CommonRoad Search - Search-based Motion Planners with Motion Primitives

Programming Exercise - **Techniques in Artificial Intelligence**

Edmond Irani Liu, M.Sc.

November 20, 2020

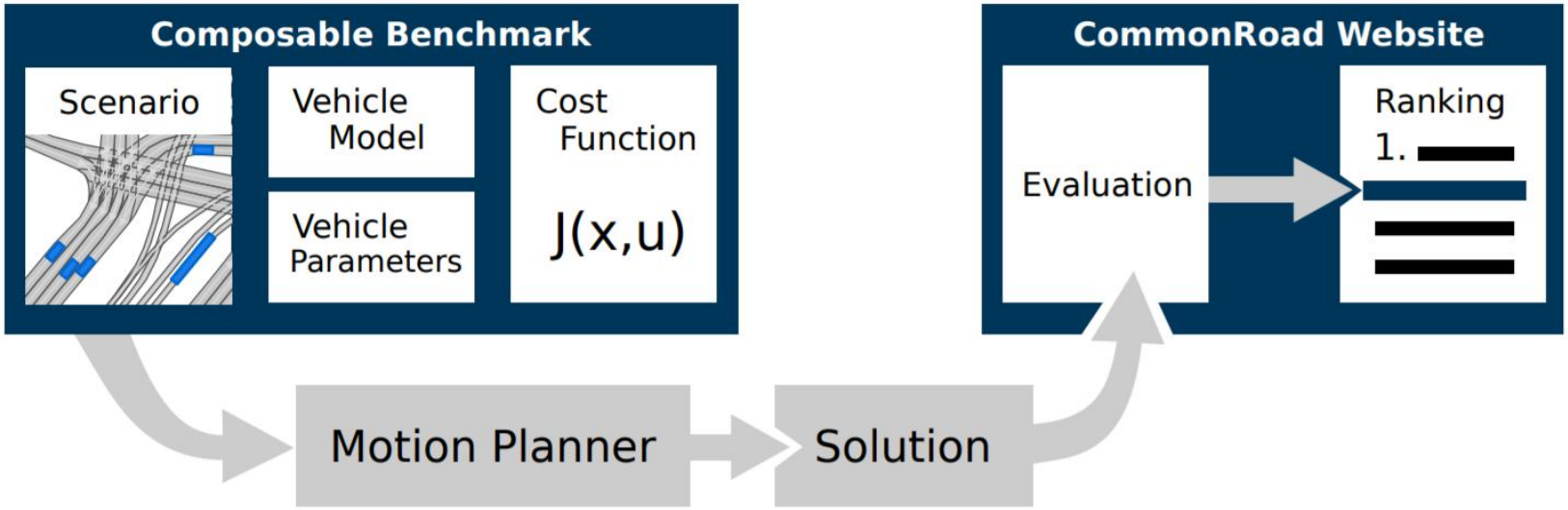
Task Description

- Solving CommonRoad scenarios using search algorithms with motion primitives

Task Description

- Solving CommonRoad scenarios using search algorithms with motion primitives

Composable benchmarks for **Mo**tion planning **on Road**s



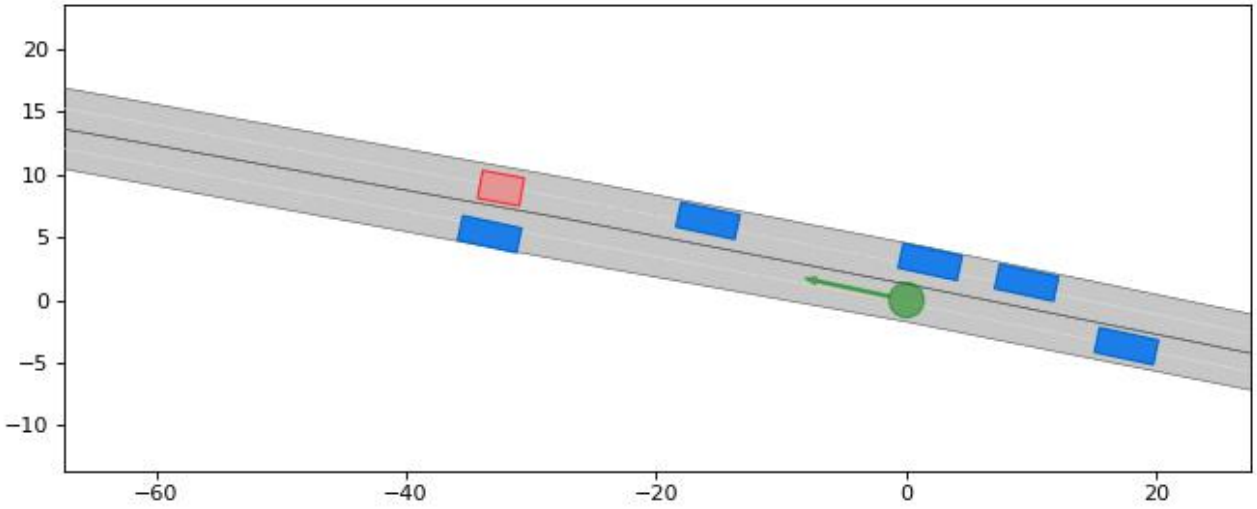
https://commonroad.in.tum.de

More details can be found in the exercise guide

Task Description

- Solving CommonRoad scenarios using search algorithms with motion primitives

Composable benchmarks for **Mo**tion planning **on Road**s



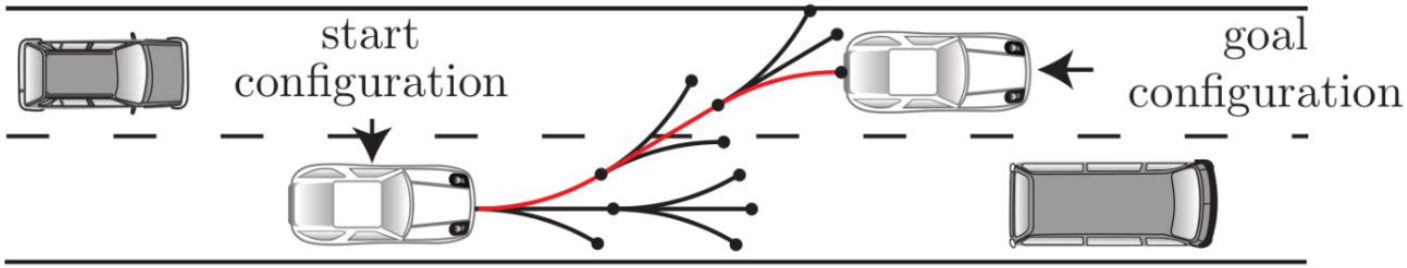
https://commonroad.in.tum.de

More details can be found in the exercise guide

Task Description

- Solving CommonRoad scenarios using search algorithms with motion primitives

Motion primitives: short trajectories that are drivable by a given vehicle model



A search tree with motion primitives

More details can be found in the exercise guide

Task Description

- For your reference, we provide 6 basic algorithms:
  1. Breadth First Search
  2. Depth First Search
  3. Depth-limited Search
  4. Uniform Cost Search (aka Dijkstra)
  5. Greedy Best First Search
  6. A* Search

More details can be found in the exercise guide

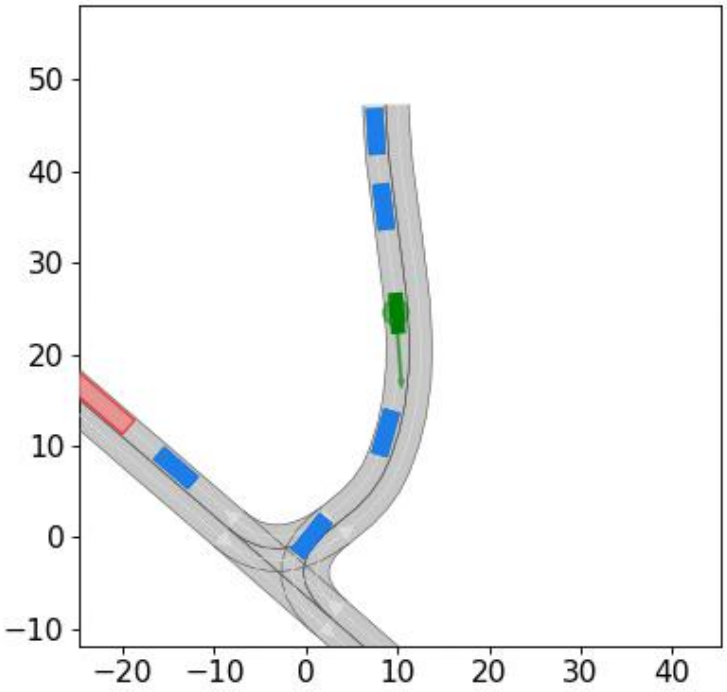
Task Description

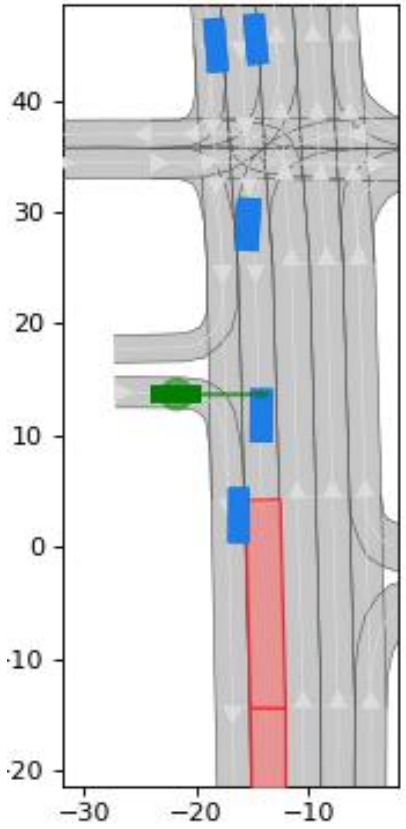
- For your reference, we provide 6 basic algorithms:
  1. Breadth First Search
  2. Depth First Search
  3. Depth-limited Search
  4. Uniform Cost Search (aka Dijkstra)
  5. Greedy Best First Search
  6. A* Search
- You need to..
  - improve the heuristic function; and/or
  - develop your own search algorithm.

More details can be found in the exercise guide

Example Solutions

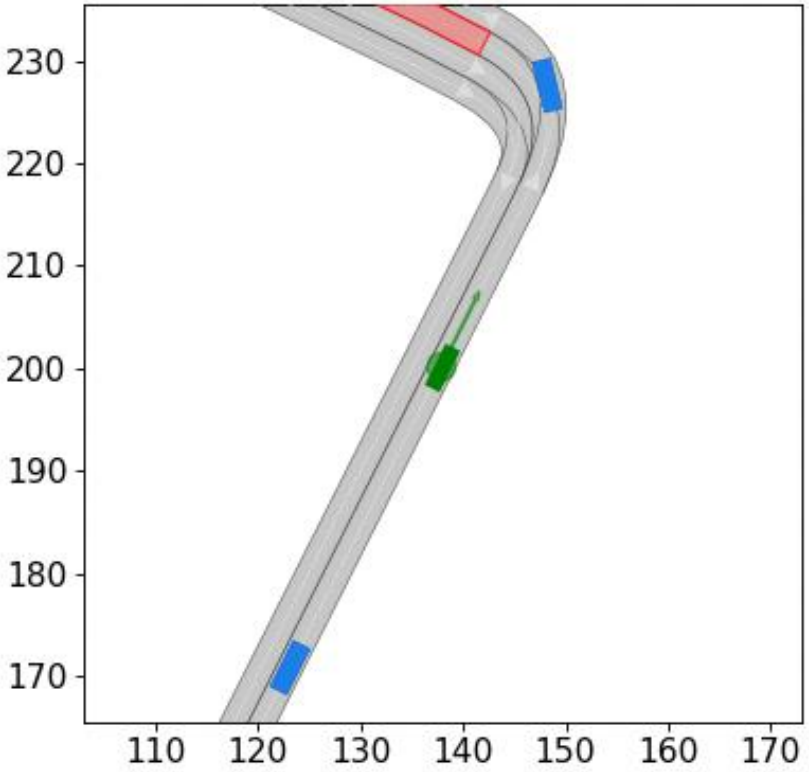
- Submissions from last year





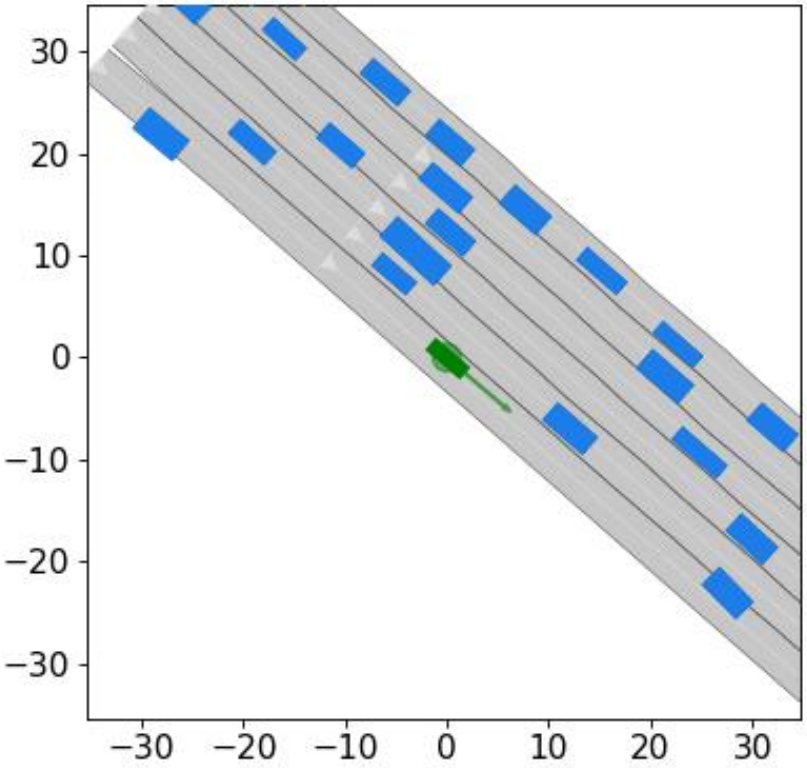
Example Solutions

- Submissions from last year



Example Solutions

- Submissions from last year



Requirements

- You need to solve at least 340 scenarios out of the 500 provided scenarios.
  (320+ already solvable with the given planners).

More details can be found in the exercise guide

Requirements

- You need to solve at least 340 scenarios out of the 500 provided scenarios. (320+ already solvable with the given planners).
- Work independently. If plagiarism detected you will lose bonus points.

More details can be found in the exercise guide

Requirements

- You need to solve at least 340 scenarios out of the 500 provided scenarios. (320+ already solvable with the given planners).
- Work independently. If plagiarism detected you will lose bonus points.
- Submit before January 18, 2021

More details can be found in the exercise guide

Rewards

Students who…

- Successfully pass the exercise

Rewards

Students who…

- Successfully pass the exercise

- Submit the most solutions (Top 10)

Rewards

Students who…

- Successfully pass the exercise

- Submit the most solutions (Top 10)

- Submit the most solutions (Top 3)

Rewards

Students who…

- Successfully pass the exercise

- Submit the most solutions (Top 10)

- Submit the most solutions (Top 3)

- Submit the most solutions (Top 1)

Rewards

Students who…

- Successfully pass the exercise

- Submit the most solutions (Top 10)

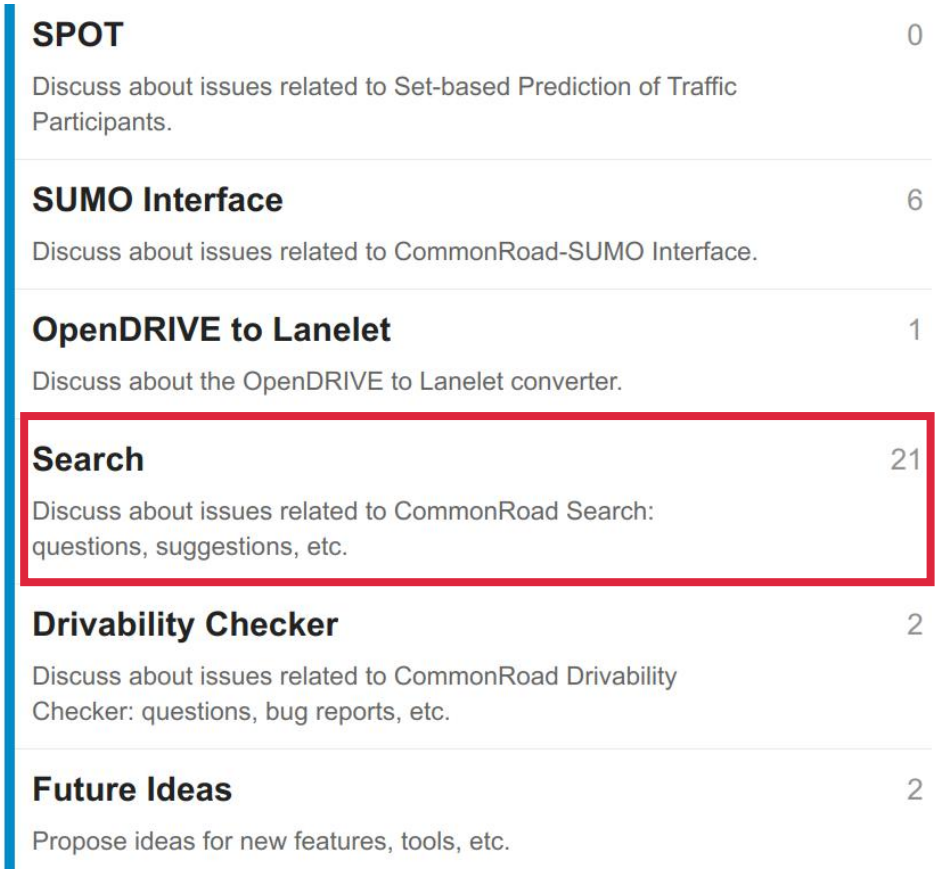
- Submit the most solutions (Top 3)

- Submit the most solutions (Top 1)

The best student will receive 200 Euros

Questions

- Please ask your questions in the CommonRoad Forum

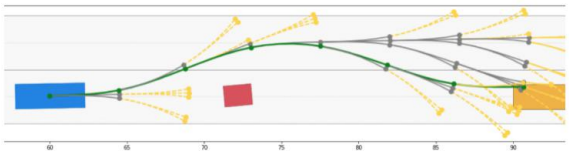


https://commonroad.in.tum.de/forum/

More details can be found in the exercise guide

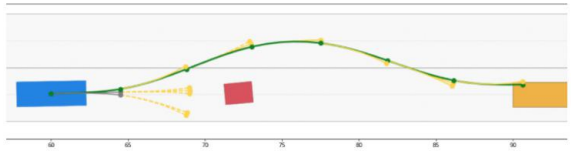
Getting Started

- Visit the repository at https://gitlab.lrz.de/tum-cps/commonroad-search
- Check out the exercise guide



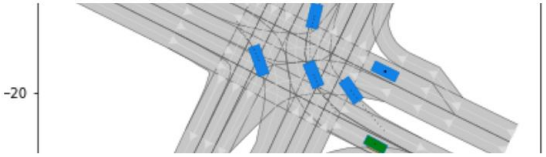
Tutorial 01: Uninformed Search

Uninformed search algorithms with motion primitives to solve motion planning problems.



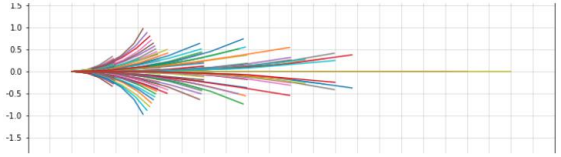
Tutorial 02: Informed Search

Informed search algorithms with motion primitives to solve motion planning problems.



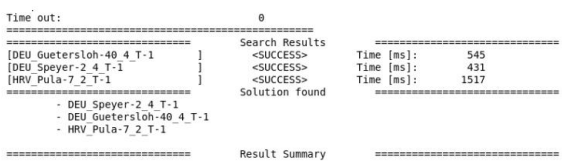
Tutorial 03: CommonRoad Search

Combining (un)informed search algorithms with motion primitives to solve real motion planning problems introduced in CommonRoad.

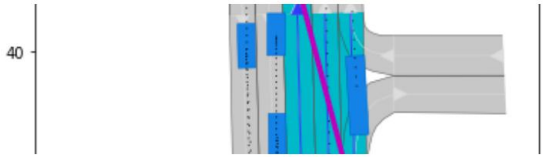


Tutorial 04: Motion Primitive Generator

Learn how to generator your own set of motion primitives.



Tutorial 05: Batch Processing



Tutorial 06: Route Planner

Questions?