

LING TANG

PhD candidate in *Computer Science, Iowa State University*

RESEARCH AREAS

Robotics, dexterous tool manipulation with anthropomorphic robotic hand, dynamic finger gaiting, grasp planning, controller design, object pose estimation, differential geometry, optimization.

RESEARCH EXPERIENCES

Robotic Manipulation of Hand Tools: The Case of Screwdriving^[1]

- Developed a control system with a robotic arm/hand pair for dexterous hand tool manipulation, integrating techniques in pose estimation, grasp planning, object dynamics, rolling kinematics, finger gaiting, and control.
- Conducted simulations and experiments with a Shadow Dexterous Hand and a Barrett WAM Arm. Executed screwdriving for more than 5 rounds of recurrent finger rolling and gaiting with an 85% success rate.

Dynamic Finger Gaits via Pivoting and Adapting Contact Forces^[2]

- Investigated the maneuvering of a hand tool via pivoting and finger gaits under the dynamics and contact friction constraints.
- Implemented the experiments to pick up a screwdriver and a knife lying on a table with a Shadow Dexterous Hand and an Adept Cobra robot (serves as an arm) through a sequence of finger gaiting.

Robotic Fastening with a Manual Screwdriver^[3]

- Designed strategies and hybrid controllers (over position, impedance and admittance) for screwdriver mounting and screw tightening.
- Implemented simulations on the platform MuJoCo with a KUKA LBR iiwa robot, achieving 75% success rate in mounting and 100% in fastening.

Surface Discretization for Grasp Planning^[4]

- Investigated discretizing a surface into patches for grasp planning via differential geometry and principal component analysis.
- Implemented algorithms to evaluate and optimize grasp quality.
- Validated grasp planning results through experiments testing robustness against disturbances.

In-hand Object Pose Estimation via Extended Kalman Filter

- Developed a real-time system for 6D pose estimation of an object manipulated by a robotic hand via EKF under contact constraints.

INTERNSHIP

Motion Planning for Piano-Playing Humanoid (06 - 08/2023)

in Research Center for Intelligent Robots, Zhejiang Lab, Hangzhou, China

- Developed dynamic motion planning algorithms generating collision-free and human-like piano-playing motions for a humanoid robot.

PUBLICATIONS

- [1] Ling Tang, Yan-Bin Jia, and Yuechuan Xue. Robotic manipulation of hand tools: The case of screwdriving. In Proceedings of the IEEE International Conference on Robotics and Automation, pp. 13883-13890, Yokohama, Japan, May 13-17, 2024.
- [2] Yuechuan Xue, Ling Tang, and Yan-Bin Jia. Dynamic finger gaits via pivoting and adapting contact forces. In Proceedings of the *IEEE/RSJ International Conference on Intelligent Robots and Systems*, pp. 8784-8791, Detroit, Oct 1-5, 2023.
- [3] Ling Tang and Yan-Bin Jia. Robotic fastening with a manual screwdriver. In Proceedings of the *IEEE International Conference on Robotics and Automation*, pp. 5269-5275, London, UK, May 29-Jun 22, 2023.
- [4] Yan-Bin Jia, Yuechuan Xue and Ling Tang. Patch Tree: Exploiting the Gauss Map and Principal Component Analysis for Robotic Grasping. Submitted to the IEEE International Conference on Robotics and Automation, Atlanta, May 19-23, 2025.



734-730-7960



ling@iastate.edu



Ames, Iowa, USA

EDUCATION

PhD Computer Science

(expected 06/2025)

Iowa State University

Ames, IA, USA

M.S. Computer Science (2018)

Eastern Michigan University

Ypsilanti, MI, USA

B.E. Software Engineering (2015)

Xiamen University

Xiamen, Fujian, China

SKILLS

- *Robotics Tools and Methods*
 - Simulation
 - Robot Operating System (ROS)
 - Controller design
 - Motion planning
 - Kinematics and dynamics
 - Optimization
 - Extended Kalman Filter
- *Hardware Expertise*
 - Shadow Dexterous Hand
 - Barrett WAM Arm
 - Adept Cobra s600 Robot
 - ATI force/torque sensor
 - Azure Kinect camera
 - 3D scanners
- *Programming Languages*
 - C++ Python Java