SIYUAN LUO

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EDUCATION

National University of Singapore Singapore
Visiting Scholar March. 2024 – Oct. 2024

- Research Interests: Differentiable Simulation for Robotics Learning, High Performance Computing

Xi'an Jiaotong University Xi'an, China
Bachelor's Degree in Computer Science and Technology Sept. 2019 – July 2023

- Research Interests: Differentiable Simulation for Robotics Learning, High Performance Computing
- Thesis: ***Multi-Scale Model for Simulation in Liquid-Fabric Interactions with Surface Tension Dominant***

PUBLICATIONS

1. SoftMAC: Differentiable Soft Body Simulation with Forecast-based Contact Model and Two-way Coupling with Articulated Rigid Bodies and Clothes. 2024 (IROS)
2. Jade: A differentiable physics engine for articulated rigid bodies with intersection-free frictional contact. 2024 (ICRA)
3. Diffclothai: Differentiable cloth simulation with intersection-free frictional contact and differentiable two-way coupling with articulated rigid bodies. 2023 (IROS)
4. Clothesnet: An information-rich 3d garment model repository with simulated clothes environment. 2023 (ICCV)
5. DASKEL: An Interactive Choreographic System with Labanotation-Skeleton Translation. 2023 (Pacific Graphics)
6. Language-Guided Manipulation with Diffusion Policies and Constrained Inpainting. 2024 (ICRA Submitted)
7. Squashing between the Wire: Real-Time Hyperelastic Material Deformation with Accurate Frictional Contact. 2025 (SIGGRAPH Submitted)

RESEARCH EXPERIENCE

National University of Singapore (Supervisor: Prof. Fan Shi) Singapore
Research Engineer Dec. 2024 – Now
GPU-based Full-Coupled Differentiable Simulator Development for Robotics

*Differentiable Simulation is useful and order extra gradient information for robotics control and manipulation. We designed high performance differentiable simulator for **rigid-soft-fluid coupling** and **contact**, applying on real robot tasks, such as drone navigation, locomotion and manipulation.*

National University of Singapore, School of Computing Singapore
Research Assistant Oct. 2022 – Oct.2024
Differentiable Simulation Combining with Robotics Control Theory

We expanded the boundaries of differentiable simulation in robotics, from rigid dynamics to soft objects and fluid manipulation tasks, such as folding cloth, grasping bowls of water, twisting towel. We integrate our method in Pytorch, JAX, AutoGrad, Taichi and other auto differentiable frameworks.

Hong Kong University of Science and Technology(GZ) (Supervisor: Prof. Zeyu Wang) China
Research Assistant Sept. 2022 – July. 2023
Human Animation Control and Artists-driven Development

We combined artists language "labanotation" with tech implementation, providing useful tools for artists and dancers.

Peking University, VCL Group (Supervisor: Prof. Bin Wang) China
Visiting Student Oct. 2020– Sept. 2021
Physics-based Soft Body Simulation and Inverse Modeling

We designed new finite element method based inverse modeling method for stiffness reconstruction in computer graphics area.

WORKING EXPERIENCE

Center of Artificial Intelligence and Robotics (CAIR)
Hong Kong Institute of Science & Innovation (Medical Simulation Group) Hong Kong, China
Research Assistant July. 2024 – Nov. 2024
Differentiable Simulation Control and Haptics-Simulation Loop Integration

HOYOVERSE (Simulation and High Performance Group) Shanghai, China
Computer Graphics Research Engineer July. 2023 – March. 2024
GPU-friendly Real-time Large-scale Cloth and Hair Simulation, Unreal Engine Development, Real-time Spatial Audio

- Design codebase for high performance cloth and hair GPU solver, using advanced Cuda features and the CudaGraph.
- Combine our solver with Unreal Engine and build digital human project for virtual character "Lumi".
- Optimize Unreal Chaos System for CPU Parallelized Cloth Simulation Pipeline.
- Developing new GPU-based real-time spatial audio and integrate with Unity Engine.

MIHOYO (Simulation and High Performance Group) Shanghai, China
Simulation Research Engineer (Intern) Mar. 2022 – Sept. 2022
GPU-friendly Cloth Solver Development

- Design new color graphing algorithm for highly parallelized numerical method in cloth simulation.
- Design advanced Jacobi solver with faster optimization and less artifacts, compared with Gauss-Seidel solver in cloth simulation.
- Implement GPU kernel launch pipeline for cloth simulation.

WORKING ABILITIES

Programming:
C++, C#, python, cuda, opencl, ISPC, javascript, typescript, webgpu

Digital Content Creation (DCC) Tools:
Unreal Engine(Source Code Development), Unity, Houdini, Blender, Autodesk Maya/3ds Max/Shotgun/Shotgrid

Familiar Libraries:
Pytorch, Jax, Taichi, Mujoco, PolyFEM, Embree, Openvkl...

TEACHING EXPERIENCE

Computer Graphics (COMP 551805), Xi'an Jiaotong University Xi'an, China
Teaching Assistant and Code Lab Founder 2021, 2022, 2023

Programming Design in C++ (Honor), Xi'an Jiaotong University Xi'an, China
Teaching Assistant 2020, 2021

GAMES 104 (Game Engine Intro and Development), Invited by BoomingTech China
Lab and community contributor.

ACADEMIC SERVICE

Reviewer of international conference and journal:
ICRA 2024, IROS 2024, ICRA 2025