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(1) Path planner for autonomous driving
We consider an industrial path planner (PP)
The PP decides the path to follow by
• enumerating a set of possible paths
• scoring them with a weighted cost function
• selecting the least costly one (e.g., red path in the figure)
The PP behavior depends on the cost function weights
We consider alternative versions of PP (by changing the weights)

(2) Oracle problem in testing the PP
Testing the PP poses several challenges
• Huge search space
• Oracle problem
• A collision is sometimes unavoidable (see example)
• How to find collisions that are avoidable?
We deem a collision avoidable if the PP configured with different weights does not lead to a collision

(3) Searching for Avoidable Collisions [ICST’20]
We proposed an approach based on genetic algorithms to find avoidable collisions
• A solution (individual) is a scenario and alternative weights
• Two objectives
  • Maximize the danger difference between the executions of the scenario in the original PP and in the alternative one
  • Minimize the difference between original and modified weights
The alternative weights for solving a collision may overfit, i.e., they do not solve other collisions (see solution in GECCO’20 work)

(4) Avoiding overfitting of solutions [GECCO’20]
We proposed an approach for finding weights solving multiple collisions
• A solution (individual) is given by multiple scenarios and alternative weights
• Two objectives
  • Maximize the danger differences between the executions of the scenarios in the original PP and in the alternative one
  • Minimize the difference between original and modified weights

(5) Self-adaptive path planner [SEAMS’20]
• There is no best PP configuration
• We re-engineered the PP such that it modifies the weights at runtime (according to the observed environment)
• We follow the MAPE-K loop architecture

References