LIU HONG

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EDUCATION

University of Illinois at Urbana-Champaign Expected Fall 2023
Doctor of Philosophy in Theoretical and Applied Mechanics GPA: 3.66/4.00

- 2023 Hasan Aref Award for excellent academic standing in fluid mechanics
- 2022 seminar competition winner for American Physical Society seimnar presentation

Purdue University Aug 2012 - May 2016
Bachelor of Science in Mechanical Engineering GPA: 3.47/4.00

EXPERIENCE

University of Illinois at Urbana-Champaign *Champaign, IL*
Research Assistant Jan 2017 - Present

- Independently enhancing the accuracy of 3D dense tracking in complex environments with multi-view system
- Optimizing digital image correlation for precise detection of structural deformation
- Collaborating closely with a team of robotic engineers to develop real-time 3D reconstruction on Jetson platform
- Leading a team in conducting micro object 3D tracking for biomedical research such as drug delivery

Vofon Turbo System *Ningbo, China*
Product Engineer Jun 2016 - Dec 2016

- Improved the turbocharger's inner wall design through computational fluid dynamics (CFD) method
- Provided essential support to the test engineer team by assisting in 3D scanning processes

PROJECTS

Light field camera 3D tracking system: Developed a single-camera system for real-time 3D tracking (link) 2023

- Achieved an extraordinary 50,000% improvement in reconstruction efficiency by successfully implementing a CUDA-accelerated ray-traversal algorithm (link)
- Performed physically-based ray tracing simulations using a realistic model of a multi-camera lens
- Designed an optical train cage system for the camera, along with a calibration method, for 3D tracking in microscopy
- Optimized image sequence reconstruction on a cluster using OpenMP and MPI

Multi-view elongated object tracker: A cross platform object tracker for combine harvester (link) 2023

- Worked together with company technicians to develop a robust multi-sensor 3D tracker with sensor mounted on a harvester
- Improved traceability by 45% by integrating epipolar searching with feature detection and iterative closest point matching algorithm and achieved pose tracking

Civil Project - Bridge defects Search: A graphical-based model for 2D image recognition and 3D localization (link) 2018

- Collaborated with civil engineer team to reconstruct a dense point cloud for a bridge using Structure from Motion (SFM) methodology with series of 2D photos captured by a drone
- Leveraged transfer learning of VGGNet for image segmentation to significantly improve the efficiency of FLANN feature matching

PUBLICATIONS

- **Hong, Liu**, and Leonardo P. Chamorro. "A fast, non-iterative ray-intersection approach for three-dimensional microscale particle tracking." Lab on a Chip 22.5 (2022): 964-971.
- **Hong, Liu**, et al. "On the submerged low-Cauchy-number canopy dynamics under unidirectional flows." Journal of Fluids and Structures 113 (2022): 103646.
- **Hong, Liu**, Ji, Bingqiang, "Dynamics of an oil-coated bubble rising in a quiescent water medium." Physical Review Fluids 7.3 (2022): 033603.

SKILLS

Technical Skills	3D reconstruction, object detection, object tracking, 3D sensor calibration, SLAM
Languages	Python, C++, Linux
Skills	CUDA, SLURM, OpenGL, Pytorch, OpenCV, MPI, OpenMP, Docker, Git, ROS, Unreal, Blender, Illustrator, Zemax