

# Design Presentation: Mobile Robot Control

R2-D2



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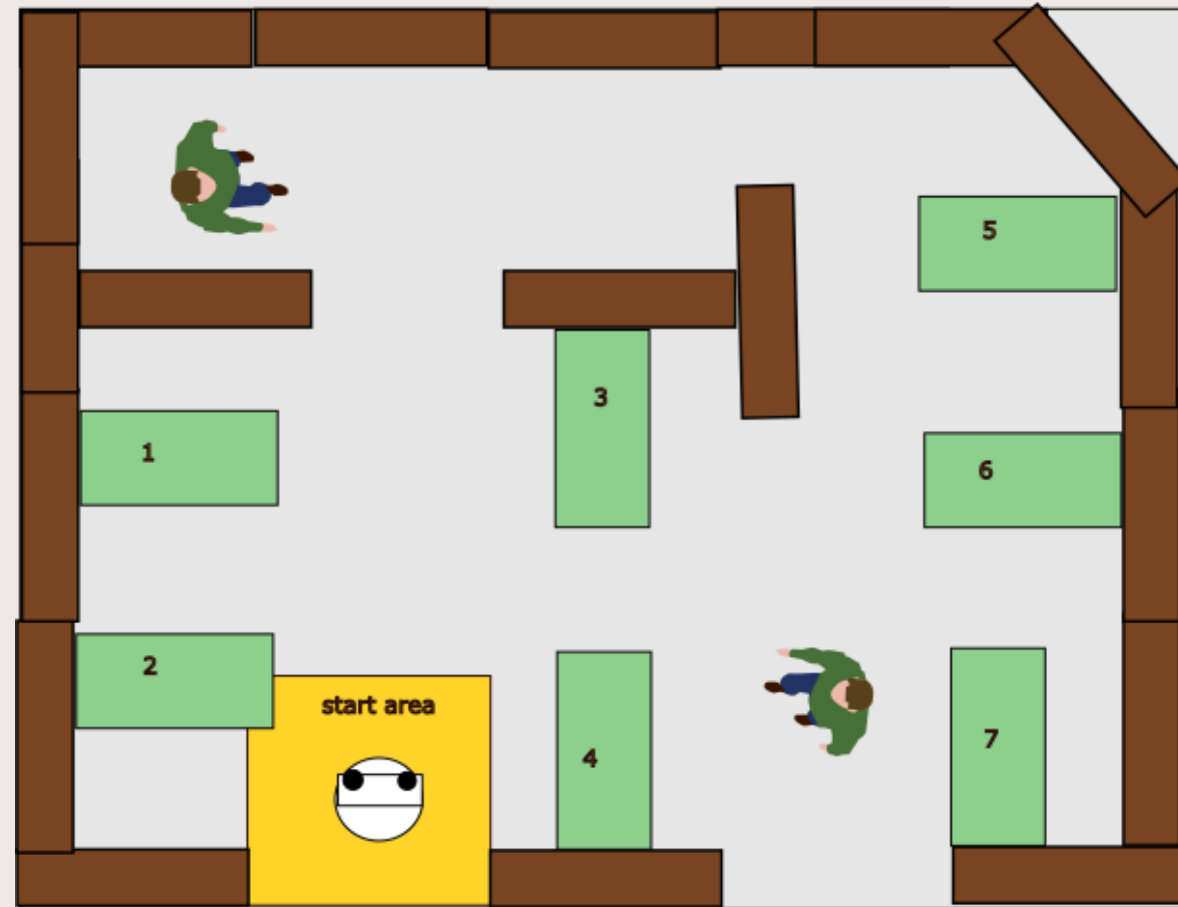
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# Challenge Overview:

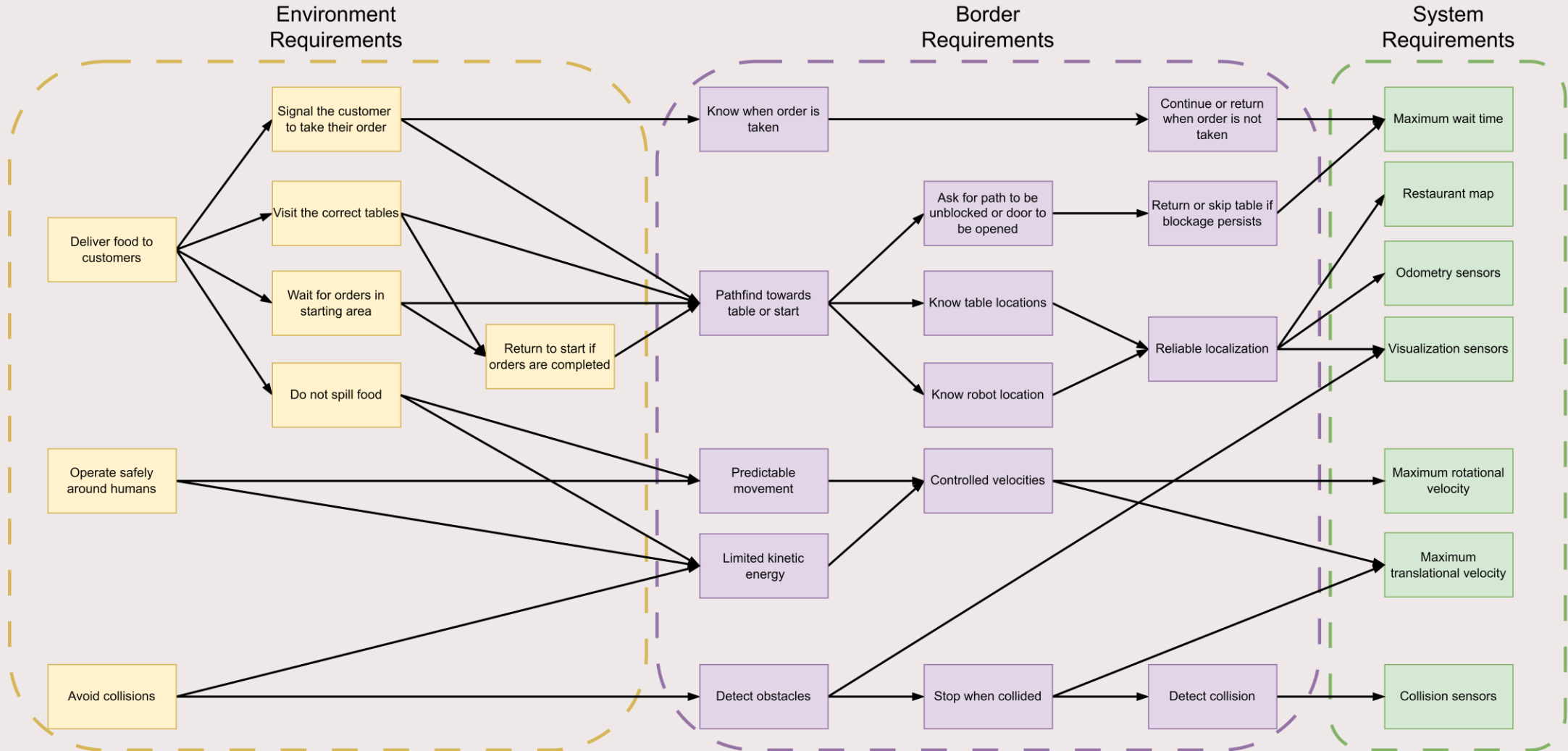
- Environment setup is a restaurant
- Unknown static and dynamic objects
- Hero (Robot) equipped with basket
- Objective:
  - Hero delivers orders to table
  - Drive up to table
  - Position near table, facing towards it
  - Give clear sound signal
  - Repeat until all tables are visited in correct order



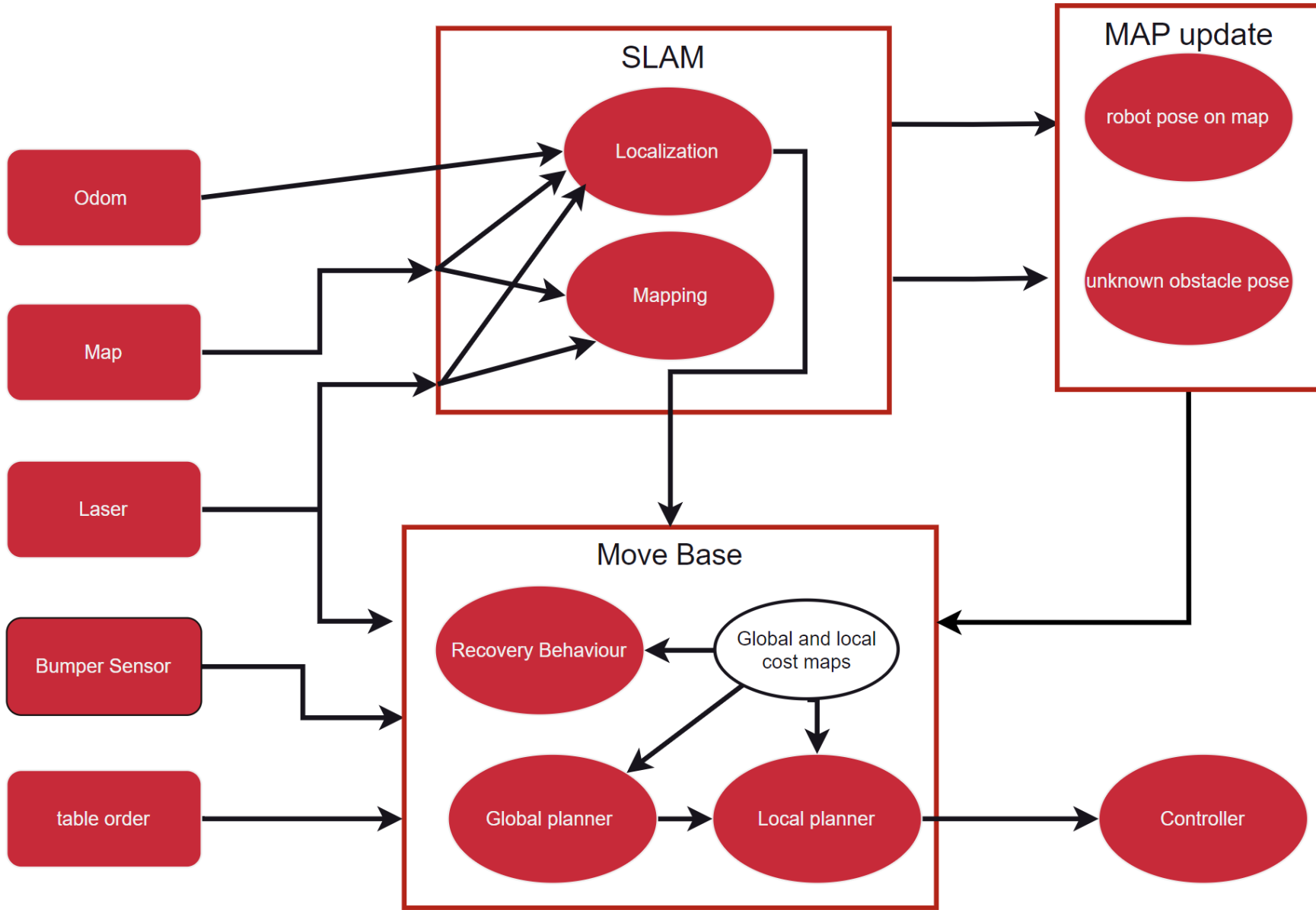
# Design Requirements

- Max speed: 0.5m/s translational, 1.2rad/s rotational
- Do not touch walls, objects or people
- Visit all tables in correct order
- Sensible movements every 30 seconds at least
- Time limit of 10 minutes
- Software easy to set up
- Bonus: Detect static and dynamic objects and present them in world model

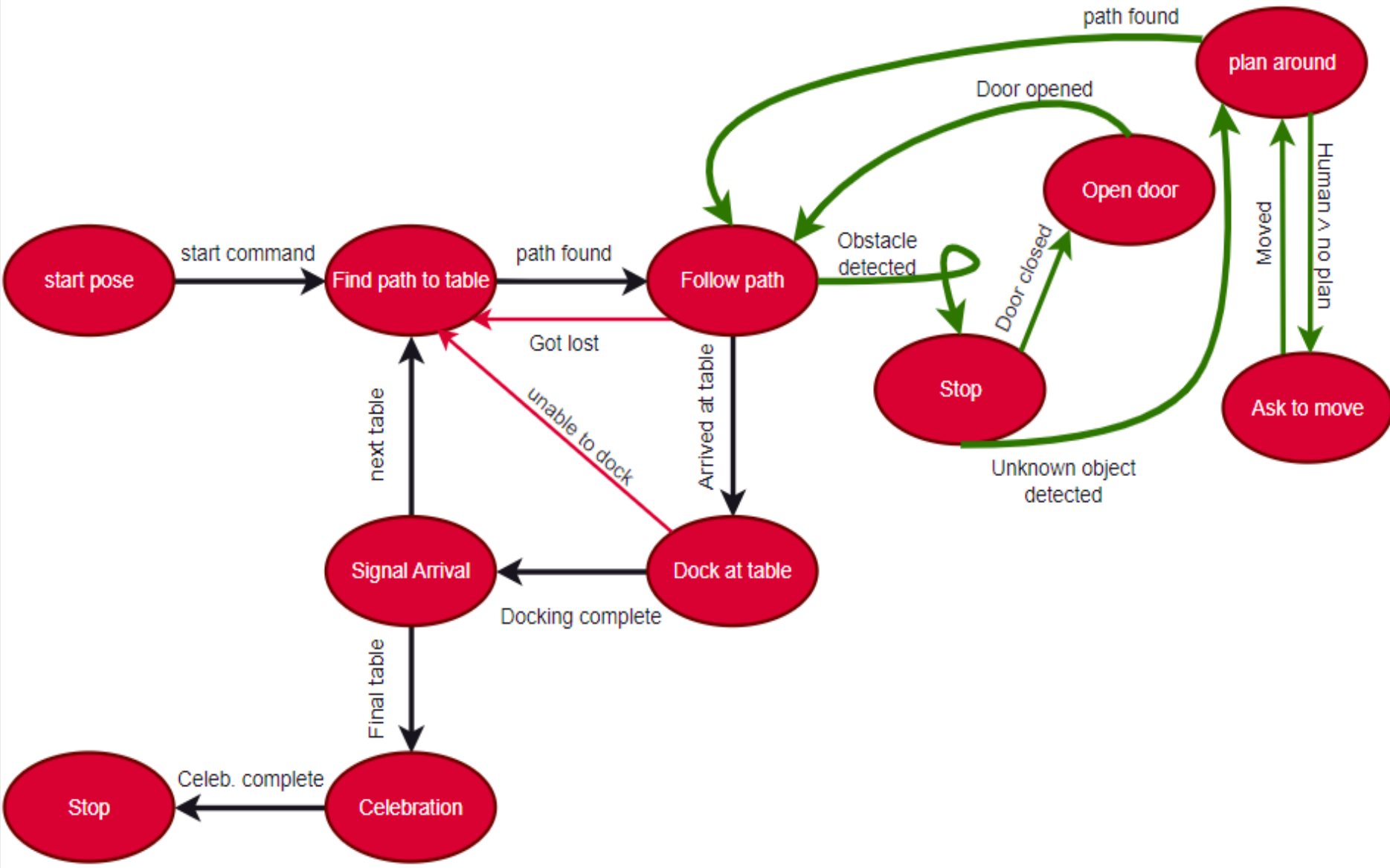
# From Desires to Specs



# Data Flow Diagram:



# State Diagram:



# Previous Exercises

## Don't Crash

- Utilized in stopping when a moving object immediately crosses the robots path

## A\* Algorithm

- In our implementation, only the nodes where a direction change is required were assessed. Could be used to make navigation to tables easier (computationally)

## Open Space Approach

- When navigating obstacles, the open space approach was taken which worked flawlessly to quickly navigate the obstacles. Alongside the A\* algorithm, this approach would make the navigation to the tables much quicker/easier

## Localization

- Particle filter algorithm will definitely be implemented, since it is essential to the success of the challenge



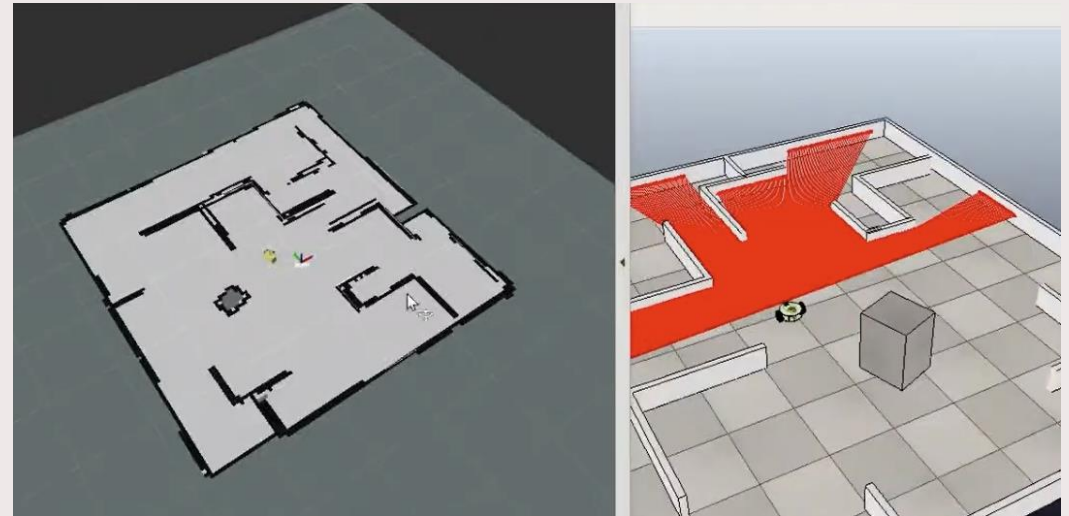
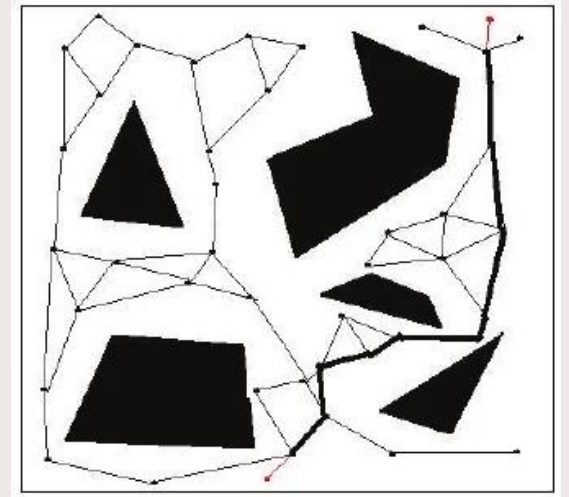
# Possible Extension Algorithms

PRM (Probabilistic Road Map)

SLAM Algorithm (Simultaneous Localization & Mapping)

- Cartographer, G-Mapping
- Submaps / Grid
- Local / Global SLAM
- Adds unexpected obstacles in map
- G-Mapping: Particle Filter

→ Combination



**Thank you!**