Documentation by Yosef Peyser, Yope8523@Colorado.edu
Ned_Controller written by Yosef Peyser and Alex Nielsen
Epuck_Controller written by Kaleb Park and Alex Nielsen

Requirements:

-PYTHON MUST BE VERSION 3.8 OR 3.7. Python 3.9 will not work. This is because the camera detection code we use with the e-puck is not working with 3.9.
-The arm must not be moved.
-configmap.npy must exist in directory controllers/ned_controller (exists by default)

Setup:

-Make sure the python version is 3.8. PYTHON 3.9 WILL NOT WORK. This is because python 3.9 breaks the epuck code. Python 3.7 and earlier may work, but we only tested against 3.8 and 3.9.
-git clone https://github.com/kjp1999/CSCI3302-Final.git
-open the webots world file in /PROJECT/factory.wbt

Quick Tutorial:

1. Reset the simulation.
2. Ensure there are ping pong balls detected in the camera's view, and they are within range of the arm (by default all should be).
3. Start the simulation if not started. Make sure ping pong balls are stationary. If ping pong balls are moving, reset the simulation.
4. Press J to save the positions of the ping pong balls detected by the camera.
5. Press H to load the positions into the Arm's controller.
6. Press T to move to the first/next ping pong ball. This will move the gripper to the next object, and close the gripper.
7. Press Y to chuck the ping pong ball into the bin.
8. Repeat steps 5,6 until there are no objects left.
9. If there are ping pong balls within reach of the arm, and detected by the camera, but the console prints "No objects loaded" repeat steps 4 and 5.

Changing ping pong ball positions:

Ping pong ball locations can be changed when the simulation is not running and time is reset. Ensure that the ping pong balls are within reach. Save the simulation. Run the simulation. If the ping pong balls move at all at the start, reset the simulation, which should fix the balls moving at the start of the simulation.

Controls:

EPUCK

↑: forward
↓: backward
→: rotate right
←: rotate left
J: save positions of objects currently in the e-puck camera's view (required)
NED ARM

H: load positions of objects (required, must save positions first with the e-puck using 'J')
T: Move gripper to first loaded object position and grab onto it
Y: Throw it away (into the bin)

(not required)
E / C: rotate link 1
W / S: rotate link 2
Q / Z: rotate link 3
A / D: rotate base
O: open the gripper
C: close the gripper
M: recreate the arm's configuration table (stores angle configurations used to configure the arm)
N: load the configuration table