Hospital challenge

Group 8

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Embedded Motion Control
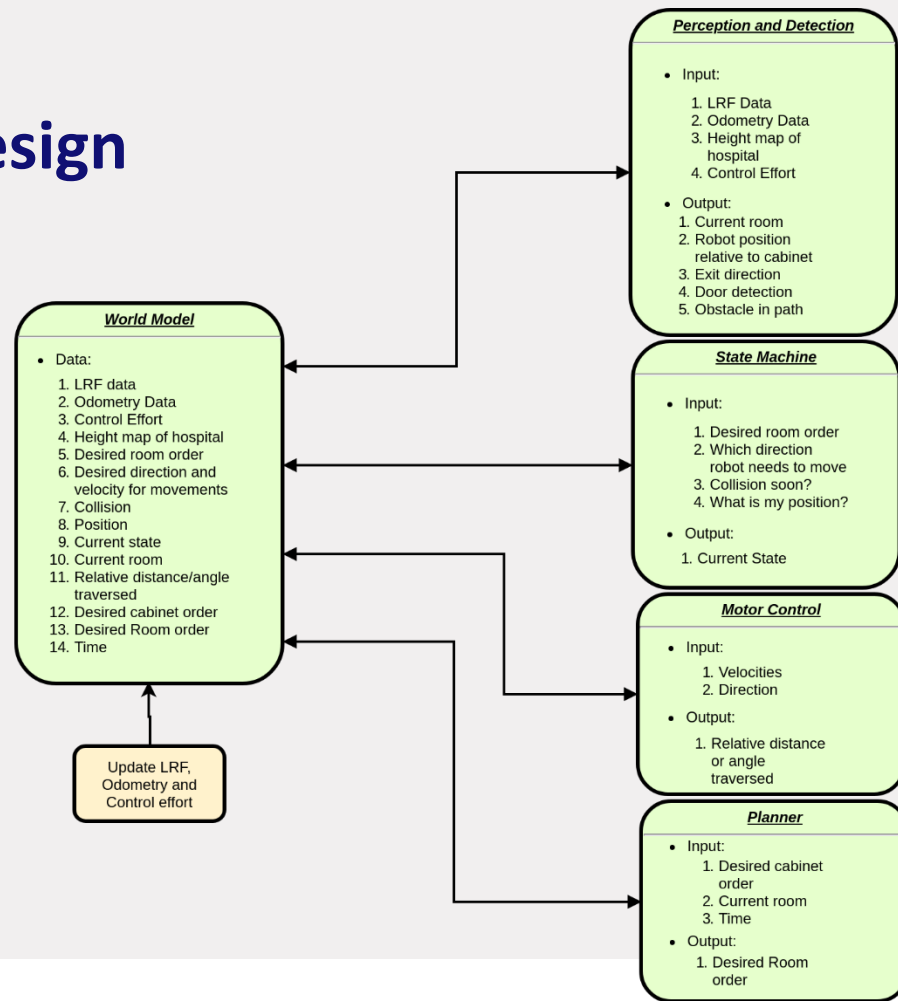
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➤ Overview software design

   ➤ Localization

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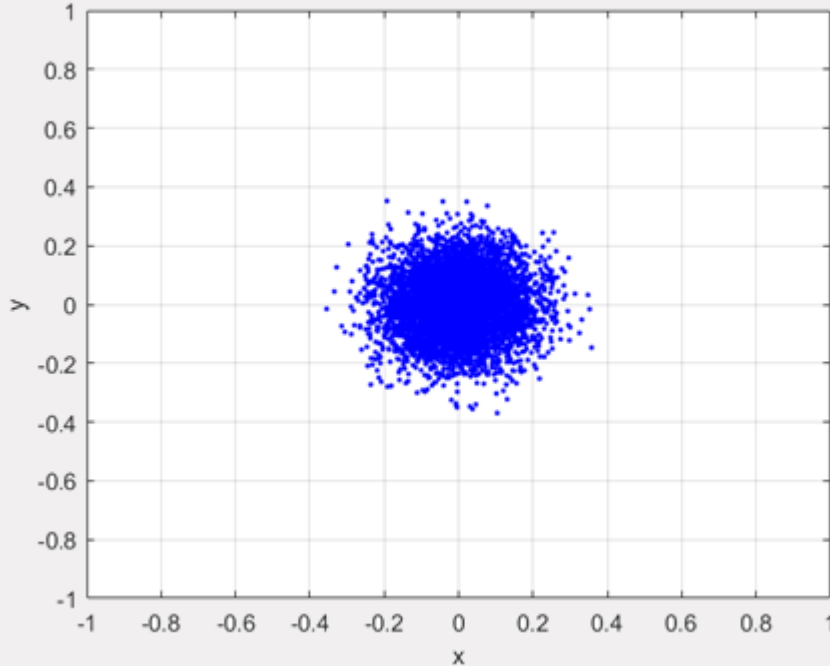
➤ Conclusion

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Overview Software Design

➢ Perception and

  Detection

  ➢ Localization

  ➢ Collision detection

➢ Planning

➢ State machine

➢ World model

Perception and Detection

- Input:
  1. LRF Data
  2. Odometry Data
  3. Height map of hospital
  4. Control Effort
- Output:
  1. Current room
  2. Robot position relative to cabinet
  3. Exit direction
  4. Door detection
  5. Obstacle in path

World Model

- Data:
  1. LRF data
  2. Odometry Data
  3. Control Effort
  4. Height map of hospital
  5. Desired room order
  6. Desired direction and velocity for movements
  7. Collision
  8. Position
  9. Current state
  10. Current room
  11. Relative distance/angle traversed
  12. Desired cabinet order
  13. Desired Room order
  14. Time

State Machine

- Input:
  1. Desired room order
  2. Which direction robot needs to move
  3. Collision soon?
  4. What is my position?
- Output:
  1. Current State

Motor Control

- Input:
  1. Velocities
  2. Direction
- Output:
  1. Relative distance or angle traversed

Update LRF, Odometry and Control effort

Planner

- Input:
  1. Desired cabinet order
  2. Current room
  3. Time
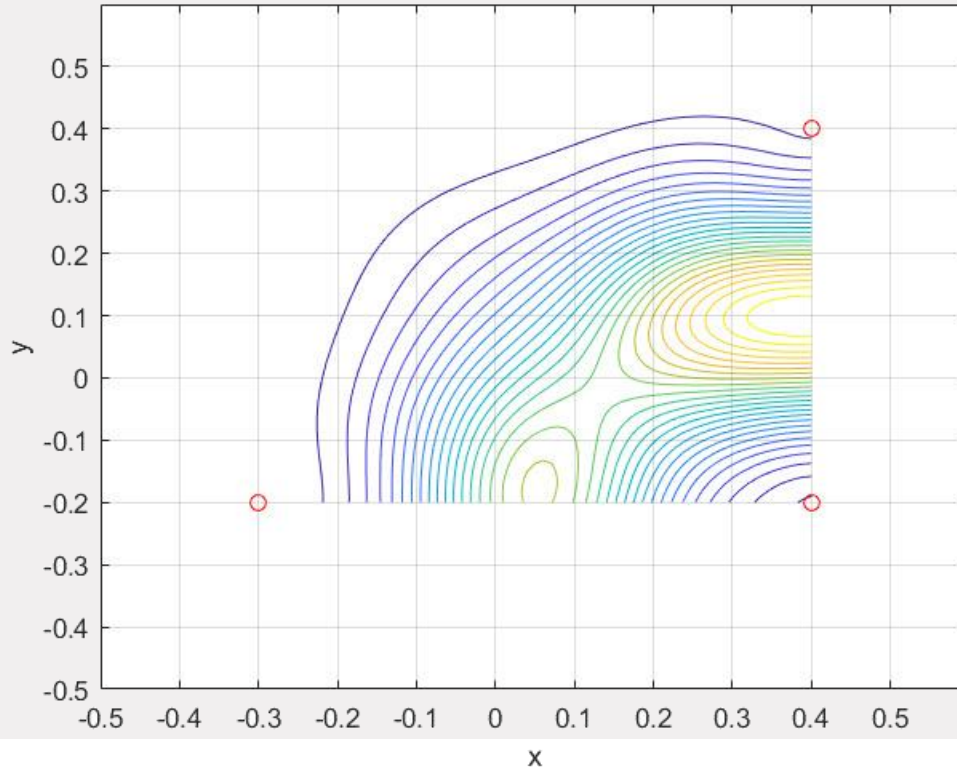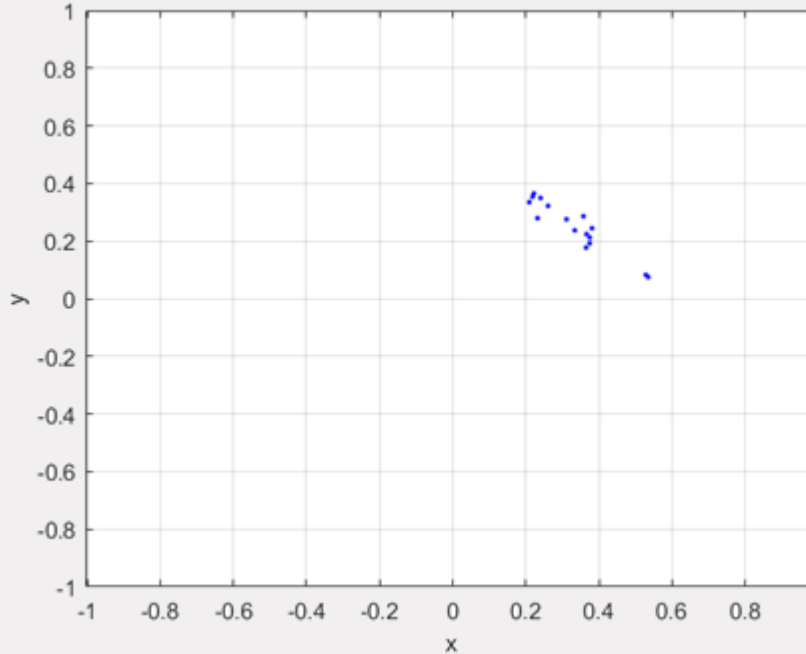- Output:
  1. Desired Room order

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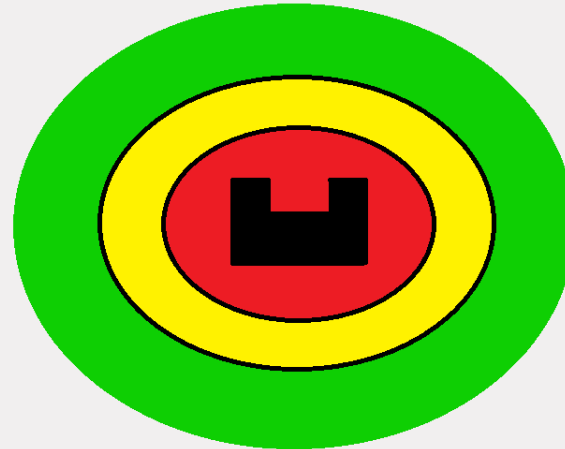# Perception and Detection: Localization

- Input:
  1. LRF Data
  2. Odometry Data
  3. Height map of hospital
  4. Control Effort

- Output:
  1. Current room
  2. Robot position relative to cabinet
  3. Exit direction
  4. Door detection
  5. Obstacle in path

➢ Fixed amount of particles
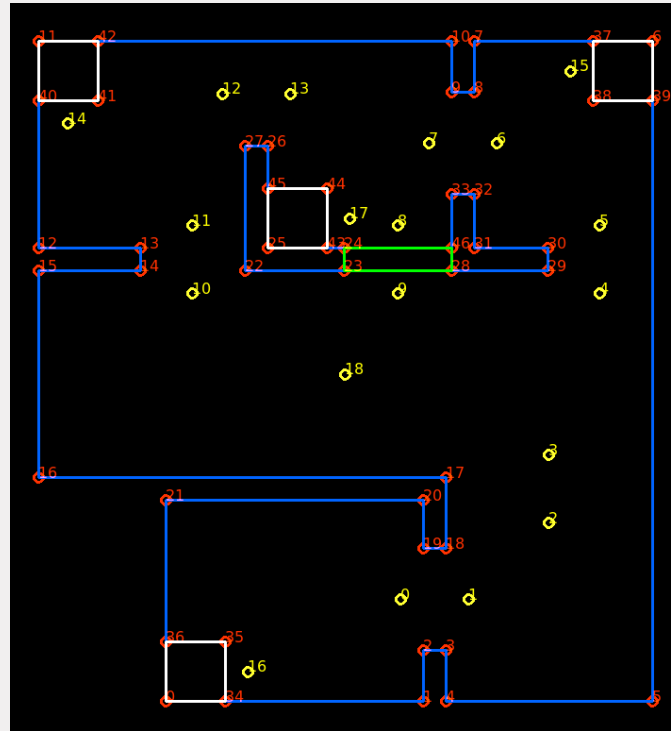
➢ Regardless map size

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Perception and Detection: Localization

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Perception and Detection: Localization

➢ Fixed amount of particles

➢ Regardless map size

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Perception and Detection: Obstacles

➢ Two radii:

   ➢ Large radius (open space movements):
      ➢ Hypotheses checking
   ➢ Small radius:
      ➢ Collision detection

Perception and Detection

- Input:
  1. LRF Data
  2. Odometry Data
  3. Height map of hospital
  4. Control Effort

- Output:
  1. Current room
  2. Robot position relative to cabinet
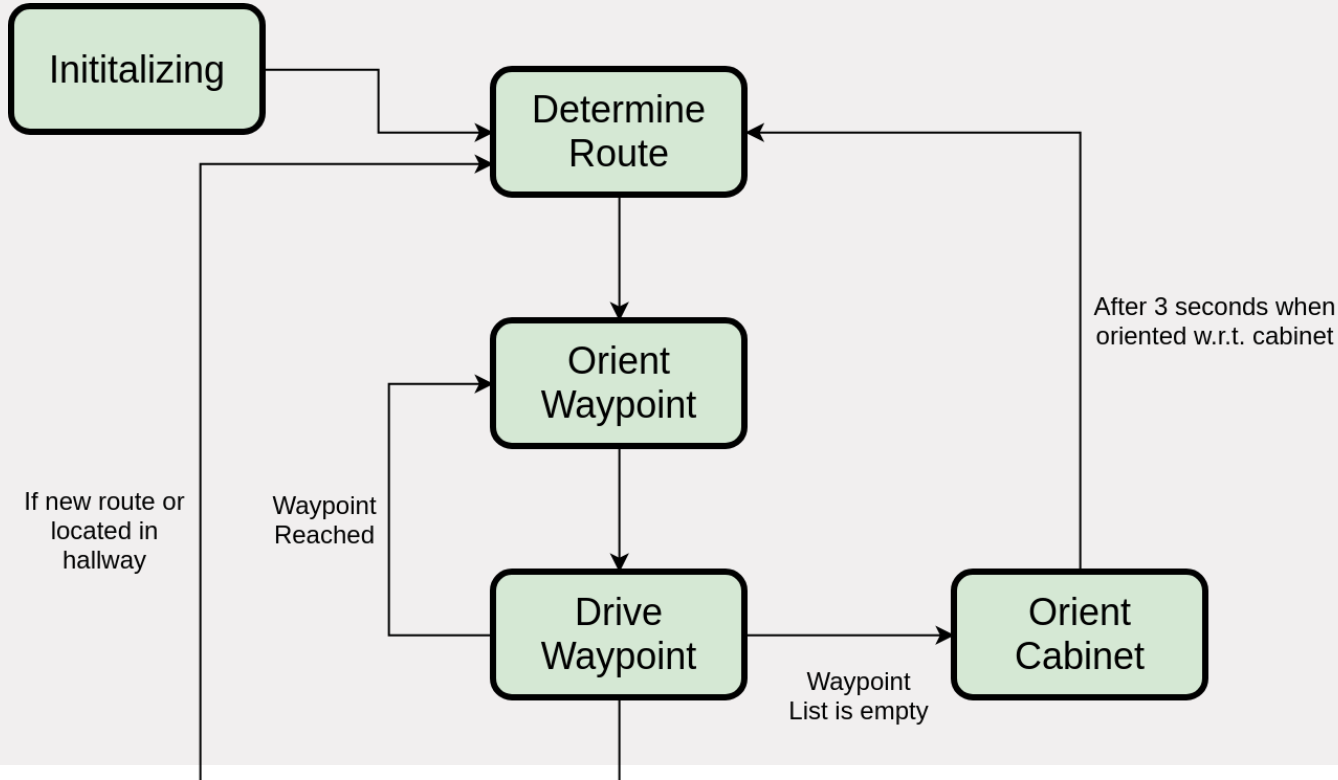 3. Exit direction
  4. Door detection
  5. Obstacle in path

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Planning

➢ Path planning

　➢ Room order

　➢ Waypoint order

Planner

- Input:
  1. Desired cabinet order
  2. Current room
  3. Time
- Output:
  1. Desired Room order

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State machine

Conclusion

➤ Simple Solution

➤ Flexible

    ➤ No gridding

➤ (Particle filter for) localization

➤ Collision detection

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