

# Motion Planning with Guaranteed Safety Using Maneuver Automata

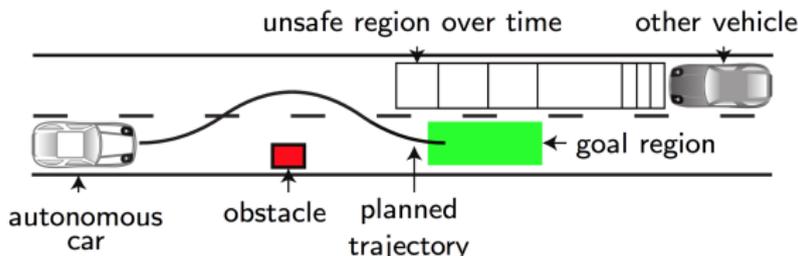
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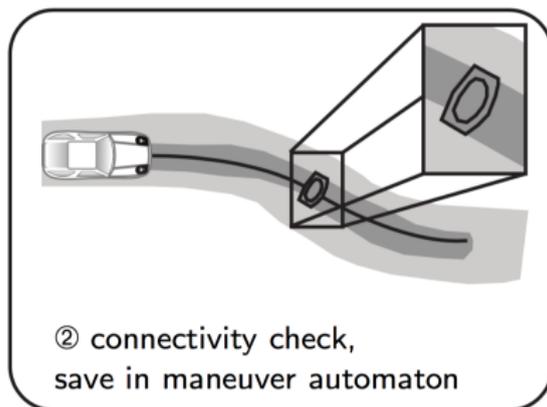
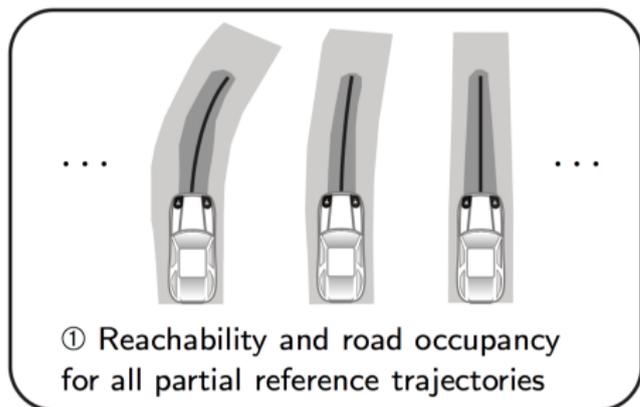
# Maneuver Automata

## Autonomous Driving



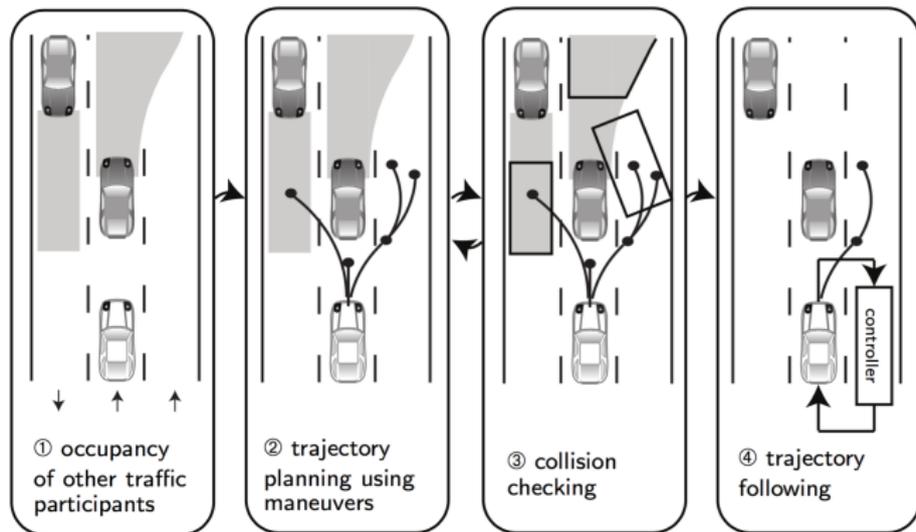
- Safe trajectory planning is a hard task. It requires:
  - the solution of an optimal control problem for the ego vehicle's trajectory
  - the computation of the reachable set of the ego vehicle
  - the computation of the reachable sets of others
- The first two steps are very time consuming and often prohibit online use
- **Solution:** Safe maneuver automata

# Maneuver Automata: Offline Part



- Optimal controllers and reachable set are computed for short trajectories, so-called motion primitives, e.g., drive straight for a short time, turn left, turn right, etc.
- All motion primitives are stored as states in a maneuver automaton
- If the final reachable set of one motion primitive is completely inside the initial set of another motion primitive, they can safely be concatenated

# Maneuver Automata: Online Part



- Offline-generated motion primitives are used for online planning
- No complex optimal control problems or reachable set computation must be performed online
- Online planning simplifies to a discrete search problem

# Topic: Motion Planning with Guaranteed Safety Using Maneuver Automata

- We developed a novel controller synthesis algorithm which computes optimized motion primitives
- **Goal:** Use these motion primitives for online planning
- **Tasks:**
  - Compute full maneuver automaton for a self-driving car using our algorithm
  - Develop/implement a safe planning algorithm using the maneuver automaton
  - Test the combined approach for different traffic scenarios

# Questions?

## **Contact:**

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