SANGHYUN SON

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Maryland, United States 240-726-3598

EDUCATION

University of Maryland, United States *Sep 2021 - Present*
PhD Student in Computer Science, GAMMA Lab, Advised by Prof. Ming C. Lin

Seoul National University, South Korea *Mar 2019 - Aug 2021*
Master of Science in Computer Science and Engineering, 3MAP, Advised by Prof. Myung-Soo Kim

Seoul National University, South Korea *Mar 2012 - Feb 2019*
Bachelor of Arts in Archaeology *Summa cum laude*
Bachelor of Science in Computer Science and Engineering

INTERESTS

Differentiable framework for **geometry** and **physics simulation** for machine learning architectures, particularly for **reinforcement learning**.

PUBLICATIONS

Sanghyun Son, Laura Yu Zheng, Ryan Sullivan, Yi-Ling Qiao, and Ming Lin. *Gradient Informed Proximal Policy Optimization.*, In Thirty-seventh Conference on Neural Information Processing Systems. 2023.

Gao, Peng, Jing Liang, Yu Shen, **Sanghyun Son**, and Ming C. Lin. *Visual, Spatial, Geometric-Preserved Place Recognition for Cross-View and Cross-Modal Collaborative Perception.*, IROS 2023.

Zheng, Laura, **Sanghyun Son**, and Ming C. Lin. *Traffic-aware autonomous driving with differentiable traffic simulation.*, 2023 IEEE International Conference on Robotics and Automation (ICRA). IEEE, 2023.

Sanghyun Son, Yi-Ling Qiao, Jason Sewall, Ming C. Lin, *Differentiable Hybrid Traffic Simulation*, SIGGRAPH Asia 2022

Sang-Hyun Son, Myung-Soo Kim, Gershon Elber, *Precise Hausdorff Distance Computation for Freeform Surfaces Based on Computations with Osculating Toroidal Patches*, Computer Aided Geometric Design (International Conference on Geometric Modeling and Processing 2021)

Youngjin Park, **Sang-Hyun Son**, Myung-Soo Kim, Gershon Elber, *Surface-Surface-Intersection Computation Using a Bounding Volume Hierarchy with Osculating Toroidal Patches in the Leaf Nodes*, Computer Aided Design (Solid and Physical Modeling 2020)

Sang-Hyun Son, Seung-Hyun Yoon, Myung-Soo Kim, Gershon Elber, *Efficient Minimum Distance Computation for Solids of Revolution*, Computer Graphics Forum (Eurographics 2020)

Sang-Hyun Son, Seung-Hyun Yoon, Myung-Soo Kim, *Computing minimum distance between surfaces of revolution using spherical shell tree*, Korean Computer Graphics Society 2019 (Korean) **Best Paper Award**

TECHNICAL SKILLS

Programming: Proficient in C, C++, C#, Python, PyTorch, OpenGL, CUDA / Conversant with TensorFlow
Software & Tools: Proficient in Unity Engine / Conversant with Unreal Engine

WORK EXPERIENCE

Adobe Research **San Jose, CA**
Research Scientist Intern *June 2023 - Aug 2023*
- Developed a new differentiable 3D shape representation that can be used for various downstream tasks

Smilegate **Pangyo, Korea**
Game Engine Programmer (Intern) *July 2018 - Sep 2018*
- Developed an algorithm in Unreal Engine to accelerate geometric computations used in massive full 3D online game environments with octree and bounding volume hierarchy (BVH)

RESEARCH EXPERIENCE

UMD : GAMMA Lab **MD, United States**
Supervised by Ming C. Lin *Sep 2021 - Present*
- Working on various topics related to geometry, physics simulation, and reinforcement learning

SNU : 3D Modeling and Processing Lab **Seoul, Korea**
Supervised by Myung-Soo Kim *Mar 2019 - Present*
- Developed a novel algorithm to bound freeform parametric surfaces with toroidal patches and enhanced the precision and speed of Hausdorff distance computation algorithm between the surfaces
- Developed a novel algorithm to find minimum distance between toroidal patches and accelerated minimum distance computation algorithm between solids of revolution

TEACHING EXPERIENCE

Teaching Assistant, UMD **MD, United States**
CMSC838B Differentiable Programming *Sep 2023 - Dec 2023*
Teaching Assistant, UMD **MD, United States**
CMSC425 Game Programming *Feb 2022 - May 2022*
Teaching Assistant, UMD **MD, United States**
CMSC132 Object Oriented Programming (2) *Sep 2021 - Dec 2021*
Teaching Assistant, SNU **Seoul, Korea**
4190.667 Geometric Modeling *Sep 2019 - Dec 2019*
Teaching Assistant, SNU **Seoul, Korea**
4190.313 Linear and Non-linear Computation Models *Mar 2019 - June 2019*

PROJECTS

GI-PPO (https://github.com/SonSang/gippo)
Python implementation of GI-PPO algorithm in paper *Gradient Informed Proximal Policy Optimization*.

Differentiable Hybrid Traffic Simulator (https://github.com/SonSang/diff-hybrid-traffic-sim)
Python implementation of paper *Differentiable Hybrid Traffic Simulation*

MinuteTorus (https://github.com/SonSang/MinuteTorus)
C++ library that supports basic math operations related to torus

MinuteFreeform (https://github.com/SonSang/MinuteFreeform)
C++ library that supports basic geometric operations related to non-rational freeform geometric entities

AWARDS

Lecture & Research Scholarship 2020
Best Paper Award (Korean Computer Graphics Society, KCGS) 2019
Brain Korea 21 Plus 2019
Samsung Convergence Software Course Scholarship 2017
Eminence Scholarship 2017
National Humanities and Social Sciences and Undergraduate Scholarship 2016