Initial Design Group 7

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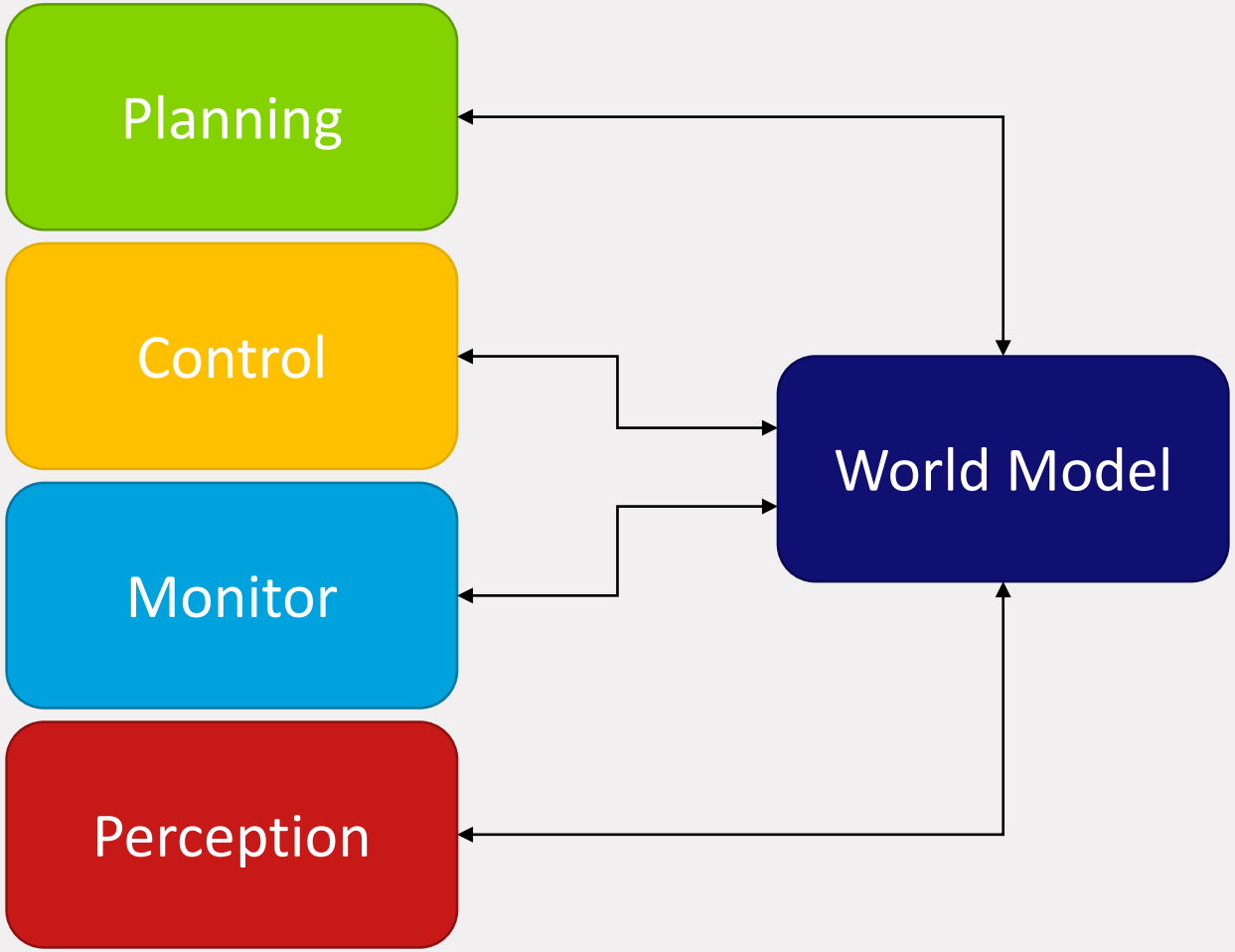
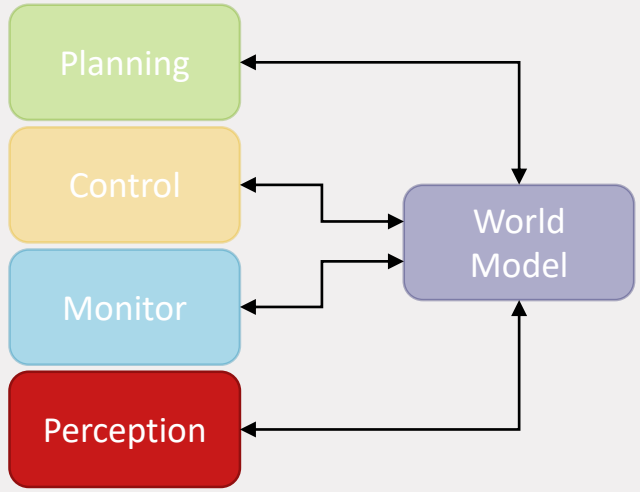
Embedded Motion Control 2019

Design Architecture Overview

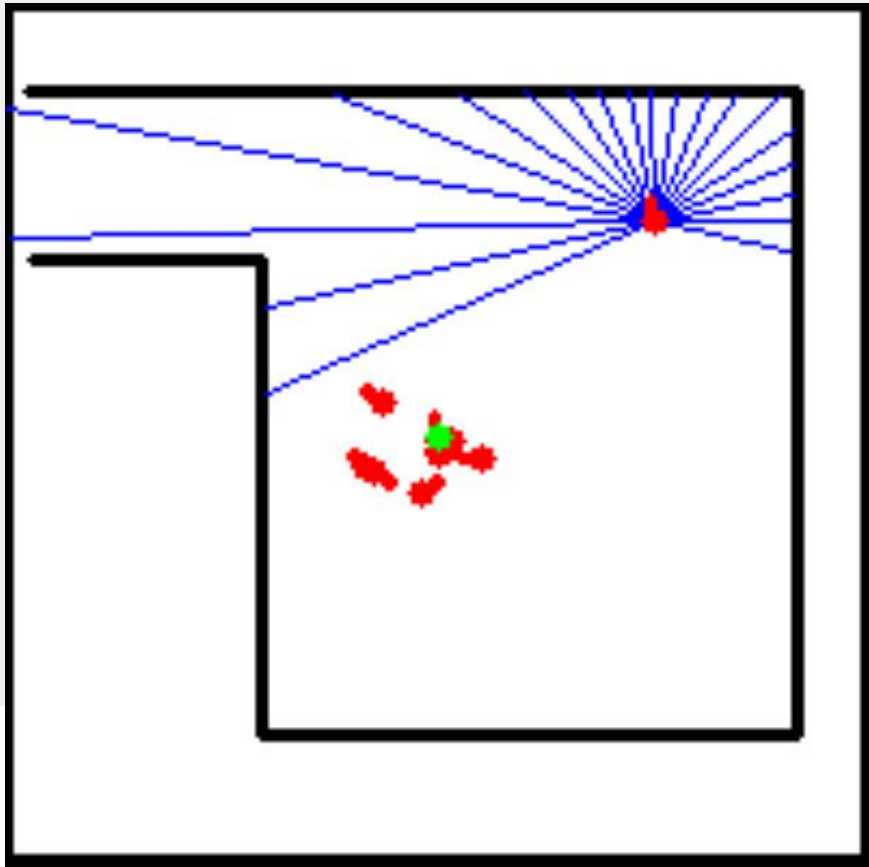


Perception



Particle filter

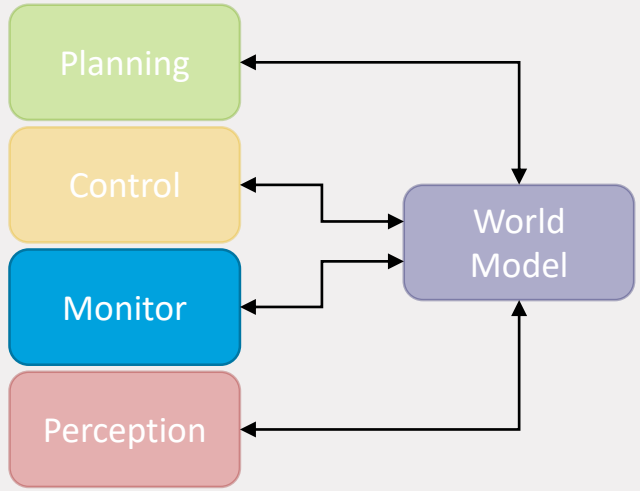
- LRF model by raycasting on given map
- Odometry to propagate particles
- PICO pose with respect to map



Data association

- Given PICO pose, determine obstacles not on map
- Track dynamic obstacles

Monitor



Extra check to avoid obstacles

- Smaller safety distance than path planner

Stop driving in the direction of obstacles after collision

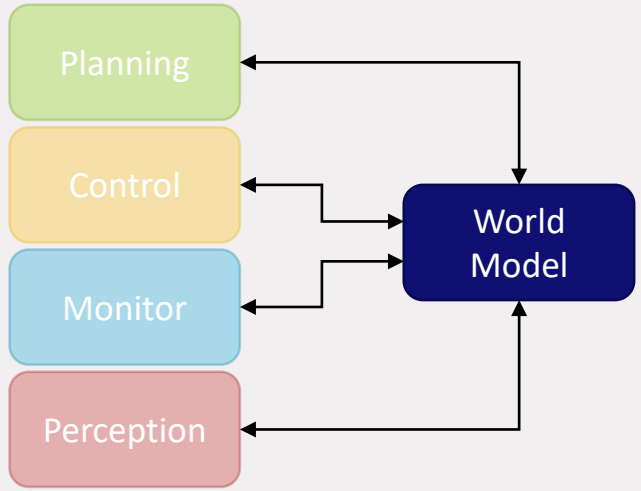
- Control effort

Indicate whether target is reached

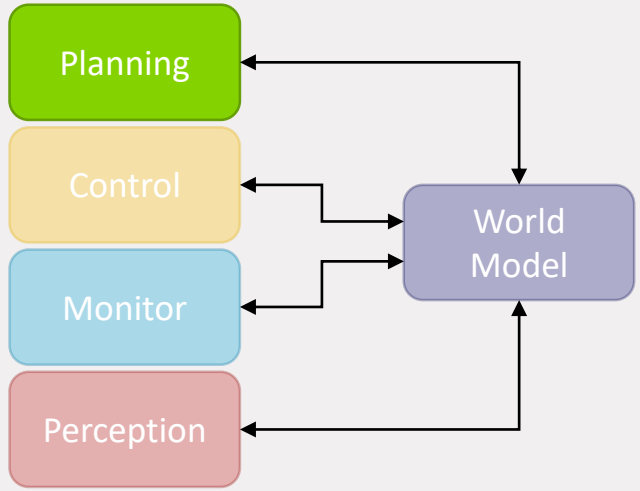
- PICO within certain small distance of target

World Model

- Obstacle positions and velocities
- PICO pose, velocity and target
- Monitoring flags:
  - Too close to obstacle
  - Collided with obstacle
  - Target reached



Planning

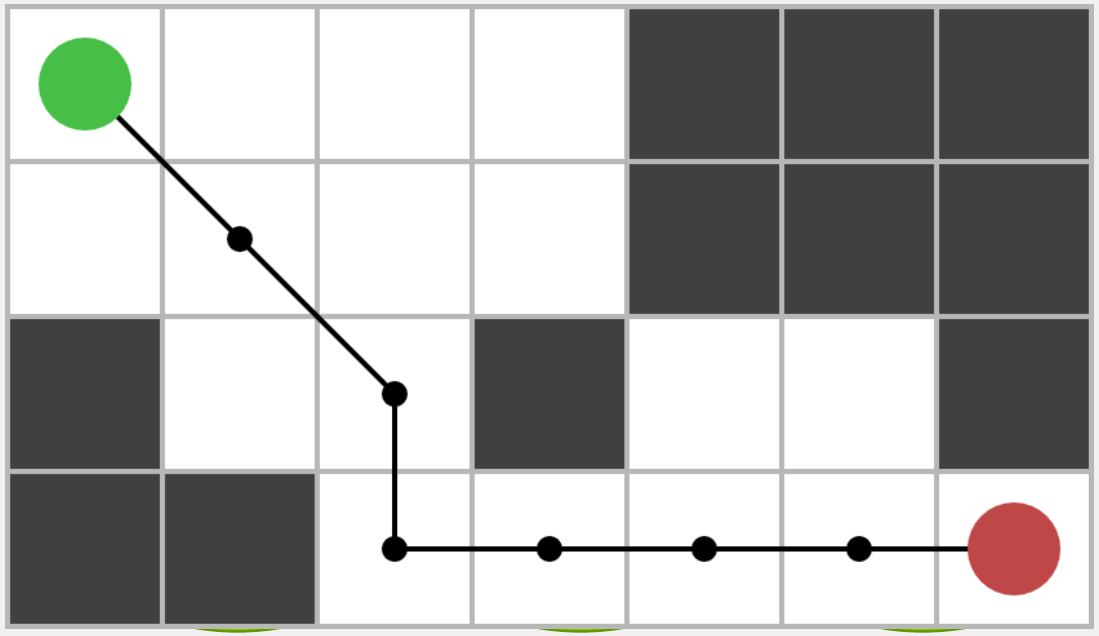


Finite State Machine

- Switch between discrete behavioral states
- Explain plan and decisions by speaking

A* path planning

- Plan shortest path through map
- Only finite precision required

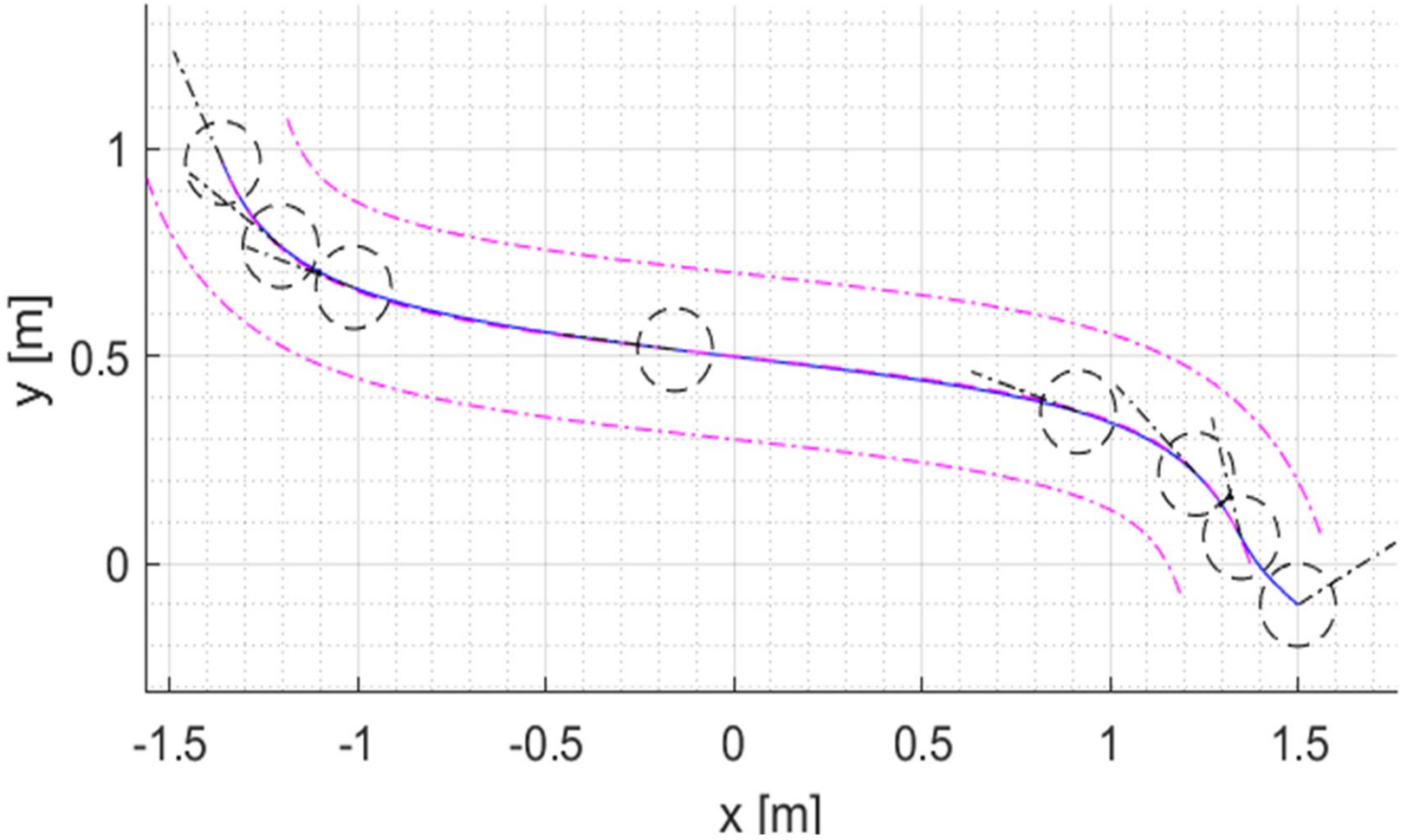


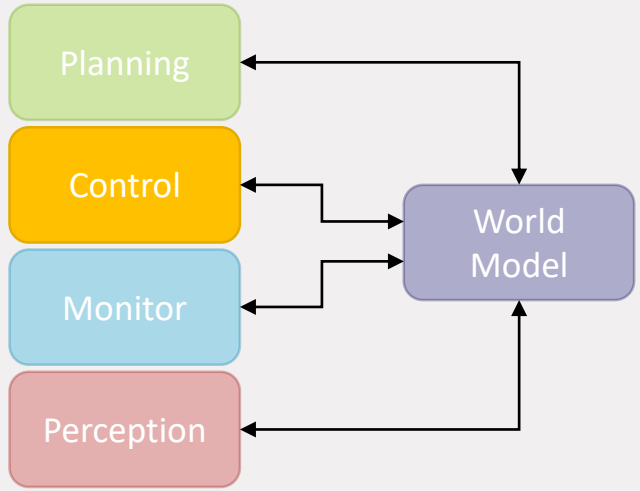
Trajectory planning

- Convert A* path to trajectory over time

TU/e

Control





- Local references
- Orientation in driving direction
- Exploit holonomicity
- Drive forward for longer distances
- Deadzone normal to path
- Velocity references as feedforward

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