



Design Presentation for Restaurant Challenge

7TH OF JUNE 2023

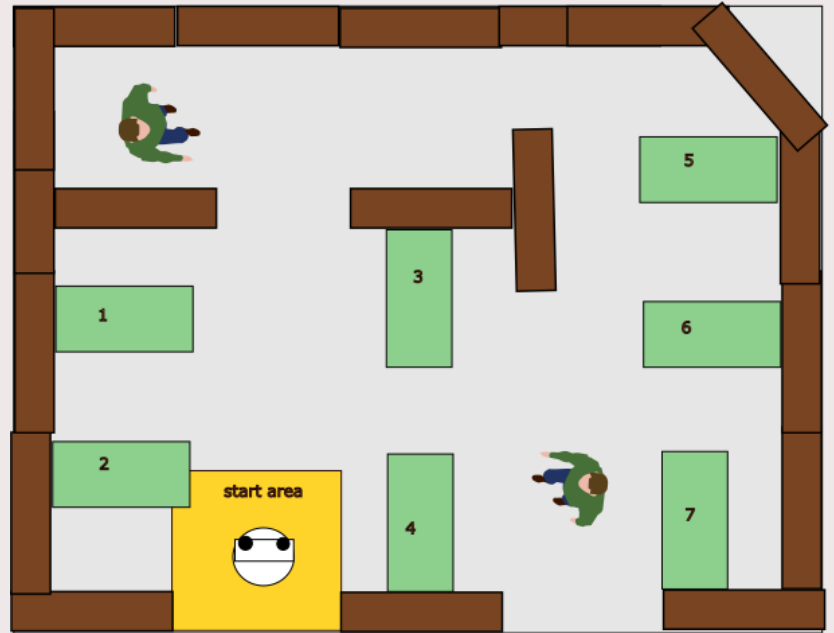
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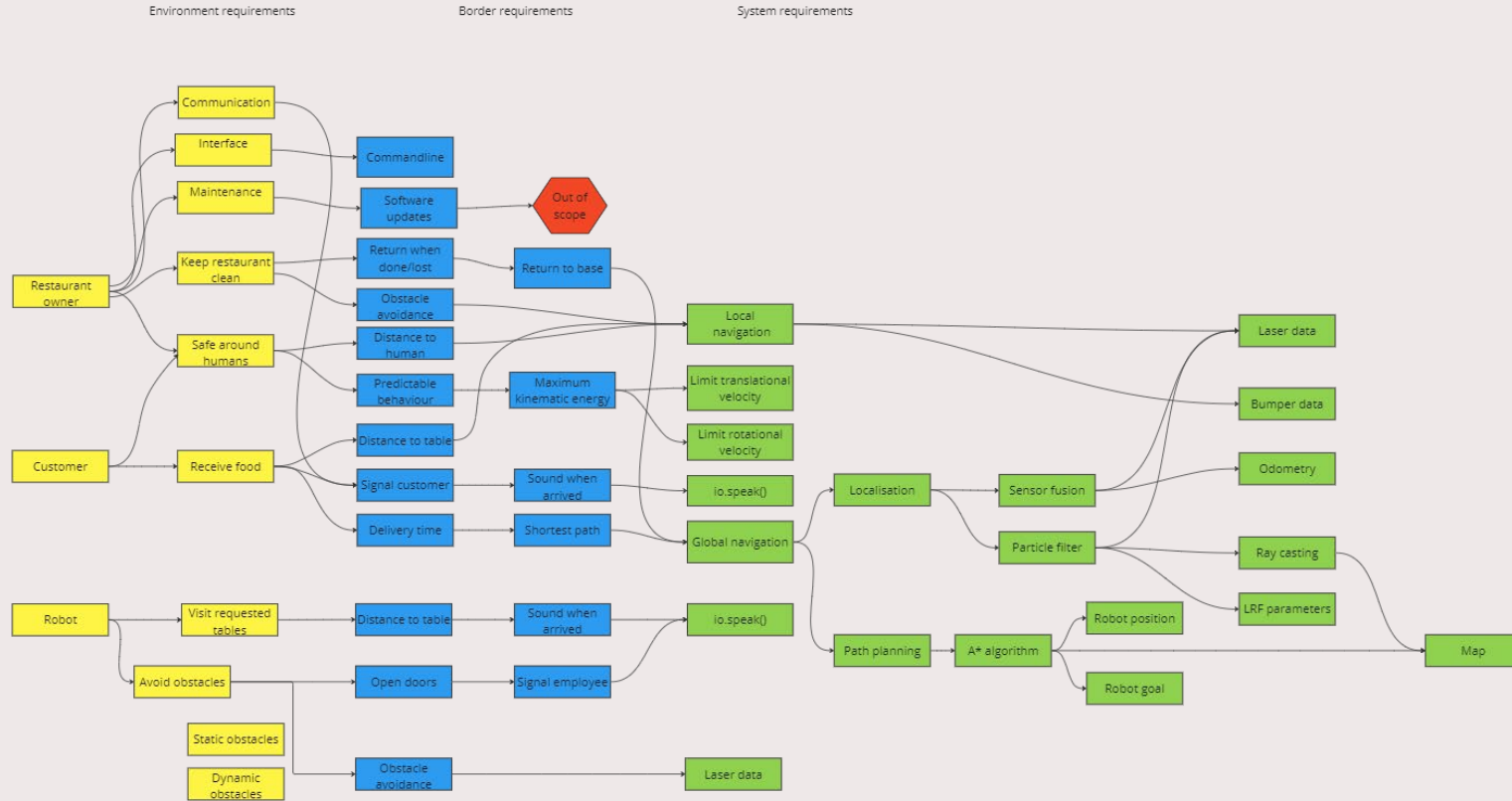
1. Challenge description
2. Requirement formulation
3. Data flow diagram
4. State diagram
5. Motivation for design choices
6. Implementation

The restaurant challenge

From a given starting point Hero should find its way to the given order of tables while avoiding obstacles



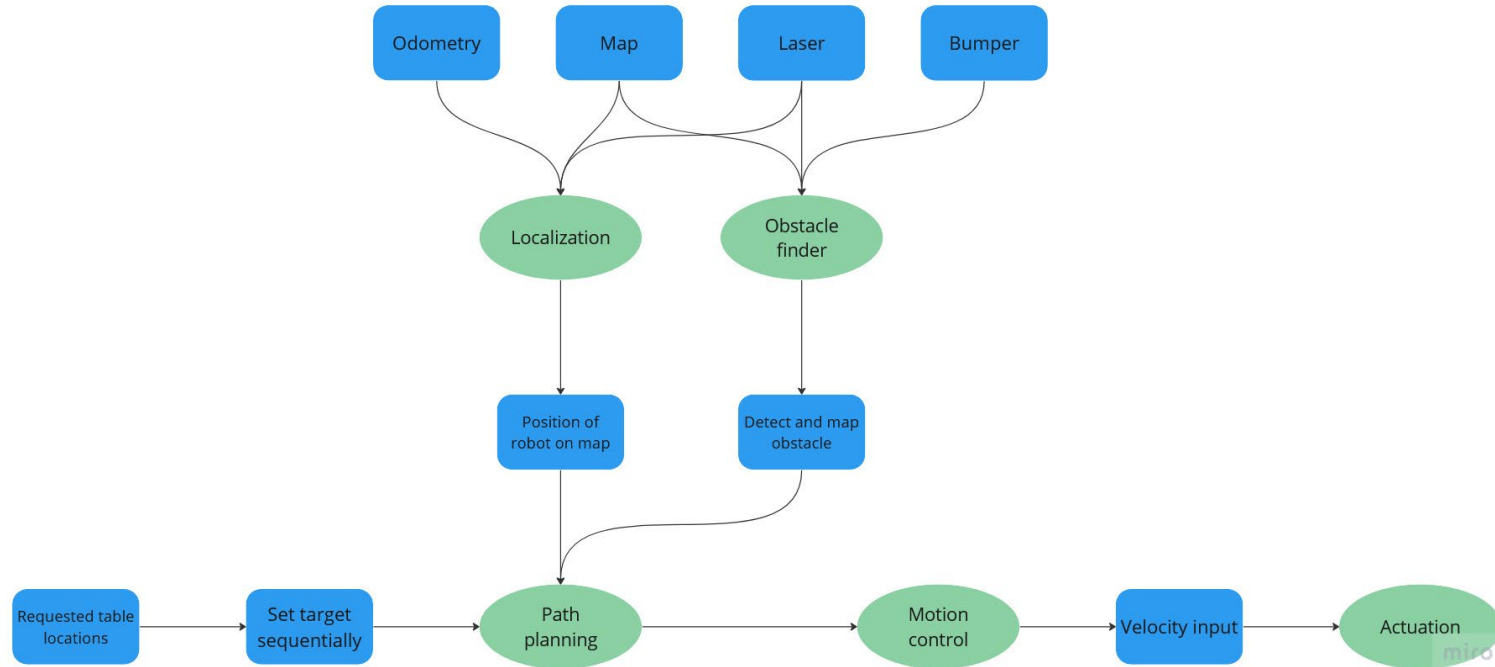
Formulating requirements



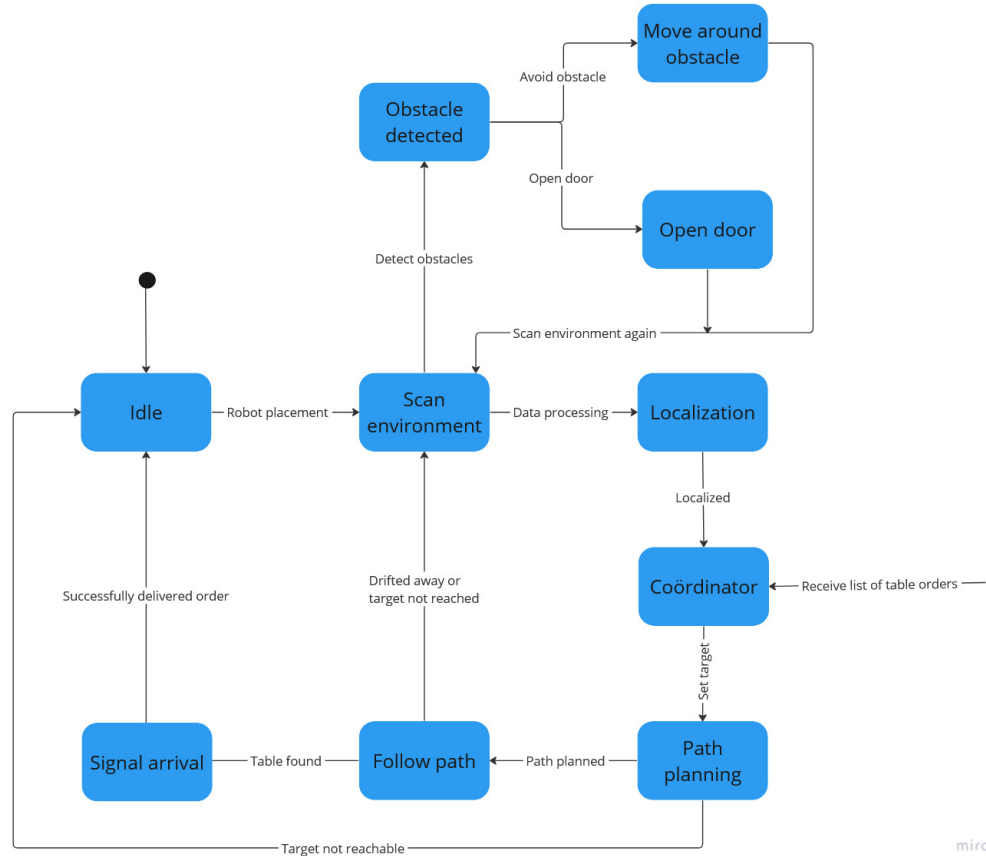
Formulating requirements

Environment	Border	System
Safe around humans	Distance to table for delivery	Max. driving speed
Deliver orders	Signal to customer when arrived	Path planning
Avoid obstacles (static and dynamic)	Continue to next order	Max. waiting time

Data flow diagram



State diagram



miro

Motivation for design choices

Human interaction

1. Predictable behaviour
 - Maximum absolute rotational velocity $\rightarrow \frac{\pi}{4}$ rad/s
 - Maximum absolute translational velocity $\rightarrow 0.5$ m/s (< Walking speed)
2. Prevent collision due to uncertainty in robot pose
 - Distance to customer $\rightarrow 0.5$ meters
3. Food in reach of customer
 - Distance to table $\rightarrow 0.2$ meters
 - Signal user \rightarrow prevent losing time at table

Delivering food

1. Global navigation
 - A* algorithm \rightarrow efficiently computing shortest path (fastest delivery time)
2. Local navigation
 - Artificial Potential Field algorithm \rightarrow obstacle avoidance
 - Open space approach \rightarrow search for clear passage
3. Localisation
 - Particle filter \rightarrow estimate current robot position



Implementation



Convert the state diagram into code



Use the data flow diagram to connect all the functions and states