Yixin Chen

PhD student at University of Toronto, Toronto, ON, Canada
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RESEARCH INTERESTS

My research interests mainly lie in physics-based simulation, high-performance fluid flow simulation and control, and computational design and fabrication.

EDUCATION

University of Toronto, Toronto, Canada — Sep. 2020 — Present
PhD in Computer Science
ShanghaiTech University, Shanghai, China — Sep. 2015 — Jul. 2019
BEng in Computer Science and Technology

PUBLICATIONS

Fluid Control with Laplacian Eigenfunctions
ACM SIGGRAPH 2024 (Conference Track)
Yixin Chen, David I.W. Levin, Timothy Langlois

Meta-ABC: A High-complexity Lattice Geometry Dataset for Deep Learning
Under revision
Yixin Chen, Towaki Takikawa, Ty Trusty, David I.W. Levin, Alec Jacobson, Elissa Ross, Daniel Hambleton

Multi-Agent Path Planning with Asymmetric Interactions In Tight Spaces
Computer Graphics Forum (CGF) 2022
Vismay Modi, **Yixin Chen**, Abhishek Madan, Shinjiro Sueda, David I.W. Levin

GPU Optimizations for High-Quality Kinetic Fluid Simulation
IEEE Transactions on Visualization and Computer Graphics (TVCG) 2021
Yixin Chen, Wei Li, Rui Fan, Xiaopei Liu

Fast and Scalable Turbulent Flow Simulation with Two-Way Coupling
ACM SIGGRAPH 2020 (Transactions on Graphics)
Wei Li, **Yixin Chen**, Mathieu Desbrun, Changxi Zheng, Xiaopei Liu

ACADEMIC EXPERIENCE

Dynamic Graphics Project, Department of Computer Science, University of Toronto
Research Assistant (RA) — Advisor: Professor David I.W. Levin — Sep. 2020 — Present
Physics-based Simulation

- Took comprehensive survey on current elastic body and fluid simulation research and analyzed the corresponding limitation of previous methods
- Implemented several basic physics-based methods and built up a c++ based simulation library
- Focusing on complex lattice geometry simulation
- Focusing on interactive and efficient fluid control problem

FLARE Lab, School of Information Science and Technology, ShanghaiTech University
Research Assistant (RA) — Advisor: Professor Xiaopei LIU — Feb. 2019 — Jan. 2020
Fast and Scalable Turbulent Flow Simulation with Two-Way Coupling
Collaboration with Professor Changxi Zheng from Columbia University, USA and Professor Mathieu Desbrun from California Institute of Technology, USA

- Proposed a stable and accurate solution for fluid-solid coupling by kinetic method with lattice Boltzmann equations
- Derived numerical optimization to determine high-order relaxation rates in non-orthogonal central-moment relaxation model and dimensional mapping for fluid-solid coupling
- Implemented new LBE solver with parallel optimization on both single and multi-GPU systems and achieved real-time coupling simulation with volume rendering

GPU Optimizations for Highly-Quality Kinetic Fluid Simulation
Collaboration with Professor Rui Fan from ShanghaiTech University, China

- Derived efficient parameterized data layout and memory access method for numerical fluid simulation based on the latest kinetic methods using lattice Boltzmann equations
- Proposed GPU optimization algorithms for single-scale and multi-scale fluid simulation using kinetic method to effectively balance efficiency and accuracy
- Implemented CUDA-based parallel optimization on single and multi-GPU, significantly faster than state-of-the-art GPUbased Navier-Stokes solvers for given accuracy and 10-20 times faster than a direct implementation

WORKING EXPERIENCE

Research Scientist and Engineer Intern May. 2022 — Present
Adobe Inc. Seattle, WA, U.S. — Mentor: Timothy Langlois
Fluid Control with Laplacian Eigenfunctions

- Took a comprehensive survey on current fluid control research and analyzed the limitations of previous methods
- Worked on several baseline 2D fluid control mehod implementations
- Worked on interactive and efficient 2D fluid control problem based on eigenfluids pipeline
- Focusing on interactive and high-performance 2D and 3D fluid control problems

Research Scientist Intern Jan. 2023 — Jun. 2023
Metafold 3D, Toronto, ON, Canada

- Develop microstructure simulation method and implement related code
- Incorporate the new simulation pipeline into the production environment

Teaching Assistant Sep. 2021 — Apr. 2022
Department of Computer Science, University of Toronto, Toronto, ON, Canada

- Assisted course instructors in grading students' assignments
- Prepared and facilitated question and answer sessions to provide feedback on questions from students

Software Testing Intern Aug. 2020 — Dec. 2020
UBTech Robotics, Chengdu, Sichuan, China

- Participate in algorithm training and test data collection, sorting, labeling and automation
- Worked with research team to test different functions and operations on current robot products and feedback with detailed reports

Research Scientist Intern Jan. 2020 — Aug. 2020
Dgene Digital Technology (Shanghai) Co., Ltd., Shanghai, China

- Participated in Computer Graphics research projects, especially about high-performance high-quality fluid simulation
- Application of the optimized fluid simulation platform to intelligent city, intelligent medical treatment and other fields

SELECTED COURSES

School of Graduate Studies **GPA:3.96**

- CSC2521H Topics in Computer Graphics (Seminar on Geometry and Animation)
- CSC2549H Physics-Based Animation
- CSC2233H Topics in Storage Systems
- CSC2558H Topics in Multidisciplinary HCI
- CSC2514H Human-Computer Interaction
- CSC2520H Geometry Processing
- CSC2505H Numerical Methods for Optimization Problems
- CSC2530H Computer Vision for Advanced Digital Photography

SKILLS

- **Programming Languages:** Python, C, C++, MATLAB, SQL, HTML
- **Computer Skills:** Git, LaTex, Microsoft Office, Adobe Photoshop, Adobe After Effects, Adobe Illustrator
- **Engineering Platforms:** CUDA, OpenGL, OpenCV, CMake, Origin pro, Mathematica, NVVP
- **Languages:** Chinese (Native), English (Fluent: TOEFL (104, R 29, L 25, S 22, W 28))