

LIU HONG

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EDUCATION

University of Illinois at Urbana-Champaign

Doctor of Philosophy in Theoretical and Applied Mechanics

Fall 2023

GPA: 3.66/4.00

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

Purdue University

Bachelor of Science in Mechanical Engineering

Aug 2012 - May 2016

GPA: 3.47/4.00

EXPERIENCE

Spectral AI

Dallas, TX

Computer Vision Engineer

Jan 2024 - Present

- Enhancing the precision of auto calibration for medical imaging captured by legacy devices and executing the reconstruction of dense 3D points and meshes using multi-spectral medical imaging.
- Creating an AR application project focused on medical prediction, precisely overlaying masks onto the target surface. This project integrates MR technology and real-time ray tracing to deliver a seamless, lag-free immersive experience, aiding doctors in reviewing AI prediction results effectively.
- Expanding the 3D immersive experience to multi-platform development, encompassing MR headsets, mobile devices, and a customized LiDAR camera projection system.

University of Illinois at Urbana-Champaign

Champaign, IL

Research Assistant

Jan 2017 - Aug 2023

- 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

PROJECTS

3D AI prediction mask visualizations: Utilized virtual models and projections to aid medical diagnosis by visualizing 3D masks. 2024

- Incorporated a high-performance image matching algorithm into iOS development to facilitate the migration of AI prediction masks to ARKit sessions
- Streamline cloud point processing to create a polished 3D mesh object, ideal for seamlessly anchoring virtual masks onto scenes identified by Lidar technology
- Real-time manipulation of 3D content using material shaders and geometry shader
- Created a virtual mask object by employing 3D ray tracing, mapping from matched 2D views to the 3D surface of a mesh object
- Aligned a Lidar camera with a projector to enable real-time projection of masks onto target regions

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.
- **Hong, Liu**, and Leonardo P. Chamorro. "On the synergy of biomicrofluidic technologies and real-time 3D tracking: A perspective." *Biomicrofluidics* 17.6 (2023).
- Aydin, O., Emon, B., Cheng, S., **Hong, Liu**, Chamorro, L. P., & Saif, M. T. A. (2020). Performance of fabrics for home-made masks against the spread of COVID-19 through droplets: A quantitative mechanistic study. *Extreme Mechanics Letters*, 40, 100924.
- Wang, H., **Hong, Liu**, Chamorro, L.P. Micro-Scale Particle Tracking: From Conventional to Data-Driven Methods. *Micromachines* 2024, 15, 629.
- Jin, Y., Kim, J. T., **Hong, Liu**, & Chamorro, L. P. (2018). Flow-induced oscillations of low-aspect-ratio flexible plates with various tip geometries. *Physics of Fluids*, 30(9).
- Wu, Y., Wu, M., Vázquez-Guardado, A., Kim, J., **Hong, Liu** ... & Rogers, J. A. (2022). Wireless multi-lateral optofluidic microsystems for real-time programmable optogenetics and photopharmacology. *Nature communications*, 13(1), 5571.
- Kim, G., Cheng, S., **Hong, Liu**, Kim, J. T., Li, K. C., & Chamorro, L. P. (2021). On the acoustic fountain types and flow induced with focused ultrasound. *Journal of Fluid Mechanics*, 909, R2.
- Houseago, R. C., **Hong, Liu**, Cheng, S., Best, J. L., Parsons, D. R., & Chamorro, L. P. (2022). On the turbulence dynamics induced by a surrogate seagrass canopy. *Journal of Fluid Mechanics*, 934, A17.
- Gao, Y., Paul, J. E., Chen, M., **Hong, Liu**, Chamorro, L. P., Sottos, N. R., & Geubelle, P. H. (2023). Buoyancy-Induced Convection Driven by Frontal Polymerization. *Physical review letters*, 130(2), 028101.
- Gao, Y., Paul, J. E., Chen, M., Seth, A., Liu, Q., **Hong, Liu**, ... & Geubelle, P. H. (2024). Fluid convection driven by surface tension during free-surface frontal polymerization. *Mechanics of Materials*, 104987.
- Choi, M. H., **Hong, Liu**, Chamorro, L. P., Edwards, B., & Timperman, A. T. (2024). Correction: Measuring the electrophoretic mobility and size of single particles using microfluidic transverse AC electrophoresis (TrACE). *Lab on a Chip*, 24(1), 148-148.
- Kang, S., **Hong, Liu**, Cheng, S., Best, J. L., & Chamorro, L. P. (2023). On the settling of aligned spherical particles in various quiescent media. *Journal of Fluid Mechanics*, 975, R1.
- Kang, S., Cheng, S., **Hong, Liu**, Kim, J. T., & Chamorro, L. P. (2023). Single sidewall cooling modulation on Rayleigh–Bénard convection. *Journal of Fluid Mechanics*, 957, A13.
- Wing, L., **Hong, Liu**, & Chamorro, L. P. Mixing and dynamics induced by flexible canopies composed of high-aspect-ratio structures.

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, Swift, Docker, Illustrator, Zemax