Safe Temporal Planning for Urban Driving

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Introduction

- A central goal of artificial intelligence is the construction of autonomous systems.
- It is becoming more common that these systems interact closely with humans. Autonomous vehicle technology is an auspicious example.
- It is crucial that AI systems humans interact with are designed with safety as a fundamental aspect.

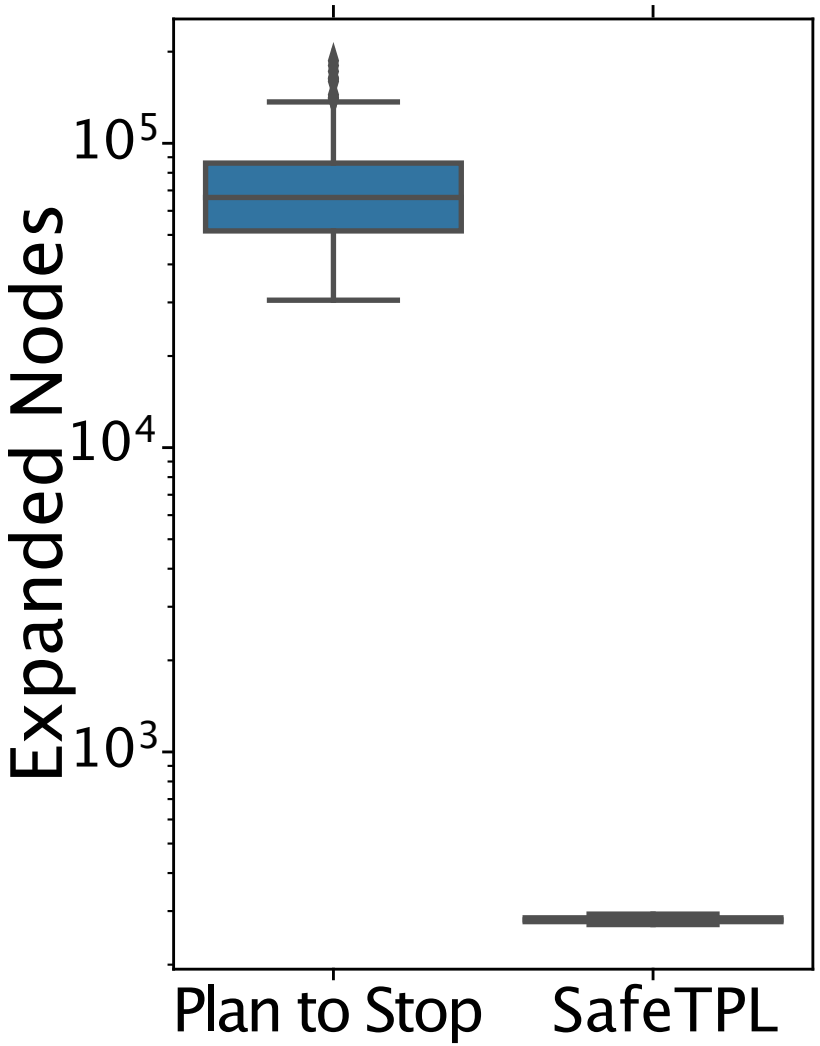
Problem Setup

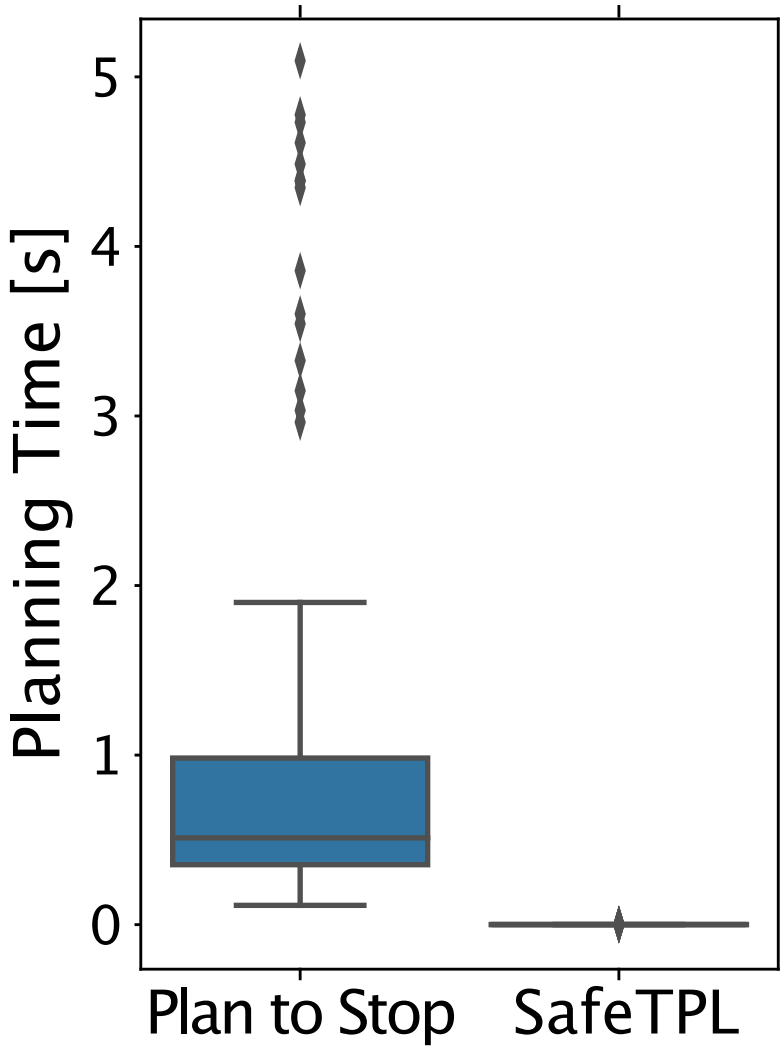
- Self-driving vehicles frequently replan to accommodate dynamic obstacles and to ensure safety.
- One way to generate a trajectory is to take a spatial plan, a path, and assign accelerations along the path.
- Previous methods approached this problem by constructing a comfortable trajectory that brings the vehicle to a stop by the end of the spatial plan.

Contributions

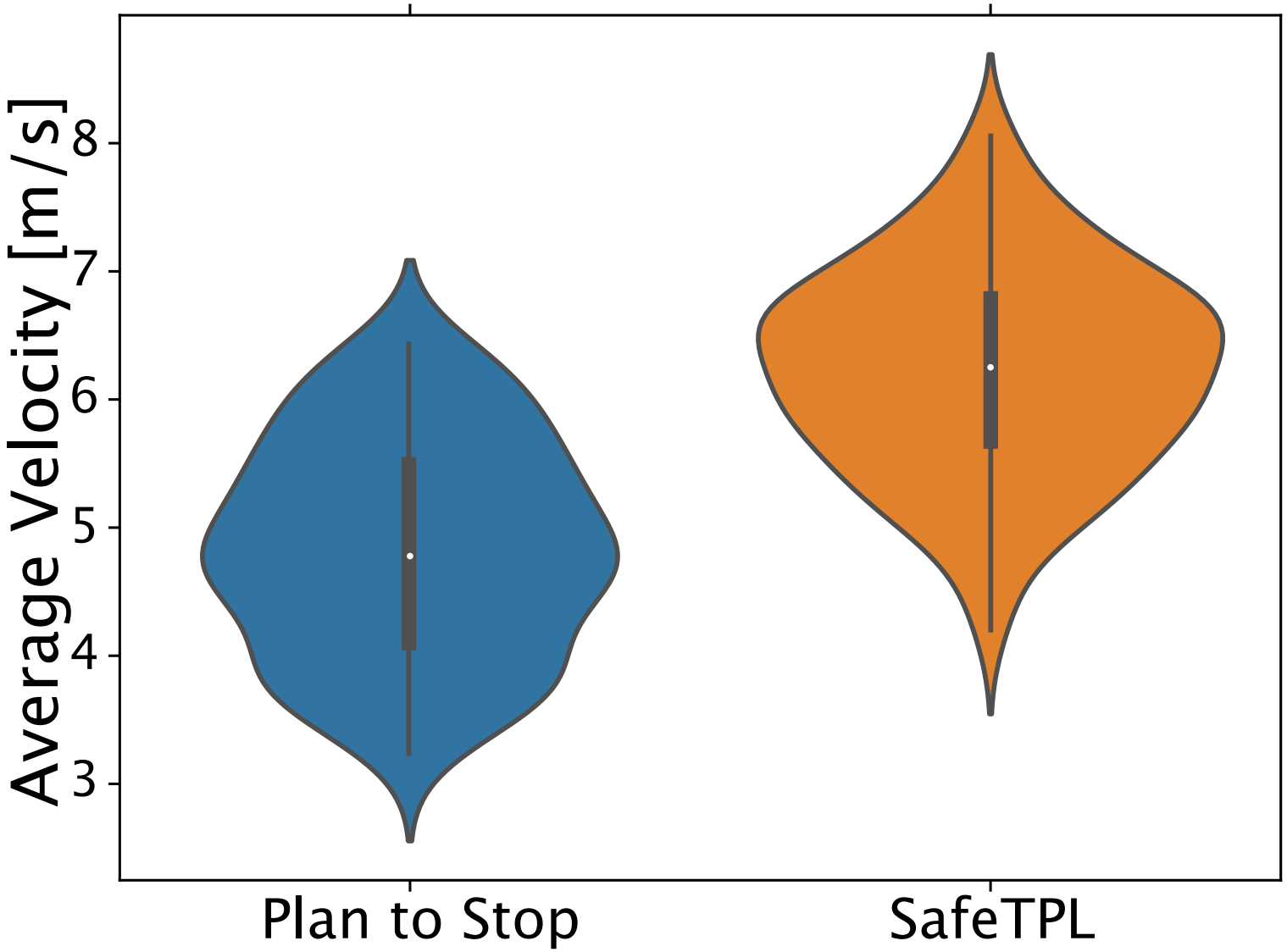
- A new technique for urban driving explicitly designed to achieve a safe high-quality plan.
- Empirically demonstrate our safe temporal planner is a significant improvement to conventional methods while still maintaining passenger comfort and safety.
- Theoretical results guaranteeing our approach will find a safe plan and expand only twice as many states as a naïve method.

Resource Utilization





Performance



Conclusion

- Introduced a new and more effective method for safe action selection in spatiotemporal planning.
- Other planners expand more nodes than required to guarantee safety; our approach quickly generates safe and comfortable plans online.
- Drastically reduced planning time while maintaining a higher average velocity of the vehicle.
- We've demonstrated that safe real-time heuristic search (Cserna et al., 2018) has important benefits in autonomous vehicles.