Daeun Song

Computer Science and Engineering · **Robotics**

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Research Interests

Robot Path and Motion Planning, Human-Robot Interaction, Machine Learning

Education

Ewha Womans University, Seoul, Korea

2017 - 2023 **Ph.D in Computer Science and Engineering**

- Supervised under Prof. Young J. Kim
- Dissertation titled "Artistic Robotic Pen Drawing System using High-DoF Manipulators"
- Graduate student representative of CSE department in 2020

2013 - 2017 **B.S. in Computer Science and Engineering**

Research Experience

University of Maryland, MD, USA

AUG 2023 - Present **GAMMA, Postdoctoral Associate** [C07-09], [H11]

- Supervised under Prof. Dinesh Manocha
- Worked on social robot navigation using a Vision-Language Model
- Participated in diffusion-based trajectory generation for mapless outdoor robot navigation
- Developed a map-based outdoor robot navigation pipeline

Ewha Womans University, Seoul, Korea

MAR 2023 - *JUN 2023* **Simulated Reality Ewha ITRC Center, Postdoctoral Researcher** [C06], [S08-09], [P02]

- Supervised under Prof. Young J. Kim
- Worked on dual-arm robotic drawing using tool-change
- Showcased our robotic drawing work in an art exhibition, participated as an artist

MAR 2017 - *FEB 2023* **Computer Graphics Lab, Research Assistant** [J03], [C01,02,05], [S02-07], [P01], [H06-10]

- Supervised under Prof. Young J. Kim
- Worked on a distortion-free robotic drawing on an arbitrary surface
- Worked on a large-scale robotic drawing using a high DoF mobile manipulator
- Participated as an assistant advisor for undergraduate/graduate robotic research projects

JAN 2016 - *FEB 2017* **Computer Graphics Lab, Undergraduate Researcher** [J01], [S01], [H04,05]

- Supervised under Prof. Young J. Kim
- Worked on a robotic drawing project to reproduce the user's input drawing from a tablet PC, led the team composed of three undergraduate students
- Participated in a research project on a physics-based character animation under reduced gravity.

LAAS-CNRS, Toulouse, France

JUN 2019 - *SEP 2019* **Gepetto Team, Student Internship** [J02], [C03,04]

- Supervised under Prof. Steve Tonneau.
- Worked on multi-contact footstep planning for legged robots on uneven terrain

Publications

International Journals

[J03] **D. Song**, J. Kim, Y. J. Kim, **SSK: Robotic Pen-art System for Large, Non-planar Canvas**, *IEEE Transactions on Robotics (T-RO)**, 2023.

[J02] **D. Song**, P. Fernbach, T. Flayols, A. D. Prete, N. Mansard, S. Tonneau, Y. J. Kim, **Solving Footstep Planning as a Feasibility Problem using L1-norm Minimization**, *IEEE Robotics and Automation Letters (RA-L)**, 2021.

[J01] Y.-h. Kim, T. Kwon, **D. Song**, Y. J. Kim, **Full-body Animation of Human Locomotion in Reduced Gravity using Physics-based Control**, *IEEE Computer Graphics and Applications (CG&A)*, (Special issue on Physically Based Animation)*, 2017.

* : SCI (Science Citation Index)-listed journals

International Conference Papers

[C09] T. Guan, R. Xian, X. Wang, X, Wu, M. Elnoor, **D. Song**, and D. Manocha, **AGL-NET: Aerial-Ground Cross-Modal Global Localization with Varying Scales**, *under review.*

[C08] J. Liang, A. Payandeh, **D. Song**, X. Xiao, and D. Manocha, **DTG : Diffusion-based Trajectory Generation for Mapless Global Navigation**, *under review.*

[C07] **D. Song**, J. Liang, A. Payandeh, X. Xiao, and D. Manocha, **Socially Aware Robot Navigation through Scoring Using Vision-Language Models** , *under review.*

[C06] **D. Song**, E. Lim, J. Park, M. Jung, Y. J. Kim, **TSP-Bot: Robotic TSP Pen Art using High-DoF Manipulators**, *International Conference on Ubiquitous Robots (UR)*, 2024.

[C05] I. Ilinkin, **D. Song**, Y. J. Kim, **Stroke-based Rendering and Planning for Robotic Performance of Artistic Drawing**, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2023.

[C04] J. Chemin, P. Fernbach, **D. Song**, G. Saurel, N. Mansard, S. Tonneau, **Learning to steer a locomotion contact planner**, *IEEE International Conference on Robotics and Automation (ICRA)*, 2021.

[C03] S. Tonneau, **D. Song**, P. Fernbach, N. Mansard, M. Taix, A. D. Prete, **SL1M: Sparse L1-norm Minimization for contact planning on uneventerrain**, *IEEE International Conference on Robotics and Automation (ICRA)*, 2020.

[C02] **D. Song**, Y. J. Kim, **Distortion-free Robotic Surface-drawing using Conformal Mapping**, *IEEE International Conference on Robotics and Automation (ICRA)*, 2019. **[H08]**

[C01] **D. Song**, T. Lee, Y. J. Kim, **Artistic Pen Drawing on an Arbitrary Surface using an Impedance-controlled Robot**, *IEEE International Conference on Robotics and Automation (ICRA)*, 2018. **[H07]**

Short Papers

[S09] **D. Song**, Y. J. Kim, Compliant Robotic Pen-Drawing, *IEEE International Conference on Robotics and Automation (ICRA) 2nd Workshop on Compliant Robot Manipulation*, 2023.

[S08] **D. Song**, Y. J. Kim, Creative Robotic Pen-Art System (stand-alone video), *IEEE International Conference on Robotics and Automation (ICRA)*, 2023.

[S07] **D. Song**, Y. J. Kim, Mobile Coverage Planning for Large-Scale Robotic Pen Drawing (poster), *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2022.

[S06] **D. Song**, Y. J. Kim, Robotic Pen-art System for Large, Non-planar Canvas (extended abstract of [J03]), *Korea Computer Graphics Society Annual Conference (KCGS)*, 2022.

[S05] E. Lim, J. Kim, **D. Song**, Y. J. Kim, TSP Pen Art using a Mobile Collaborative Robot, *Korea Computer Graphics Society Annual Conference (KCGS)*, 2021. **(Best Undergrad Paper Award [H10])**

[S04] **D. Song**, Y. J. Kim, Distortion-free Robotic Surface-drawing using Conformal Mapping (extended abstract of [C02]), *Korea Robotics Society Annual Conference (KRoC)*, 2020.

[S03] **D. Song**, Y. J. Kim, Hi-fidelity Robotic Pen Drawing on a Bumpy Surface, *IEEE International Conference on Robotics and Automation (ICRA) Robots and Art Forum*, 2018.

[S02] **D. Song**, T. Lee, Y. J. Kim, Artistic Pen Drawing on an Arbitrary Surface using an Impedance-controlled Robot (extended abstract of [C01]), *Korea Robotics Society Annual Conference (KRoC)*, 2018. **(Best Paper Award [H06])**

[S01] **D. Song**, T. Lee, J. Kim, S. Sohn, Y. J. Kim, Artistic Pen Drawing on an Arbitrary Surface using an Impedance-controlled Robot (extended abstract of [C01]), *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) Workshop on Artistically Skilled Robots*, 2016.

Patents

[P02] Y. J. Kim, **D. Song**, Robot Path Creating Method, Computing Device for Performing the Method, Korean intellectual Property Office, *(under review)*.

[P01] Y. J. Kim, **D. Song**, J. Kim, Robotic apparatus and method for artistic pen drawing on an arbitrary surface, Korean intellectual Property Office, 1019356400000.

Honors & Awards

[H11] **MRC Postdoctoral Fellowship** | Maryland Robotics Center, University of Maryland (2023 - 2024)

[H10] **Best Undergrad Paper Award** | Korea Computer Graphics Society Annual Conference (KCGS 2021)

[H09] **Solvay Scholarship Award** | Outstanding Academic Performance (2019 - 2020)

[H08] **RAS Travel Award** | International Conference on Robotics and Automation (ICRA 2019)

[H07] **RAS Travel Award** | International Conference on Robotics and Automation (ICRA 2018)

[H06] **Best Paper Award** | The 13th Korea Robotics Society Annual Conference (KRoC 2018)

[H05] **Honorable Mention** | Hanium Expo Contest 2016

[H04] **Honorable Mention** | Capston Awards (Engineering Education Festa 2016)

[H03] **1st Place** | Ewha Engineering Capstone Design Contest 2016

[H02] **1st Place** | Ewha Engineering Student Portfolio Contest 2016

[H01] **2nd Place** | Ewha Power ProgrammER(E-PPER) Contest 2016

Technical Skills

Programming Language: C/C++, Python, Java, Matlab

Robotic Hardware: KUKA iiwa 7 R800 manipulator, UR5e dual arm w/ Robotiq 3F gripper, Ridgeback mobile platform, Husky UGV, Jackal UGV, Turtlebots, Fetch mobile manipulator

Robotic Programming: ROS, OMPL, MoveIt!, Navigation stack, HPP, CoppeliaSim, Isaac Sim

Others: Experience with OpenGL, OpenCV, PCL, PyTorch, Tensorflow

Activities

Talks & Demos

- **TALK** | Invited talk @Pebblous, Daejeon, KR *NOV 2023*
- **TALK** | Invited talk @SGVR Lab, KAIST, Daejeon, KR *NOV 2023*
- **DEMO** | Drawing simulation demo, ITRC Forum 2022, KR *APR 2022*
- **DEMO** | Drawing robot demo, Engineering Education Festa 2016, KR *NOV 2016*
- **DEMO** | Drawing robot demo, Hanium Expo 2016, KR *NOV 2016*

Academic

- **Teaching Assistant** | Introduction to Physically-based Animation (Graduate) *Spring 2023*
- **Teaching Assistant** | Numerical Methods (Undergrad) *Spring 2022*
- **Teaching Assistant** | Computer Programming (Undergrad) *Spring 2016*

Service

- **Reviewer** | IEEE Robotics Automation and Letters (RA-L 23, 24)
- **Reviewer** | IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 20-24)

Others

- **Robotic Art Exhibition** | Artist, CO-DRAW, Collaborative Robotic Art Exhibition *MAY 2023*
- **Summer School** | Participate, AI & Robotics Summer School 2020 *AUG 2020*
- **Tutorial** | Participate, Reinforcement Learning Tutorial *JAN 2017*
- **Tutorial** | Participate, Arduino & IoT Sensing and Wireless Communication Control Tutorial *JAN 2016*
- **Summer School** | Participate, EWHA-EPITA Sumer School, Paris, France *JUL 2015*