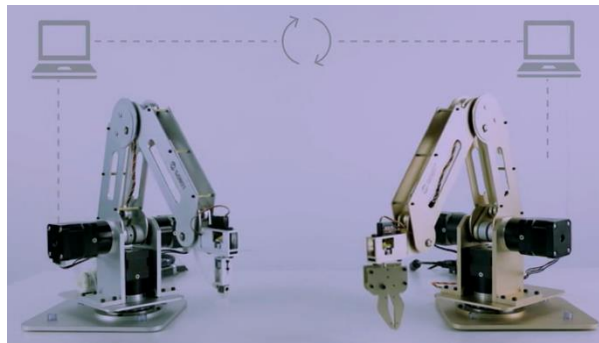
SPECIFIC OBJECTIVES

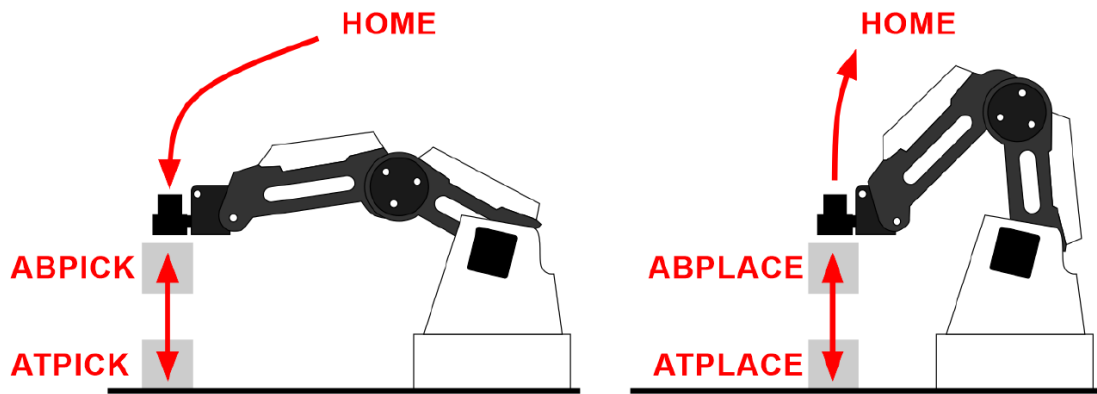
- Perform using a controller (teach pendant PC) spatial position control.
- Strengthening practical knowledge and basic concepts related to manipulative robots.
- Identify the robot parts and basic concepts.

INTRODUCTION

Robotic arms are excellent for performing pick and place operations such as placing small electronic components on circuit boards, as well as large boxes on pallets. A pick and place operation will require at least 5 points:

- Home
- Above the pick point
- At the pick point
- Above the pick point
- Above the place point
- At the drop point
- Above the place point
- Home





As a rule, always go to a position above the pick or place point first so that the robot can accurately and repeatedly place the object straight down in a linear motion, with no friction or interference

KEY CONCEPTS

- How does a robot perform a pick and place operation?
- What end effector or end of arm tooling works best?
- What are Pick and Place conventions in industry?
- How do I attach the Mechanical gripper to the Dobot?
- How do I record positions with the Dobot?
- How do I easily edit a program in DobotApplication 1.1.1?

KEY VOCABULARY

- | | |
|----------------------|-----------------------------|
| • Relative Positions | • Teach |
| • Joint movement | • Linear move |
| • Axis movement | • Home |
| • Work envelope | • Loop |
| • Ramping | • End Effector |
| • Accuracy | • End of Arm Tooling (EoAT) |

EQUIPMENT & SUPPLIES

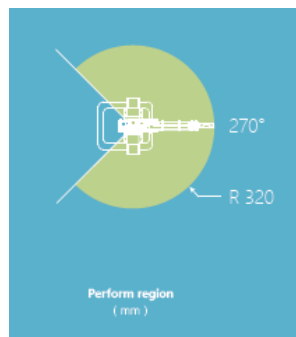
- Dobot One
- DobotApplication 1.1.1 software
- Dobot Field Diagram
- ¾ inch cylinders
- Accompanying video: Pick & Place with Dobot

PROCEDURE



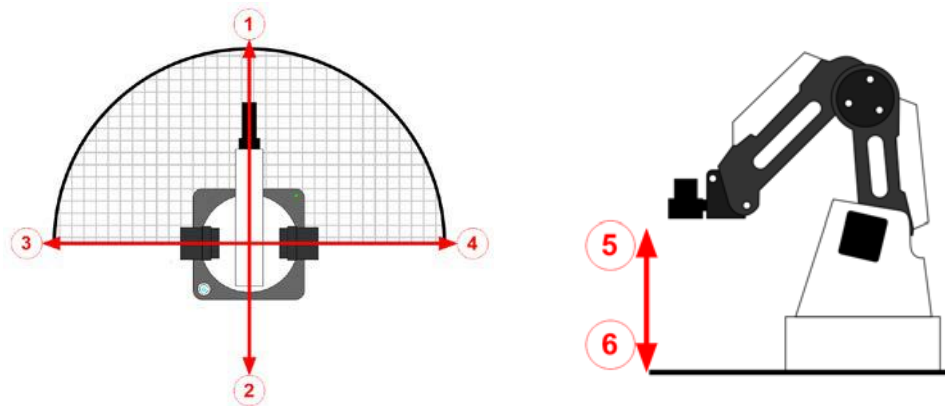
Caution: NEVER wire anything to the Dobot while it has power on. ALWAYS turn it off before making connections or damage to the robot could occur.

1. Follow the manual to turn on the Dobot arm with the correct procedure and plug in the wire USB.
2. Open DobotApplication 1.1.1 software and connect the robot in the software.
3. Be sure the Gripper is chosen as the accessory.
4. Open the teach and playback, and Home the robot making sure the robot's work envelope is clear. then make sure of workspace of this robot is as show below, write them down if you see any different.



| Joint | Working Range |
|------------------------|----------------|
| Joint 1 base | +135° to -135° |
| Joint 2 rear arm | +85° to -5° |
| Joint 3 forearm | +95° to -10° |
| Joint 4 rotation servo | +90° to -90° |

5. Move the robot around. In the space below, draw a diagram showing the X and Y axis on the robot. Be sure to label the arrows as +/-.



6. Place one of the $\frac{3}{4}$ metal cylinders on one of the squares of the field diagram.
7. Use the teach and playback window and record all the position necessary to do a pick and place operations in this order:
 - Home
 - Above pick
 - At pick
 - Above pick
 - Above place
 - At place
 - Above place
 - Home
8. Name the positions in the name column of the program

Be sure to name the positions something relevant so that others will be able to tell what the position is. Example: A point named Abpick means the point above the place where it is picked up.
9. Be sure to open and close the gripper using the column as shown or with code
10. Hit the “Play” button to run your program and see what happens. Did it work the first time? If not, what did you have to change to make it work?

11. Change the position type of step #5 (above place) in the first column to move linear (MOVL). Run the program. What changed?
12. Record the points $(x, y, z, \phi, \theta, \psi)$ of all positions and orientation spatial to do trajectory of job with Dobot arm. .
13. Use python or any other programming language to communicate with the Dobot robotic arm and send commands to take pieces from a stack and then place them in an orderly manner in the horizontal palette field diagram.
<https://www.youtube.com/watch?v=gqw8KbpqKaA>
14. Record you code.

REPORT (IEEE format)

1. How can you get the suction to turn on in time to pick up the part, or get it to shut off in time to drop it off correctly? Explain below after you have tried it in the program.
2. What happens if you replace the $\frac{3}{4}$ " cylinder with a $\frac{3}{4}$ " wooden cube? Run it and see. Describe below what happens.
3. Add the code used.

GOING BEYOND

Finished early? Try some of the actions below. When finished, show your instructor and have them initial on the line.

- _____ 1. Have the robot reverse the process and put the cube back in its original place.
- _____ 2. Make the process happen multiple times.
- _____ 3. Adjust the speeds of each position to increase efficiency but not lose accuracy.

BIBLIOGRAFÍA

- [1] DOBOT , del sitio: <https://www.dobot.cc/downloadcenter/dobot-arm-v1.html#most-download>
- [2] Dobot User Manual for V1.0: https://www.dobot.cc/downloadcenter/dobot-arm-v1.html?sub_cat=101#sub-download