TAS-Car Group 10
Slalom course

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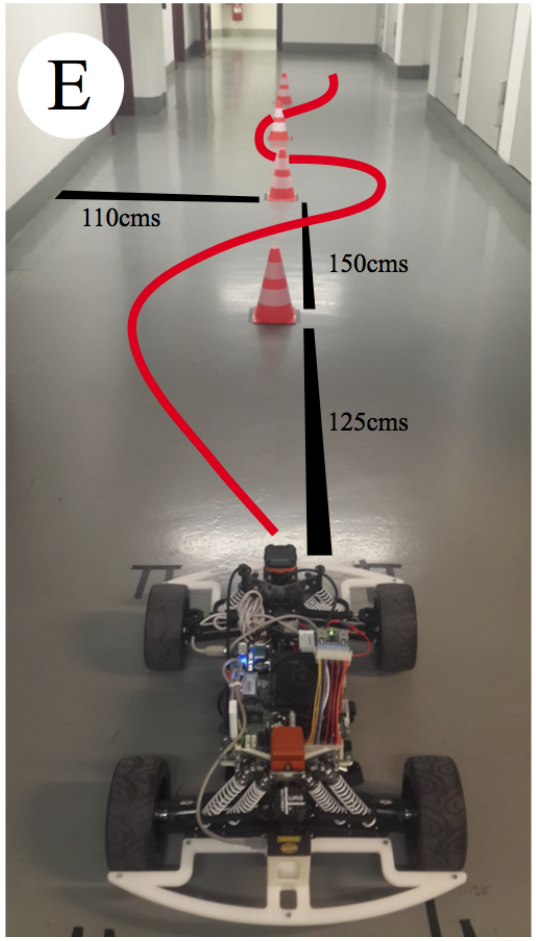
Methods

Implemented:

- Autonomous driving
- Speed adjustment
- Collision avoidance
- Oscillation suppression

Partially/not working:

- Slalom task
- Initial pose through wifi
- Combined laser scans
- Kalman Filter



Autonomous driving

- Navigation through waypoints
- Optimizing navigation stack parameters
- Speed adjustment
- Oscillation suppression
- Collision avoidance

Problem of speed adjustment:

- Car steering angles oscillate at a higher speeds

$\rightarrow$ Limit steering angle depending on laser scan

  - Turn off limitation at corners and obstacles

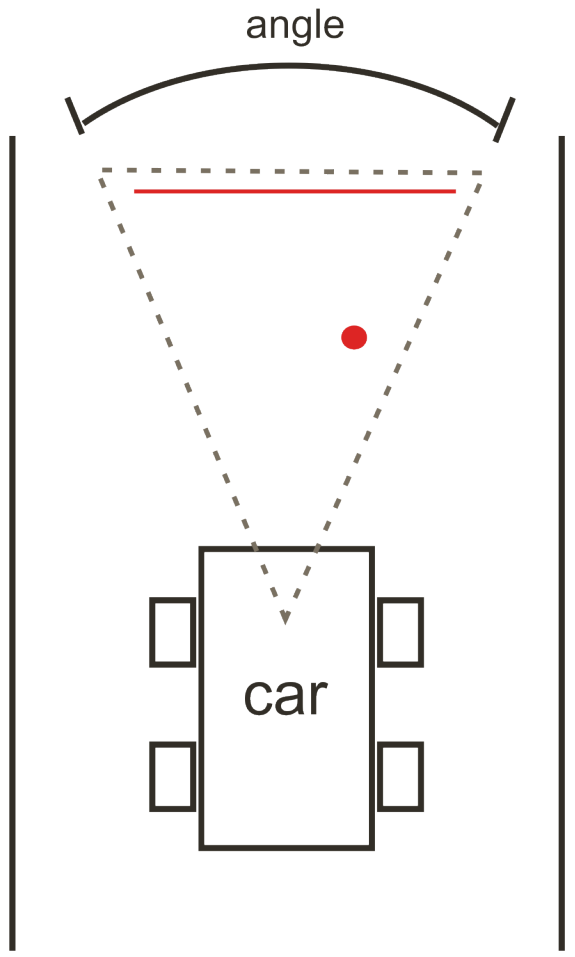
Speed adjustment

Fixed area in front of the car is checked for obstacles to adjust the speed.

- Angle defines values of the laserscan to look at
- Compute the median of the n smallest values of laserscan(angle)
- Speed $= 1535 \cdot$ median
- Emergency break if median is smaller threshold

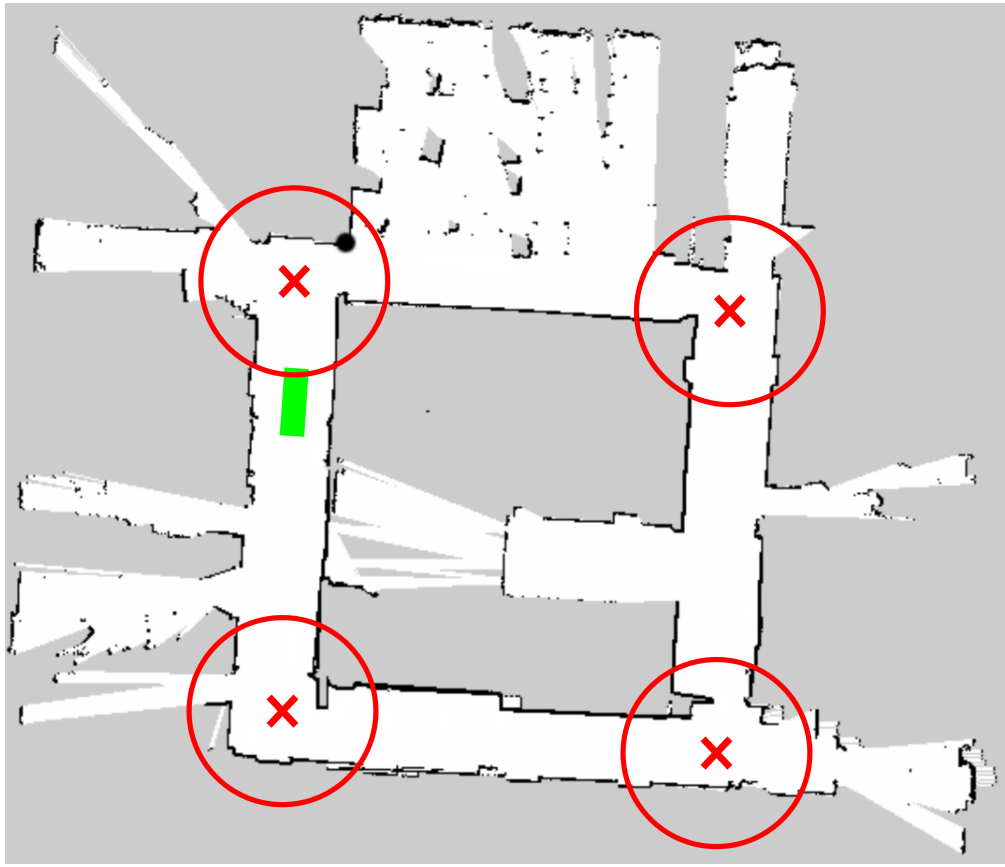
Problem:

- Car starts oscillating if speed is higher than 1550



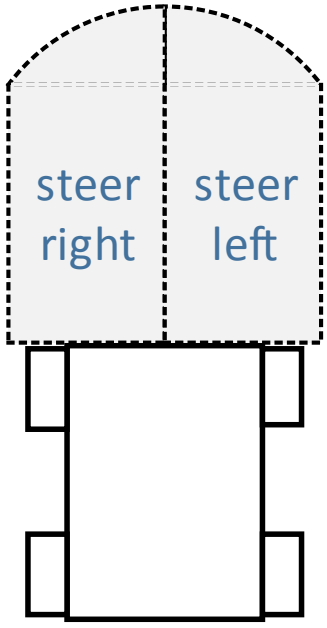
Oscillation suppression

To overcome the oscillation we limited the steering angle except in the corners of the lab.



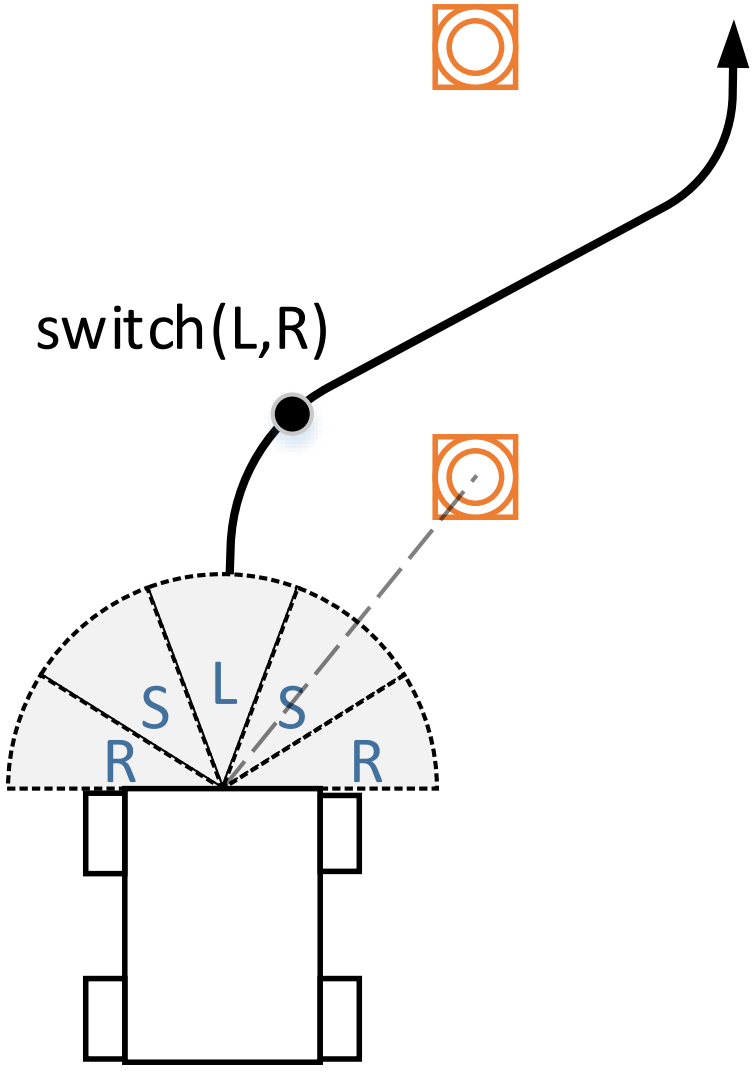
Collision avoidance

- Define collision area
- Cut laser scan in halves
- Detect obstacle
  - Smallest laser scan value
- Steer away from obstacle



Slalom task

- Detect cone
  - Find jump in laser scan
  - Find opposite jump
  - Average the indices
- Split laser scan into sectors
- Define actions for sectors
  - Depending on nearest cone
  - Passing cone left or right
  - Switch actions for new nearest cone
- Future Improvements
  - Cone detection robustness



Multi-merge laser scanner

- For better pose estimation through AMCL combine front and rear laser scan with existing node.
- Functionality of node:
  - Convert scans to point cloud
  - Combine the clouds with least possible error
  - Convert back as one laser scan
- Problem: Missing information in merged scan
- Reasons for this error:
  - Error in transformation
  - Scans must be in same plane

Initial pose through wifi

Idea: Find out the initial position over the Wifi intensity.

- Start Position depending on intensity of router
- Closest router doesn't have highest intensity

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Level Pos 1: 100
Level Pos 2: 92
Level Pos 3: 45

Found init position 1
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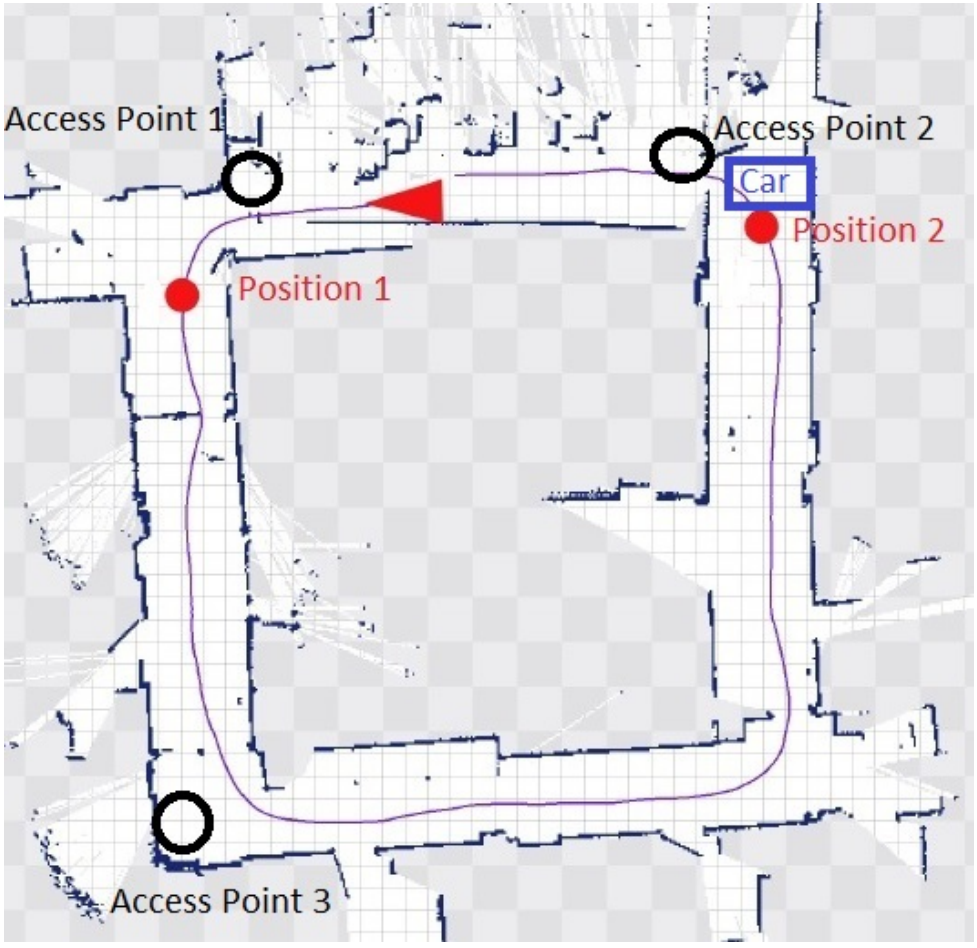

Discussion

- Basic Navigation could be realized
- Not enough time to smooth out all errors and implement certain features
- Too much effort spent on fixing errors and getting to know the system