Real-Time Motion Planning Approach for Automated Driving in Urban Environments

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Outline

- Contribution of paper to literature
- Real time planning
- Path planning approach
  - Collision checking
- Speed profile generation
- Trajectory generation
- Conclusion

Contribution of paper to literature

- Balanced between optimality and computing time
- Determinism at medium and high speeds
- Considering kinodynamic constraints of vehicle
- Avoiding static and dynamic obstacles

Real time planning

- Computation of optimal path at medium and high speeds
- Avoiding dynamical obstacles

Path planning approach

- Continuous curvature path
- High degree of quintic Beziér curves provide high controllability at the extreme points (degree of freedom to adjust velocity and acceleration)

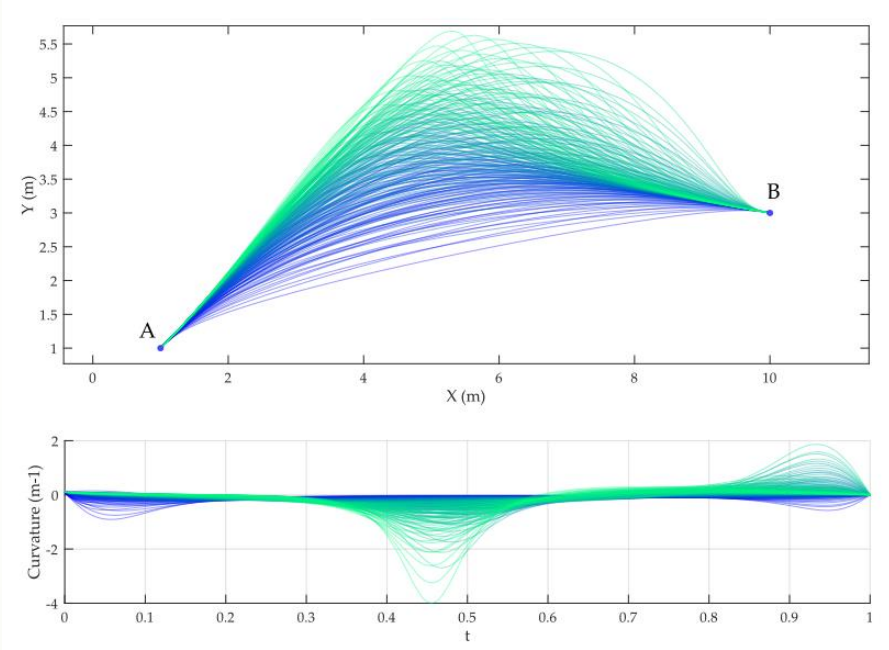

Figure 1.
Top: Quintic Bézier Curves
Bottom: Curvature of each curve

Collision checking

- Most expensive process
- Calculate collision check with approximate bounding rectangle with added safe margin

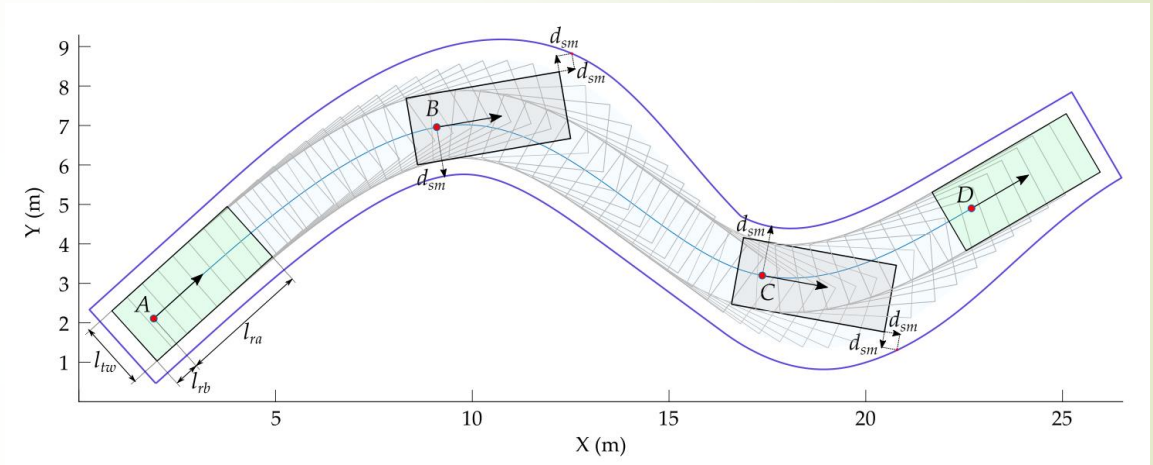

Figure 2. Occupancy map of a regular vehicle

Speed profile generation

- Limits longitudinal and lateral acceleration as well as speed
- Initial speed and final speed are calculated

Trajectory generation

- Problem initialization
- Candidates evaluation
- Best candidate selection and final trajectory calculation

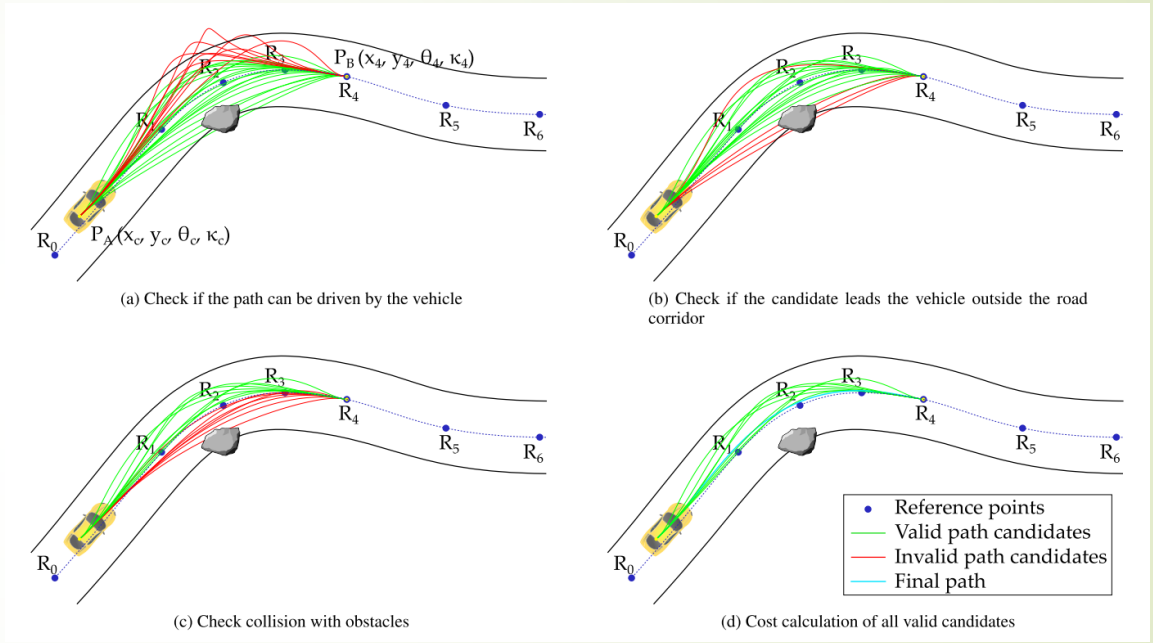

Figure 3. Path candidates and their evaluation

Conclusion

- Optimality between convergence and computation time
- Path and speed profile generation
- Real time operation