Hongtu Xu

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Education

ShanghaiTech University, Shanghai, China (Undergraduate, Junior) 2019 – 2023 (expected)

Bachelor of Engineering, Computer Science and Technology

- Overall GPA: 3.86/4.00, Ranking: 2/166, **Major GPA: 4.0/4.0** (Get **A+** in **all** CS courses)
- Relevant Coursework: Computer Graphics I (A+), Parallel Computing (A+), Computer Architecture I (A+), Operating System (A+), Probability and Statistics (A+), C/C++ Programming (A+), Algorithm Design and Analysis (A+), Introduction to Information Science and Technology (A+), Discrete Mathematics (A+), Algorithms and Data Structures (A+)

Work and Research Experience

Aeroacoustics Simulation using the Lattice Boltzmann Methods | *Research Assistant* Oct. 2021 – Present
Advisor: Xiaopei Liu, Assistant Professor, School of Information Science and Technology, ShanghaiTech

- Implemented boundary flags for the Interpolated Bounce-Back method.
- Compared the accuracy of many boundary treatments.
- Implemented the acoustics collection kernel.
- Currently focusing on improving the precision on the boundary and optimizing the performance of the collision model.

High Performance Realistic Volume Rendering | *Research Assistant* June 2021 – Present
Advisor: Xiaopei Liu, Assistant Professor, School of Information Science and Technology, ShanghaiTech

- Implemented volumetric path tracing in both CPU and GPU, using CUDA and OptiX for GPU acceleration.
- Reproduced residual ratio tracking for transmittance estimation.
- Implemented super voxels to accelerate residual tracking.
- Integrated the renderer into the lab's simulation system.
- Currently working on problems in multiple overlapping medias and water rendering (black water droplet on transmittance materials). We want to render a waterspout from our fluid simulation data.

Honors and Awards

- **Gold Medal**, The 2020 ACM-ICPC Asia Yinchuan Regional Contest May 2021
- **Gold Medal**, The 2020 ACM-ICPC Asia Nanjing Regional Contest Dec. 2020
- **Silver Medal**, 2020 China Collegiate Programming Contest, Weihai Site Oct. 2020
- Scholarship (**top 2%** in the School of Information Science and Technology of ShanghaiTech) 2021
- Scholarship (**top 7%** in the School of Information Science and Technology of ShanghaiTech) 2020
- **1st prize**, The 2018 National Olympiad in Informatics in Provinces, Sichuan Nov. 2018
- **1st prize**, The 2017 National Olympiad in Informatics in Provinces, Sichuan Nov. 2017
- **1st prize**, The 2016 National Olympiad in Informatics in Provinces, Sichuan Nov. 2016

Projects

Skeleton Extraction using Chordal Axis Transform *CS271 Computer Graphics II* Mar. 2022

- Implemented 2D Delaunay Triangulation, supporting simple concave polygons with holes.
- Implemented Chordal Axis Transform to extract skeletons with visualization.

3D Convex Hull and Collision Detection *CS271 Computer Graphics II* Feb. 2022 – Mar. 2022

- Implemented Clarkson-Shor algorithm for convex hull construction with the expected time of $O(n \log n)$.
- Implemented Gilbert–Johnson–Keerthi distance algorithm for collision detection.
- Visualized the convex hull and collision with an interactive GUI.

CUDA Cuckoo Hashing *CS 121 Parallel Computing* Nov. 2021 – Dec. 2021

- High performance GPU hash table using cuckoo hashing.
- Did profiling and comparisons with existing open source projects.

Parallel Breadth-First Search *CS 121 Parallel Computing* Oct. 2021 – Nov. 2021
Parallelized the breadth-first search algorithm on graphs.

- Implemented a hybrid BFS algorithm by combining top-down and bottom-up BFS.
- Implemented with OpenMP and used techniques like prefix sum, bit map for further optimizations.

2D Lattice Boltzmann Method Solver July 2021 – Aug. 2021

- A D2Q9 lattice Boltzmann solver using CUDA and OpenMP with visualization.

Computer Graphics I Course Projects Spring 2021

- An OpenGL mesh viewer with camera and phong lighting, supporting font rendering.
- A NURBS editor using OpenGL and contains a self-created GUI.
- An offline renderer using path tracing (basic bidirectional path tracing), supporting participating medias.
- A volume renderer by ray casting.

Rhythm Game running on Dev Board using C and RISC-V *CS110 Computer Architecture I* June 2021

- A software rasterization renderer inside.
- Modified the display driver to support double buffering.

A Collection of Unity Games *ARTS1303 Unity Game Development* Summer 2020

- A Danmaku game inspired by GeometryWars & Touhou Project.
- A platformer game inspired by Super Mario & Metal Slug & I Wanna Be the Guy & Contra.
- A FPS zombie shooting game.
- A first person shooter game inspired by Serious Sam.
- Used advanced feature of Unity, like animation layer, shaders, post processing.

Teaching Experience

CS171 Computer Graphics I, ShanghaiTech *Teaching Assistant* Sept. 2021 – Jan. 2022
CS100 Introduction to Programming, ShanghaiTech *Teaching Assistant* Feb. 2021 – June 2021
SI100B Introduction to Information Science and Technology *Teaching Assistant* Sept. 2020 – Jan. 2021

Activities

GeekPie, ShanghaiTech University Sept. 2019 – Present

- Core member, maintainer and developer of various systems. Core developer of voting system, providing technical support for the final road show of the design thinking course and many activities held by student union.

ACM Club, ShanghaiTech University Sept. 2019 – Present

- Core member, ICPC and CCPC contest participants.

Miscellaneous

- Programming: especially experienced in C/C++ (including modern C++), CUDA, Python, also comfortable with Java, MATLAB, C#, JavaScript
- Tools & Frameworks: CMake, git, LaTeX, Unity, OptiX 7, OpenMP, MPI, PBRT
- Language: Chinese (Native), English (Fluent)