HAOZHE DU

Zhejiang University ◇ Hangzhou, Zhejiang, 310058, P.R.China
(+86) 13140108277 ◇ hzdu@zju.edu.cn ◇ hz-du.github.io

EDUCATION

Zhejiang University, Hangzhou, Zhejiang, P.R.China *September, 2022 – Now*

Master in College of Control Science and Engineering; **Advisor:** Prof. Rong Xiong

Research Topics: Embodied Artificial Intelligence, Deformable Object Manipulation

Zhejiang University, Hangzhou, Zhejiang, P.R.China *September, 2018 – June, 2022*

Bachelor of Engineering in **Automation** (Robotics Track)

College of Control Science and Engineering / Chu Kochen Honors College

- **GPA: 3.97/4, 91.1/100, Ranking: 1/28**

Dual Bachelor Degree in **Mechatronic Engineering**

SCHOLARSHIPS & AWARDS

- **2020, 2021 Championship of RoboCup Small Size League, China Open** (Most Influential Robot Competition in China)
- **2022 Championship of RoboCup Small Size League, Zhejiang Provincial Competition**
- **2022 Outstanding Graduates of Zhejiang University**
- **2020, 2021 Zhejiang Provincial Government Scholarship** (Top 5%)
- **2021 Pilot Scholarship in Chu Kochen Honors College** (Top 5%)

PUBLICATIONS & MANUSCRIPTS

1 **Haozhe Du**, Rong Xiong and Yue Wang. PolyFold: A Generalizable Framework for Language-Conditioned Bimanual Cloth Folding. *under review.* [Project Page]

2 **Haozhe Du**, Zhike Chen, Yufeng Wang, Zheyuan Huang, Yunkai Wang and Rong Xiong. Multi-Agent Trajectory Prediction Based on Graph Neural Network. *2021 IEEE International Conference on Real-time Computing and Robotics (RCAR).* [IEEE Paper Link]

3 Zexi Chen, **Haozhe Du**, Xuecheng Xu, Rong Xiong, Yiyi Liao, Yue Wang. Learning Interpretable BEV Based VIO without Deep Neural Networks. *2022 Conference on Robot Learning (CoRL).* [Link]

4 Zexi Chen, Yiyi Liao, **Haozhe Du**, Haodong Zhang, Xuecheng Xu, Haojian Lu, Rong Xiong, Yue Wang. DPCN++: Differentiable Phase Correlation Network for Versatile Pose Registration. *2023 IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI).* [IEEE Paper Link]

5 Zhike Chen, **Haozhe Du**, Haodong Zhang, Rong Xiong. Semantic Mask Transformer for 3D Human Pose Generation with Detailed Text Description. *submitted to AAAI 2025, under review.*

5 Zhike Chen, Zhiye He, **Haozhe Du**, Chenrui Han, Yunkai Wang, Zexi Chen, Rong Xiong. Multi-Stage Decision-Making Skill Learning for Soccer Robot. *2021 IEEE International Conference on Real-time Computing and Robotics (RCAR).* [IEEE Paper Link]

RESEARCH EXPERIENCE

Zhejiang University, Hangzhou, P.R.China
CSE Robotics Lab, College of Control Science and Engineering *November, 2021 – Now*
Research Assistant, Advisor: Prof. Rong Xiong

Project: Language Conditioned Deformable Object Manipulation

- Propose PolyFold, a novel language-conditioned bimanual cloth folding framework that excels in zero-shot generalization and inherent multi-step reasoning capability, while also operating in an expert-demonstration-free manner. Given solely a language goal (even if it is ambiguous), PolyFold utilizes parameterized polygon model, Large Language Models (LLMs), and a self-supervised learning downstream policy to achieve a sequence of successful cloth folding actions. PolyFold can be divided into three key parts: subgoal decomposition LLM, symmetrical fold line generation LLM, and fold line guided bimanual pick-and-place policy. Experiments show that PolyFold is able to zero-shot generalize to various cloth types and 70 cloth folding tasks in simulation and real-world scenarios, surpassing previous SOTA vision-conditioned and language-conditioned methods.

Project: Differentiable Phase Correlation Network for Measurements Pose Registration

- Propose DPCN++, a differentiable phase correlation based method for versatile measurements pose registration in a initialization-free and correspondence-free manner. DPCN++ decouples the translation and scale from rotation, using Fourier transform and spherical radial aggregation, and then the rotation, scale and translation are efficiently estimated in the spectrum step-by-step independently. The proposed method is validated via extensive experiments on both 3D measurements like mesh, point cloud and 2D measurements like gravity aligned BEV images, achieving superior performance compared to both classical and learning-based baselines.
- Propose a interpretable and differentiable BEV based visual-inertial odometry (VIO), which adopts Unscented Kalman Filter (UKF) as a differentiable layer to predict the pitch and roll used for BEV camera image projection, and then a differentiable phase correlation based pose estimator is utilized to estimate the remaining 3 DoF poses between the BEV frames. Experimental results on synthetic and real-world datasets demonstrate that the proposed approach is competitive with state-of-the-art methods and generalizes well on unseen scenes.

ZJUNlict Robot Soccer Team, College of Control Science and Engineering *July, 2020 – July, 2022*
Core Team Member, Advisors: Prof. Rong Xiong & Dr. Zheyuan Huang

Project: Soccer Robot Motion Prediction based on Heterogeneous Graph Neural Network

- Propose a graph neural network based method for robot swarm motion prediction which models different robots and environment as heterogeneous components. Inputting positions and velocities of robots, the positions in specific time intervals are predicted.
- The proposed method is verified on the small soccer robot platform, which emphasizes confrontation and interaction of robot agents, and achieved the best prediction results compared to traditional kinematics methods.

Project: Centralized and Hierarchical Real-Time Decision Module for Soccer Robot Swarm

- Propose a centralized hierarchical decision-making module that utilizes finite state machine and scoring-based heuristic search to provide precise task instructions for robot swarm. The upper-level

decision-making component utilizes a finite state machine to allocate various skills to different robots cyclically, while the lower-level component analyzes the current situation via global observations. It determines the role and positioning of the robot swarm through scoring-based heuristic search techniques, leveraging GPU-accelerated parallel computing for enhanced performance efficiency. As a result, our system excels in real-world robot competitions, surpassing all other participating teams.

PROGRAMMING SKILLS

Python, Pytorch, C/C++, ROS, Java, MATLAB, Git, Markdown, LaTeX