Juyeop Han

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Research Interest

Decision Making under Uncertainty, Robotic Perception, Deep Learning, Control & Estimation Theory

Education

Massachusetts Institute of Technology (MIT) — Cambridge, MA
Ph.D. Student at MIT Mechanical Engineering and LIDS — *Sep. 2023 - Present*
- Advisor: Prof. Sertac Karaman

Korea Advanced Institute of Science and Technology (KAIST) — Daejeon, South Korea
M.S. in Aerospace Engineering — *Mar. 2021 - Feb. 2023*
- Advisor: Prof. Han-Lim Choi
- Thesis: "Computation of Tight Forward Reachable Set for a Multirotor based on the Nonlinear Adaptive Controller"

Seoul National University (SNU) — Seoul, South Korea
B.S. in Mechanical Engineering — *Mar. 2015 - Feb. 2021*
- **Summa Cum Laude**
- Leave of Absence for Mandatory Military Service (2017 - 2019)

Research Experience

Autonomy and Embedded Robotics Accelerated Lab, MIT — Sep. 2023 - Present
Graduate Research Assistant | PI: Prof. Sertac Karaman — *Cambridge, MA*
- Quantifying uncertainty of neural networks for robotics application [**P1**]
- Building large city-scale scenes through 3D neural scene representation with multi-modal sensor measurements

Autonomous Decision and Control Lab, CU Boulder — Oct. 2017 - Feb. 2018
Visiting Scholar | PI: Prof. Zachary Sunberg — *Boulder, CO*
- Engaged in developing decision making algorithm of control system with temporal logic and reachability

Lab for information and Control Systems, KAIST — Jan. 2021 - Jul. 2023
Graduate Research Assistant | PI: Prof. Han-Lim Choi — *Daejeon, South Korea*
- Proposed algorithm for kernel-based 3-dimensional dynamic occupancy grid map [**C1**]
- Proposed method for real-time computation of tighter forward reachable set (FRS) of multirotor with adaptive controllers [**C2**]
- Planned optimal trajectory in cluttered environment for quadrotors using pseudospectral method [**C3**]

Innovative Design and Integrated Manufacturing Lab, SNU — Jun. 2020 - Aug. 2020
Undergraduate Research Intern | PI: Prof. Sung-Hoon Ahn — *Seoul, South Korea*
- Implementing path planning and object recognition of 6 DOF robot actuator for surface cleaning

Publications

Preprints

[P1] **J.Han**, L.L.Beyer, G.V.Cavalheiro, and S.Karaman, "NVINS: Robust Visual Inertial Navigation Fused with NeRF-augmented Camera Pose Regressor and Uncertainty Quantification", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2024 **(Submitted)** [arXiv]

Conferences

[C1] **J.Han***, Y.Min*, B.Jeong, H.Chae and H.Choi (*equal contribution), "DS-K3DOM: 3-D Dynamic Occupancy Grid Mapping with Kernel Inference and Dempster-Shafer Evidential Theory", *International Conference on Robotics and Automation (ICRA)*, 2023 [paper] [code] [video]

[C2] **J.Han**, and H.Choi, "Computation of Tight Forward Reachable Set for a Multirotor based on the Nonlinear Adaptive Controller", *American Control Conference (ACC)*, 2023 [paper]

[C3] **J.Han**, M. Tahk, and H. Choi, "Pseudospectral method-based safe motion planning for quadrotors in a cluttered environment", *AIAA Science and Technology Forum (Scitech)*, 2022 [paper]

Honors & Awards

Scholarships

Korean Government Scholarship, South Korean Government — Sep. 2023
Government-Funded Scholarship, KAIST — Mar. 2021
SNU Alumni-Funded Scholarship, SNU Alumni Foundation — Mar. 2020
Merit-Based Scholarship, SNU — Sep. 2015

Awards

Outstanding Award, SNU ME Materials and Manufacturing Process Course — Dec. 2019
Participation Award at Seoul Hackathon, Administration of Seoul — Jun. 2016
Creative Award, SNU ME Creative Engineering Design Course — Dec. 2015

Professional Activities

Organizer, IDMAV Workshop at Robotics: Science and Systems (RSS) conference — 2023
Reviewer, IEEE Control System Letters (L-CSS) — 2022

Technical Skills

Programming C/C++, Python, MATLAB, CUDA
Libraries & Tools ROS, Pytorch, OpenCV, Git, Nix, LaTeX, SolidWorks
Languages Korean (Native), English (Fluent, 2 years in U.S. military)

Extracurricular Activities

Unit Supply Specialist (ROK Army Sergeant), 2nd Infantry Division, US Army — Nov. 2017 - Aug. 2019
Leadership Member, DALISHA (SNU Running Crew) — Sep. 2018 - Feb. 2021