Taewan Kim

twankim@uw.edu http://taewanresearch.notion.site

Summary

Ph.D. candidate in Aeronautics & Astronautics specializing in optimization-based planning and control for autonomous systems. Interned at SpaceX and MERL. Amazon Science Hub Fellow. Proficient in Python and C/C++ for algorithm development and implementation. U.S. permanent resident.

Experience

Jan 2025 – Mar 2025	**GNC Engineering Intern.** SpaceX. - Developed C++ simulation and flight software for power system control; collaborated with cross-functional teams to deliver a minimum viable product.
Jun 2023 – Sep 2023	**Research Internship.** Mitsubishi Electric Research Laboratories. - Designed a novel decoupled motion planning algorithm for UAV-UGV coordination via reachable sets [4].
Jul 2018 – Jul 2020	**Software Engineer.** Mechatronics R&D Center, Samsung Electronics. - Built ML-based metrology and inspection software using with Python/PyTorch for semiconductor manufacturing.
Mar 2017 – Jul 2018	**Research Associate.** Seoul National University. - Researched autonomous vehicle control (continuation of M.S. project); 3 publications [9]–[11] in IROS and ICRA.

Projects

1. **Optimization-based Robust Control for Uncertain Systems**
   - Designed robust control algorithms that ensure safety under uncertainty using numerical optimization techniques, with a focus on semidefinite programming [1], [2], [6]; proved theoretical properties such as invariance, recursive feasibility, and Lyapunov stability.

2. **Motion Planning for Complex Vehicles**
   - Formulated motion planning problems for aircraft autonomous landing, powered descent guidance for reusable rockets, and hypersonic entry. Developed solution methods using an numerical optimization approach (sequential convex programming) [3], [5], [7] [video].

3. **Learning-based Control with Real Robot Experiments**
   - Developed model-based reinforcement learning algorithms for training constrained neural net policy [8], [9] and learning based MPC [10], [12]. Performed real experiments using Robot Operating System (ROS) [video1], [video2].

Education

2021 – present	**Ph.D., University of Washington, exp. Aug 2025** in Aeronautics and Astronautics. Advisor: Prof. Behçet Açıkmeşe.
2015 – 2017	**M.S., Seoul National University** in Mechanical and Aerospace engineering. Advisor: Prof. H. Jin Kim.
2009 – 2015	**B.S., Hanyang University** in Mechanical engineering. including 2 years obligatory military service.

Awards

2023	**AIAA Best Paper Award** for [5].
2023 – 2024	**Amazon Fellowship**, UW+Amazon Science Hub [announcement].
2020 – 2021	**James L. Teslow Endowed Ph.D. Fellowship**, University of Washington.
	William E. Boeing Endowed Fellowship, University of Washington.
2009 – 2015	**National Scholarship for Science and Technology**, Korea Student Aid Foundation.

Publications

1. **T. Kim** and B. Açıkmeşe, "Sufficient lmi copositivity conditions for funnel synthesis of uncertain nonlinear systems," *arXiv preprint arXiv:2402.15629*, 2024.
2. **T. Kim**, P. Elango, and B. Açıkmeşe, "Joint synthesis of trajectory and controlled invariant funnel for discrete-time systems with locally lipschitz nonlinearities," *International Journal of Robust and Nonlinear Control*, vol. 34, no. 6, pp. 4157–4176, 2024.
3. **T. Kim**, A. G. Kamath, N. Rahimi, J. Corleis, B. Açıkmeşe, and M. Mesbahi, "Six-degree-of-freedom aircraft landing trajectory planning with runway alignment," *arXiv preprint arXiv:2405.16680*, 2024.
4. **T. Kim**, A. P. Vinod, and S. Di Cairano, "Decoupled trajectory planning for monitoring uavs and their ugv carrier by reachable sets," in *2024 American Control Conference (ACC)*, IEEE, 2024.
5. A. G. Kamath, P. Elango, **T. Kim**, *et al.*, "Customized real-time first-order methods for onboard dual quaternion-based 6-dof powered-descent guidance," in *AIAA SciTech 2023 Forum*, 2023, p. 2003.
6. **T. Kim**, P. Elango, T. P. Reynolds, B. Açıkmeşe, and M. Mesbahi, "Optimization-based constrained funnel synthesis for systems with lipschitz nonlinearities via numerical optimal control," *IEEE Control Systems Letters*, vol. 7, pp. 2875–2880, 2023.
7. S. Mceowen, A. G. Kamath, P. Elango, **T. Kim**, S. C. Buckner, and B. Acikmese, "High-accuracy 3-dof hypersonic reentry guidance via sequential convex programming," in *AIAA SCITECH 2023 Forum*, 2023, p. 0300.
8. **T. Kim**, P. Elango, D. Malyuta, and B. Açıkmeşe, "Guided policy search using sequential convex programming for initialization of trajectory optimization algorithms," in *2022 American Control Conference (ACC)*, IEEE, 2022, pp. 3572–3578.
9. **T. Kim**, C. Lee, H. Seo, S. Choi, W. Kim, and H. J. Kim, "Vision-based target tracking for a skid-steer vehicle using guided policy search with field-of-view constraint," in *2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, IEEE, 2018, pp. 2418–2425.
10. J. Lee, S. Ryu, **T. Kim**, W. Kim, and H. J. Kim, "Learning-based path tracking control of a flapping-wing micro air vehicle," in *2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, IEEE, 2018, pp. 7096–7102.
11. C. Y. Son, H. Seo, **T. Kim**, and H. J. Kim, "Model predictive control of a multi-rotor with a suspended load for avoiding obstacles," in *2018 IEEE International Conference on Robotics and Automation (ICRA)*, IEEE, 2018, pp. 5233–5238.
12. **T. Kim**, W. Kim, S. Choi, and H. J. Kim, "Path tracking for a skid-steer vehicle using model predictive control with on-line sparse gaussian process," *IFAC-PapersOnLine*, vol. 50, no. 1, pp. 5755–5760, 2017.