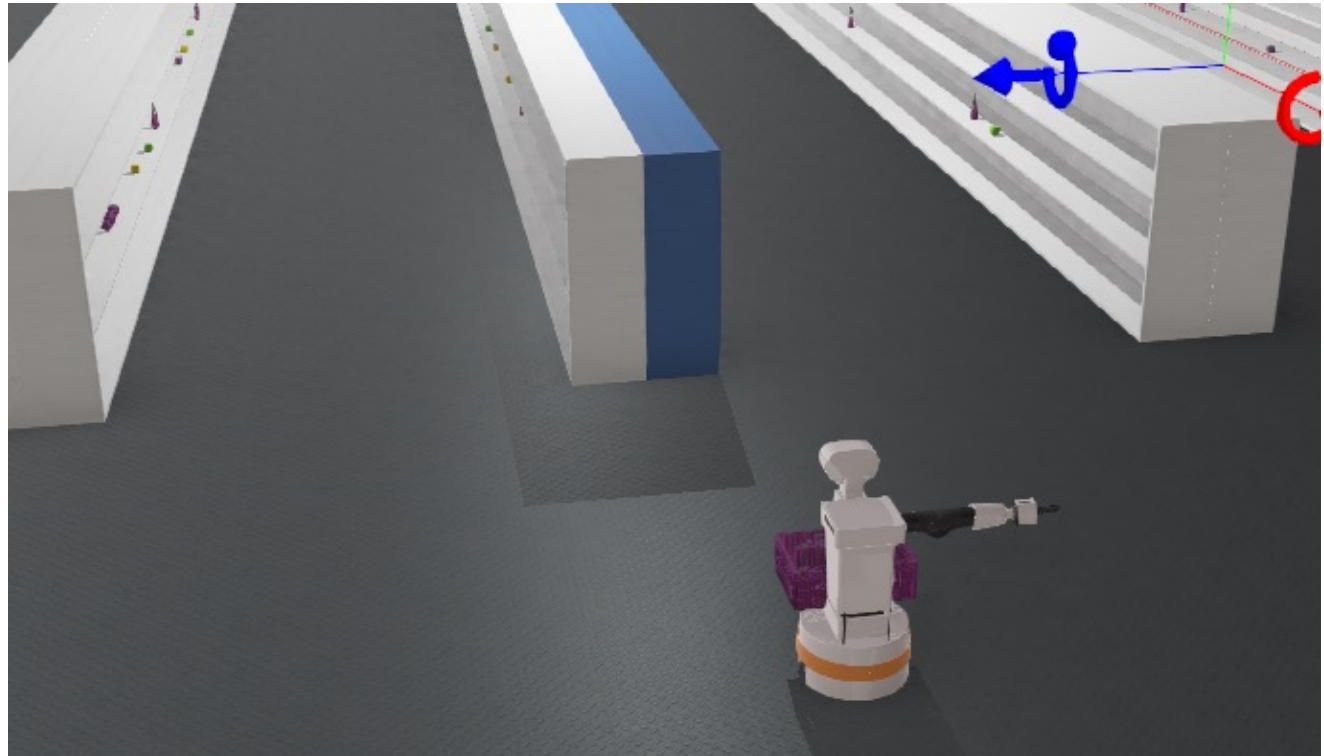


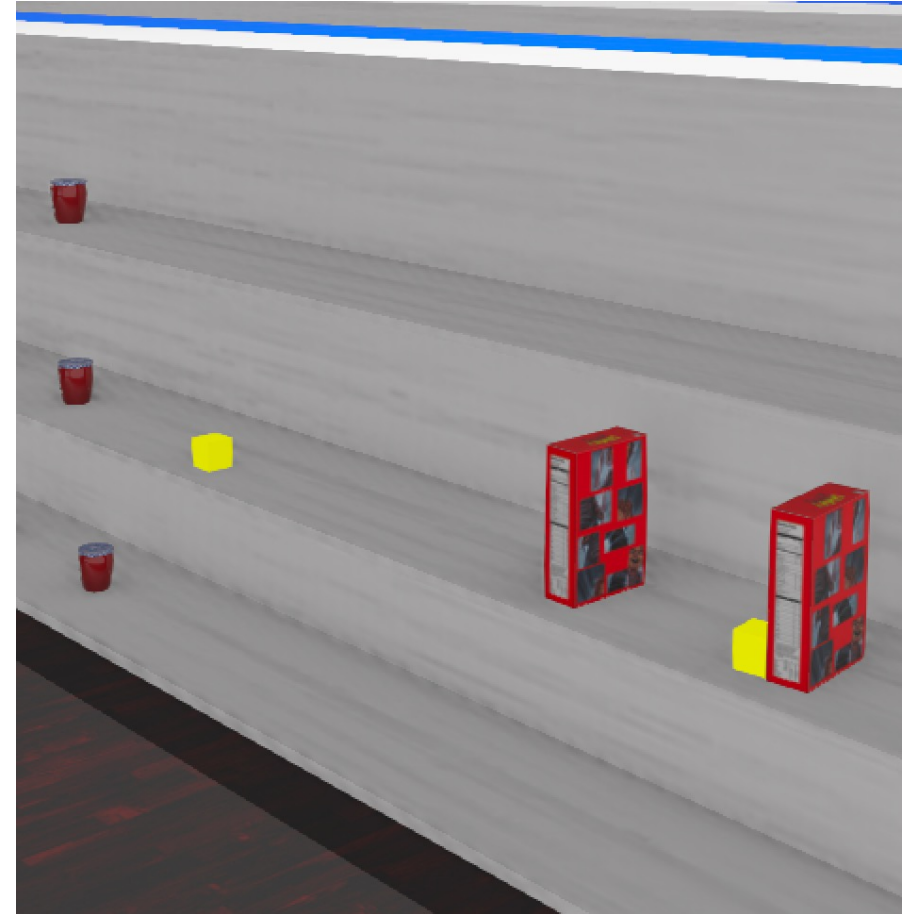
# Final Project: Grocery Shopper Bot

1. Proposal **Nov 8**
2. Progress report **Nov 22**
3. Final report / project **Dec 6**
4. **Peer-evaluations due Dec 8**



# Goal

- Pick-up all yellow cubes (2 pt each, 20 pt total)
- Pick-up two extra cubes from clutter (4 pt each, 8 pt extras)



# Baseline



- Tiago robot from labs, yellow cubes need to be in the crate to score
- Add any sensors you want – Microsoft Kinect, ultrasound, distance...
- Lab 5 will provide a strong baseline:
  - Map the environment
  - Compute routes to all of the objects
  - Implement behaviors to pick cubes using recognition node
- Then:
  - Replace GPS by improved odometry
  - Replace recognition node with vision
  - ...

# New device: gripper



- Two motors: left finger, right finger
- Two sensors: left encoder, right encoder

```
left_gripper_enc=robot.getDevice("gripper_left_finger_joint_sensor")
right_gripper_enc=robot.getDevice("gripper_right_finger_joint_sensor")
left_gripper_enc.enable(timestep)
right_gripper_enc.enable(timestep)
```

```
robot_parts["wheel_left_joint"].setVelocity(vL)
robot_parts["wheel_right_joint"].setVelocity(vR)
```

```
if(gripper_status=="open"):
    # Close gripper, note that this takes multiple time steps...
    robot_parts["gripper_left_finger_joint"].setPosition(0)
    robot_parts["gripper_right_finger_joint"].setPosition(0)
    if right_gripper_enc.getValue()<=0.005:
        gripper_status="closed"
else:
    # Open gripper
    robot_parts["gripper_left_finger_joint"].setPosition(0.045)
    robot_parts["gripper_right_finger_joint"].setPosition(0.045)
    if left_gripper_enc.getValue()>=0.044:
        gripper_status="open"
```

# Scoring Rubric

Mapping	Tier	Points -- 12
Manual	1	6
Autonomous	2	12
SLAM (Manual/Autonomous)	3	18

Computer Vision		18
WeBots Supervisor / API	1	6
Color blob detection (HW3) (Recognition on Camera but use only color data, not recognition ID to identify which block obtained from webots API)	2	18
Machine / Deep Learning or any kind of object localization	3	28

Manipulation		24
Trajectory: Hardcoding in Joint Space	1	12
Teleoperation in Cartesian Space (requires IK)	2	24
IK	2	24
Autonomous: Task-Level Planning + Obstacle Avoidance (IK + Hardcoded Waypoints)	3	30

Localization		12
WeBots Supervisor	1	4
Odometry	2	10
SLAM / MCL	3	18

Planning for Navigation		14
Teleoperation	1	5
A*	2	8
RRT	3	14
RRT w/ Path Smoothing	4	18

Total Points (in %)	100
Objects	20
Completing Tiers	80
Bonus Objects Points (4 pts each object)	8
Bonus Tier Points	32
Maximum Points	140

# Peer review

- Watch video, read report, run code
- How many objects did they get?
- Which techniques did they use?
- Each student needs to provide two assess two submissions

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