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Robot Café

Human-Robot and Robot-Robot Interaction

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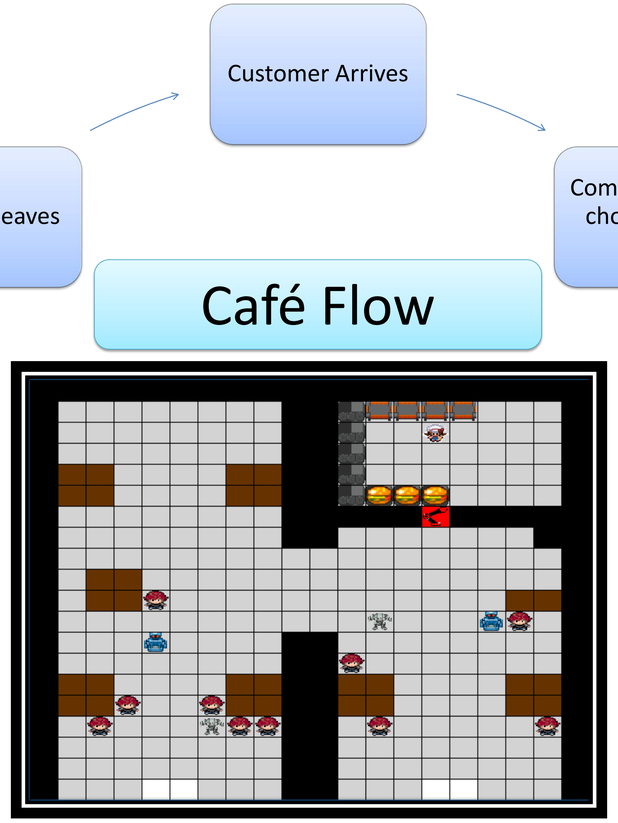
Problem Statement

Robot Café is a restaurant where the food is cooked by humans and served by robots. We have multiple different types of robots all interacting between the customers and chefs i.e. the customers only ever see the robots.

Robots

1. Robot Waiter
   - I. Breadth-first search
   - II. Closest customer first (requested to serve)
   - III. Defaults back to birth place when nothing to do
2. Robot Server
   - I. Same I and III as Robot Waiter
   - II. FIFO customer service
   - III. If multiple orders then waits to get that much food maxing at 3 burgers.
3. Robot Arm
   - I. Grabs food from conveyor belt
4. Distributed path planning
5. Robot Hierarchy : Determines which robot has to move out of the way (lowest moves)
   - I. Servers (numerically ordered)
   - II. Waiters (numerically ordered)

Café Flow



Customers

In our world, customers appear at the door given a random chance every world step. They then randomly depth-first search for an open table. They request a burger after being asked a random number of times by the waiter. After receiving their burger from the robot server, they leave searching breadth-first search for a door.

Chef's Kitchen

The Kitchen receives an order from the robot waiter and starts to cook the food if there is an open counter. The food takes 10 steps to make. The food goes on the conveyor belt to the robot arm. If after 15 steps of cooking and the conveyor belt is full then the food is thrown away and the order is cooked again.

Command Center

1. Jobs split evenly between robots
   - I. Each new customer is given to the next robot and eventually cycles back to the first robot.
2. Jobs split by room location
   - I. The room is split vertically in half
   - II. One Waiter and Server per side
   - III. The back tables are not used as often due to random chance but still have an effect

Experiment

1. Compare two management styles used by the Command Center and Free For All
2. 1:20 chance for new customer every step
3. Two Robot Waiters and two Robot Servers
4. 30,000 time steps for each experiment
5. Customer total time from arrival to departure recorded along with initial time showing up.

The results demonstrate that with the current world setup for the experiment that splitting the room was better for getting customers out faster.