Video of Robot 2 Operation

https://youtu.be/r_A9VaIbqZQ?si=NobfDllAXUxavUvw

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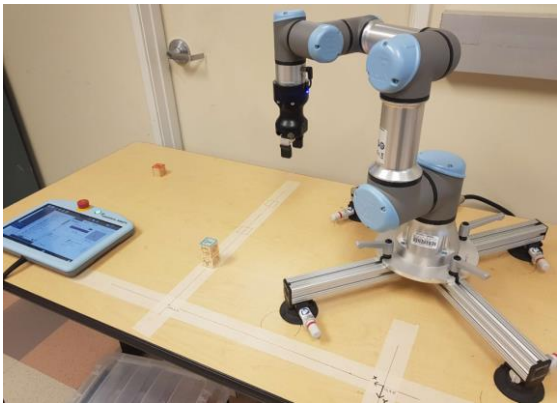
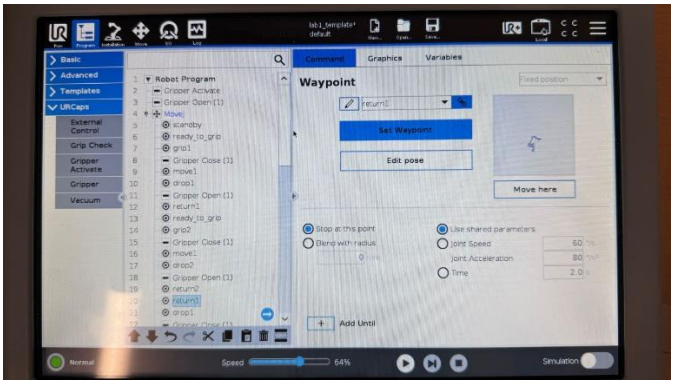
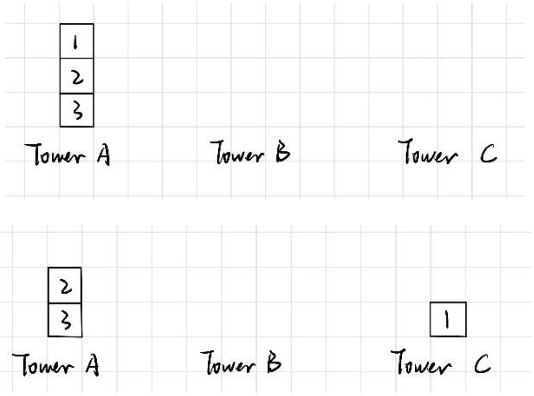
The Complete Sequence



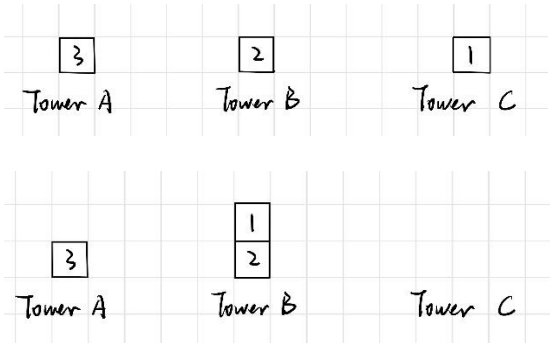
Tower A B C from down to up, the group task is to move all blocks from Tower A to Tower B.



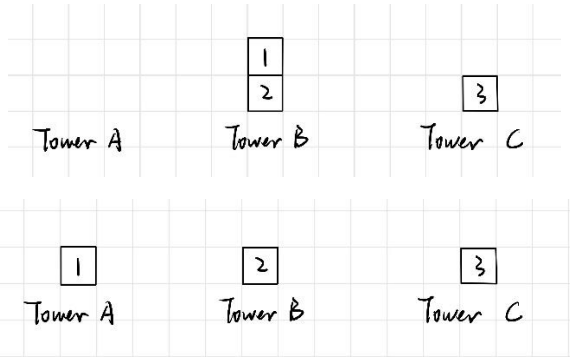
We use “Gripper Open/Close”buttom to control the gripper which can grasp and release blocks, and “WayPoints” to set different stop points where to pick and drop blocks.



Initially, the robotic arm moves from the “standby” position to align directly above tower A. It then descends to pick up block 1 and moves directly to tower C. The robot opens the gripper within 1cm above the ground to place block 1, then ascends directly above it.

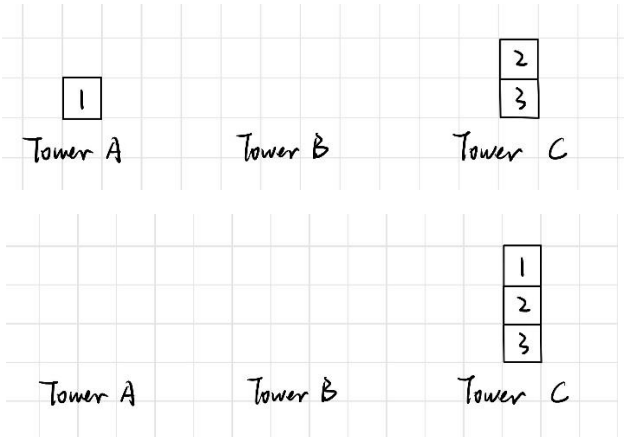


Adhering to the constraint that higher-numbered blocks cannot be placed on lower-numbered ones, the arm returns to Tower A, picks up block 2, and places it on Tower B using the same method as block 1. After moving back above Tower B, it goes to Tower C, grabs block 1, and places it on top of block 2 in Tower B.



Following this sequence, the robot returns to Tower A to capture block 3, and strategically positions it in Tower C. Subsequently, from Tower B, it grabs block

1 and places it in Tower A. At this point, the three blocks are now distributed across the three locations. Team members can then sequentially place block2 on block3 and subsequently position block1 on top of block2 to complete the task.



This step-by-step process ensures compliance with the stacking constraint and maintains the logical order of block placement.

Caution

1. When putting down the blocks, remember to leave enough clearance between the blocks and the table to avoid a collision. When adjusting this clearance, make sure to slow down the speed of the robot by giving quick taps on the pendant.
2. After a collision, the robot will be locked. We need to restart the system on the teach pendant and remember to reactivate the gripper.
3. Additionally, it's crucial to maintain a minimal clearance between the blocks during these adjustments. An excessive clearance may lead to undesired rotations when releasing the block, compromising the precision of the placement process. Finding the right balance in clearance is essential to ensure a stable and controlled release without unintended rotations.
4. When moving the gripper between different towers, it is essential to first transit to a position above the tower for a certain distance, rather than directly moving from the gripping point to the placing point. This precaution

is taken to mitigate the risk of potential collisions with other blocks that may be present in the vicinity. Thus, we have 'return 1', 'return 2' and 'readytogrip' positions frequently used in the code for moving to the above of each tower.

5. When placing one block onto another, simply using the downward direction key may not achieve perfect alignment. This limitation arises from the fact that the downward key only controls a single rotational joint, resulting in a curved trajectory for the end effector's movement. To ensure accurate alignment, additional adjustments, particularly in the left and right directions, are necessary when the gripped block approaches the lower block.