Jingyi Xiang

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Education

University of Illinois Urbana-Champaign
Bachelor of Science in Electrical Engineering & Minor in Computer Science   *August 2020 – May 2024*
○ Dean's List: Fall 2020, Spring 2021, Fall 2021, Spring 2022
○ GPA: 3.88/4.0; Technical GPA: 3.86/4.0
○ Relevant courses: Introduction to Robotics, Introduction to Machine Perception, Artificial Intelligence, Control Systems, Digital & Analog Signal Processing

Publications

1. **J. Xiang**, H. Dinkel, H. Zhao, N. Gao, B. Coltin, T. Smith, and T. Bretl, "TrackDLO: Tracking Deformable Linear Objects Under Occlusion with Motion Coherence", *IEEE Robotics and Automation Letters*, August 2023.
2. **J. Xiang** and H. Dinkel, "Simultaneous Shape Tracking of Multiple Deformable Linear Objects with Global-Local Topology Preservation", in *IEEE ICRA Workshop on Representing and Manipulating Deformable Objects*, May 2023.
3. H. Dinkel*, **J. Xiang***, H. Zhao, B. Coltin, T. Smith, and T. Bretl, "Wire Point Cloud Instance Segmentation from RGBD Imagery with Mask R-CNN", in *IEEE ICRA Workshop on Representing and Manipulating Deformable Objects*, May 2022.

* Equal Contribution

Research Experience

Bretl Research Group, *Coordinated Science Lab at UIUC*.
Advisor: Timothy Bretl, Professor of Aerospace Engineering
Undergraduate Research Assistant   *January 2022 – Present*

○ **Tracking Deformable Linear Objects in RGB-D Imagery**   *August 2022 – Present*
  • Developed a new deformable linear object tracking algorithm, TrackDLO, for robust deformable linear object tracking under occlusion without external state information or physics simulation.
  • Developed a non-rigid point set registration based method for tracking multiple deformable linear objects simultaneously.
  • Created open-source C++ ROS (Robot Operating System) packages for the tracking methods developed.

○ **Automated Data Generation and Annotation for Deep Learning** *January 2022 – December 2022*
  • Implemented the Copy-Paste Augmentation method in an automated dataset generation process to scale the amount of available training data and to eliminate the time-consuming process of manual image annotation.
  • Collaborated with other researchers in the group to create COCOpen, an open-source library that automatically generates datasets of color images with objects of interest, labeled with object instance segmentation masks, bounding boxes, and category identification.

○ **Eye-In-Hand Extrinsic Camera Calibration for Industrial Robots**   *May 2022 – July 2022*
  • Designed and 3D printed custom camera mounts for linking the camera and the robot end-effector.
  • Calibrated our hardware system with fiducial markers and two eye-in-hand camera calibration algorithms: the Tsai-Lenz algorithm and a recently published method based on pose graph optimization.

○ **Instance Segmentation of Deformable Linear Objects**   *February 2022 – May 2022*
  • Identified, implemented, and evaluated two state-of-the-art deformable linear object instance segmenta-

tion algorithms.
- Used the instance segmentation masks output from Mask R-CNN to segment featureless point clouds in stereo depth imagery.

Projects

Tracking Deformable Linear Objects with Geodesic-Based Bayesian Coherent Point Drift
CS 498 Machine Perception Final Project April 2023 - May 2023
○ Implemented a recently published non-rigid registration algorithm, Geodesic-Based Bayesian Coherent Point Drift, in both Python and C++.
○ Integrated the Geodesic-Based Bayesian Coherent Point Drift algorithm into existing deformable linear object tracking algorithms to improve the tracking performance in edge cases.

Leadership

Illinois Office of Undergraduate Research
Illinois Undergraduate Research Ambassador March 2023 – Present
○ Held peer mentoring meetings to guide underclassmen through the process of finding research opportunities.
○ Assisted workshops that aim to introduce undergraduate research to new students.
○ Represented and assisted the Illinois Office of Undergraduate Research in campus-wide events to promote undergraduate research on campus.

Illini VEX Robotics at UIUC
Co-Founder & Competition Team Lead December 2020 – March 2023
○ Collaborated with teams from other institutions to create a knowledge base for competitive robotics.
○ Mentored high school teams in the community to help them get started in robot programming.
○ Organized and held weekly team events such as build meetings, social events, workshops, and general meetings to create team bonding.
○ Documented the progress of the team in an engineering notebook and delivered presentations to professional engineers during robotics tournaments.
○ Created guides and documentation for new member onboarding.
○ Oversaw robot design, manufacturing, and programming.

John Carroll School Robotics Team
Alumni Mentor June 2020 – April 2022
○ Produced a series of tutorial videos on how to use Autodesk Fusion 360 to design robot mechanisms.
○ Produced tutorial documents on basic robot programming and control algorithms.
○ Held mentoring appointments with current team members to provide guidance on various technical topics.

Honors & Awards

OpenCV AI Competition 2022
○ *First Prize Winner (Awarded to the top 10% submissions)* January 2023

UIUC Electrical and Computer Engineering Scholarships and Awards
○ *Indira Gunda Saladi Engineering Research Prize* August 2023
○ *Ellery B. Paine Outstanding Junior Award* March 2023
○ *A.R. "Buck" Knight Scholarship* September 2022, August 2023
○ *Oakley Scholarship in Electrical and Computer Engineering* September 2021

VEX Robotics Competition World Skills Standing College Division
○ *Top 5 Worldwide, Top 3 in the US* May 2021, May 2022

VEX Robotics Competition World Skills Standing High School Division
- ○ *18th Overall, 3rd in Programming* *May 2020*

VEX Robotics Competition Maryland State Championship
- ○ *Excellence Award, Robot Skills Champion, Tournament Division Finalist* *March 2020*

Presentations

Bretl Research Group Weekly Seminar, *UIUC.*
- ○ 1-hour slide presentation: "Deformable Linear Object Tracking as Non-Rigid Point Set Registration" *February 2022*
- ○ 1-hour slide presentation: "Tracking Deformable Linear Objects Under Occlusion" *September 2022*
- ○ 15-minute slide presentation: "Wire Instance Perception from RGBD Imagery with Mask R-CNN" *April 2022*

Undergraduate Research Symposium, *UIUC.*
- ○ Poster presentation: "TrackDLO: Tracking Deformable Linear Objects Under Occlusion with Motion Coherence" *April 2023*
- ○ Poster presentation: "Wire Instance Perception from RGBD Imagery with Mask R-CNN" *April 2022*

Undergraduate Research Opportunity Program Symposium, *UIUC.*
- ○ 15-minute slide presentation: "Perceiving and Tracking Deformable Linear Objects" *August 2022*

Skills

Operating Systems: Windows, Linux
Programming Languages: Python, C++, LaTeX, C, MATLAB
Software: Robot Operating System (ROS), Autodesk Fusion 360, Autodesk Inventor, Ultimaker Cura
Hardware: Intel RealSense Camera, ABB IRB120 Industrial Robot Arm, OnRobot 2FG7 Gripper