Real-time Motion Planning for Agile Autonomous Vehicles

Summary : Summarize the paper, what are the main contributions? Where does the work fit in the literature? What advances does it make?

Significance : What is the significance of those advances? Which communities/application areas would benefit from the contributions in the paper?

Technical   commentary : Are the methods correct? Do the derivations make sense? Are the assumptions employed reasonable? If there are experiments, are they described in sufficient detail?

Speculative   commentary : How could the work be improved? What are some glaring flaws? Are there any subtle flaws? What could be some extensions?

Literature   trail : Provide 3 papers that are cited in this paper. Provide 3 papers that cite this paper (if there are any)

Other comments : Things that you want to say that are not covered by above.

**QUESTION 1**

1. Speculative Commentary: Comment on improvements that could be made or any other flaws which could be improved upon.

The text in the paper can be reduced by using mathematical equations at appropriate places. Figures/tables can be used to summarize the textual content.

### QUESTION 2

1. Summary: Provide the summary of the paper.

The paper provides a randomized motion-planning algorithm as an extension to the Probabilistic RoadMap framework. This paper adds dynamics of control to the PRM-based solution and evaluates it in a Land Rover & Small Autonomous Helicopter. The algorithm is presented in a layered manner- Real-time(safety aspect), Agile (control dynamics aspect) along with collision avoidance.

### QUESTION 3

1. Significance: Highlight the significance of the advances of the paper.

The paper provides a real-time random motion planning for agile vehicles, which takes into account the control dynamics of the platform. It also analyses the obstacle-free and collision-avoidance approaches separately mathematically and combines the two. The stepwise analysis of the algorithm –System Dynamics, Obstacle-Free Guidance System, Environment Characterization has led to the Problem Formulation and only then obstacles are considered.

### QUESTION 4

1. Provide 3 papers that are cited in this paper. Provide 3 papers that cite this paper (if there are any)

Cites:

1. Hsu, David, et al. "Randomized kinodynamic motion planning with moving obstacles." *The International Journal of Robotics Research* 21.3 (2002): 233-255.
2. Feron, E., et al. "A randomized attitude slew planning algorithm for autonomous spacecraft." *AIAA Guidance, Navigation, and Control Conference and Exhibit*.
3. LaValle, Steven M., and James J. Kuffner Jr. "Randomized kinodynamic planning." *The international journal of robotics research* 20.5 (2001): 378-400.

Cited by:

1. LaValle, Steven M. *Planning algorithms*. Cambridge university press, 2006.
2. Ren, Wei, and Randal W. Beard. *Distributed consensus in multi-vehicle cooperative control*. London: Springer London, 2008.
3. Ren, Wei, and Randal W. Beard. *Distributed consensus in multi-vehicle cooperative control*. London: Springer London, 2008.
4. Ren, Wei, and Randal W. Beard. *Distributed consensus in multi-vehicle cooperative control*. London: Springer London, 2008.

### QUESTION 5

1. Other Comments: Thing you want to say that are not covered by the aforementioned topics.

N/A.

### QUESTION 6

1. Technical Commentary: Comment on the scientific methods used in the paper.

The paper provides a very good analysis of related work, analysis of complexity and performance bounds of the randomized algorithm used. This along with evaluation on multiple platforms such as Land Rover and Quadcopter is used to convince the readers of the effectiveness of the algorithm. Thus, the paper blends theory and practice effectively