JIANG, Han

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EDUCATION

The Hong Kong University of Science and Technology, Hong Kong SAR, China *September 2020 - Present*
BSc in Computer Science and Mathematics; GPA: 3.956/4.300; Major GPA: 4.014/4.300
Relevant High-level Courses: *Computer Graphics, Geometry Processing and Real-time Rendering, Computer Vision, Deep Learning. Numerical PDE, Differential Geometry.*

University of California, Riverside, Riverside, CA, USA *January 2023 - July 2023*
Undergraduate Exchange Student; Major: Computer Science; GPA: 4.0/4.0

RESEARCH EXPERIENCES AND PUBLICATIONS

Inpaint4DNeRF --- Text-guided Generative NeRF Inpainting with Stable Diffusion *July 2023 - November 2023*
Supervisor: Prof. Chi-Keung Tang, Prof. Yu-Wing Tai

- Proposed a framework to do inpainting in a given background 3D or 4D NeRF, by substituting the original object by a text-prompted novel object. Contributed ideas and worked on the theory, coding, and paper writing, with 2 other teammates and under the supervision of Prof. Tang and Prof. Tai.
- With one stable diffusion inpainted seed image, developed a pre-processing method to generate the complete set of training images with coarse multiview consistency. Proposed and implemented stable diffusion correction to add plausible details to low-quality training images, used in both pre-processing and NeRF training. Proposed to use and Implemented Iterative Dataset Update to refine NeRF and training images simultaneously.
- Project website available at: hjiangav.github.io/inpaint4dnerf
- Submitted to *Computer Vision and Pattern Recognition (CVPR) 2024*.

Second-order Accurate Particle-in-cell Method for Navier-Stokes Equations *January 2023 - July 2023*
Supervisor: Prof. Craig Schroeder

- Developed a particle-in-cell method to simulate incompressible fluids with MPM on MAC grids, that is second-order accurate in both space and time. Contributed ideas and worked on the theory, implementation, coding, numerical experiments, and paper writing, together with Prof. Schroeder.
- Implemented experiments in PhysBAM and Maple, and successfully discovered and verified second-order accurate schemes for each component of MPM on Navier-Stokes equations: particle-grid transfers, Lagrangian advection, time integration, pressure projection and viscosity. Proposed the use of quadratic PolyPIC, and derived explicit formulae of quadratic PolyPIC under the complete scheme.
- Submitted to *Journal of Computational Physics (JCP)*.

Global Geometrical Registration of Neural Radiance Fields *December 2022 - March 2023*
Supervisor: Prof. Chi-Keung Tang, Prof. Yu-Wing Tai

- Proposed a framework to find a rigid transformation that aligns two neural radiance fields (NeRF) with partial overlapping, without any prior approximations. Contributed ideas and worked on the theory, coding, and paper writing, with another teammate under the supervision of Prof. Tang and Prof. Tai.
- Transferred and implemented the traditional image registration pipeline on 3D density grids converted from the NeRFs, including multi-scale corner detection and description, feature matching, and RANSAC. Developed a rotation-invariant neural corner descriptor. Proposed and implemented a data augmentation strategy to effectively pre-train the descriptor network so that no finetuning at test time is required.
- Available on arxiv: arxiv.org/abs/2305.12843

Fluid Simulation in NeRF Context *September 2022 - November 2022*
Supervisor: Prof. Chi-Keung Tang, Prof. Yu-Wing Tai

- Explored to incorporate particle-based fluid simulation with dynamic NeRFs, which is based on a recent work on fluid dynamics reconstruction. Particles are binded with features to render the fluid. Attempted to use recurrent neural networks on particle features to predict particle states in other frames, so as to solve inverse problems like fluid reconstruction from images. Worked on coding under the supervision of Prof. Tang and Prof. Tai.

Non-linear Utility Functions for Interactive Regret Minimization *February 2022 - May 2022*
Supervisor: Prof. Raymond Chi-Wing Wong

- Proposed a data pre-processing algorithm to transform several classes of non-linear utility functions to linear, to extend the scope of an existing method on the interactive regret minimization problem. Contributed ideas and summarized the research into a report, under Prof. Wong's supervision.
- Mathematically summarized, analyzed and verified the correctness of the proposed algorithm.

SKILLS

- Programming Languages: Python (Pytorch, NerfStudio), C++, Scala.
- Relevant software: PhysBAM, Maple, Git, Latex.
- Languages: English, Mandarin Chinese (native).