Zhi (Leo) Wang

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Education

Tsinghua University *Sep. 2020 - Present*
B.Eng. in Electronic Engineering
Advisor: **Prof. Milin Zhang** and **Prof. Jianyu Chen** *Beijing, China*

University of Illinois Urbana-Champaign *Mar. 2024 - Nov. 2024*
Visiting Student (On-Site), Computer Science Department
Advisor: **Prof. Wenzhen Yuan** *Champaign, USA*

Publications

[C2] DoorBot: Closed-Loop Task Planning and Manipulation for Door Opening in the Wild with Haptic Feedback
Zhi Wang*, Yuchen Mo*, Shengmiao Jin, Wenzhen Yuan
*IEEE International Conference on Robotics and Automation **(ICRA), 2025*** , Under Review
[Paper], [Video], [Code], [Website], [Dataset]

[C1] KOSMOS-E: Learning to Follow Instruction for Robotic Grasping
Zhi Wang*, Xun Wu*, Shaohan Huang, Li Dong, Wenhui Wang, Shuming Ma, Furu Wei
*IEEE International Conference on Intelligent Robots and System **(IROS), 2024, Oral***
[Paper], [Video], [Code], [Website], [Dataset]

Research Experience

University of Illinois Urbana-Champaign (UIUC)
Mar. 2024 - Nov. 2024

Research Assistant at RoboTouch Lab, Advised by Prof. Wenzhen Yuan *Champaign, USA*

- **[C2] Research Topics: Mobile and Bimanual Manipulation for Articulated Objects in the Open World**
- Proposed **DoorBot**, a hierarchical, closed-loop, haptic-aware control framework with unified action representation, enabling a bimanual, mobile robot to explore and open diverse unseen doors in the wild. DoorBot achieves a **90%** success rate across 100 trials on totally **20 unseen doors** in the UIUC Campus.
- Main Contributions: **(1)** Primitives Design: **Well-designed primitives** split the whole task into the high-level planner and low-level policy to lower the dimensionality. **(2)** Grasping-and-Unlocking Model: **A novel action representation** maps RGB images to 3D action parameters. **(3)** Closed-loop System with Haptic Feedback: Robots learn from mistakes adaptively, correct actions autonomously, **sense object attributes from haptics**.

Microsoft Research Asia (MSRA)
Jun. 2023 - Mar. 2024

Research Intern at NLC Group, Advised by Dr. Shaohan Huang *Beijing, China*

- **[C1] Research Topics: Multimodal Learning for Semantically Robotic Grasping**
- Proposed **KOSMOS-E**, a Multimodal Large Language Model (**MLLM**) combining visual and textual information to enhance capabilities for semantically robotic grasping maneuvers.
- Proposed **INSTRUCT-GRASP**, a large-scale, instruction-following, multimodal, robotic grasping dataset comprising **1.8 million** grasping data, 2 modalities, 8 instruction types, 3 information sources, 3 tasks, and 2 scenes.
- KOSMOS-E achieves an **85.19%** success rate for image-wise evaluation and a **72.63%** success rate for object-wise evaluation on Cornell Grasping Dataset.

Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua
Sep.2021 - Sep. 2022

Research Assistant at ISR-LAB, Advised by Prof. Jianyu Chen *Beijing, China*

- **Research Topics: The World's Fastest Humanoid Robot in the Wild [Website] [Media]**
- Designed a versatile **humanoid robot** capable of superior locomotion performance in diverse environments, where I finished the efficient **BLDC-FOC motor driver** design and whole-body power supply.
- As the prototype of RobotEra's **STAR1**, **the fastest humanoid robot** in the open world at that time, it attracts numerous media reports and commercial interests.

Research Interests

My research lies at the intersection of robotics, learning, manipulations, and interactions. My ultimate goal is to develop **intelligent manipulation systems** and **general-purpose robot foundation models**. Some sub-goals could be:
(1) Multimodal Leaning: Integrating **vision, language, touch, audio** for fine-grained and effective manipulation.
(2) Robot Learning: Using **imitation learning and reinforcement learning** for long-horizon embodied interaction.
(3) Human-Robot Interaction: Enabling robots to **safely and intelligently interact** with humans in the open world.
(4) Generalizability: Developing **generalizable policies and learning architectures** across diverse embodiments.

Projects Portfolio

Industry Experience: Frying and Cooking Robot *Apr. 2023 - Jul. 2023*
Research Intern in Computer Vision and Robotics [Code] [Website] *EncoSmart Technology (Beijing) Co., LTD*
- Developed a crucial vision module for robotic grasping and insertion, helping LAVA, an autonomous cooking and frying robot, achieve **sub-millimeter accuracy**.

Independent Project: EIS-Based Virtual Gimbal Embedded in SD Card *Nov. 2021 - May. 2022*
Founder & Developer *Tsinghua University*
- Developed an **image-and-sensor-based video stabilization** solution utilizing a custom SD card with integrated IMU data and FlowNet2-based optical flow.

Competition Project: Intelligent and Agile Vehicle *Sep. 2021 - Dec. 2021*
Team Leader [Code] *Electronic Design Competition*
- Developed Tank, an **autonomous vehicle** system, leverages FOC-PID closed-loop control for precise self-localization and robust motion planning.

Course Project: PYNQ-Based Intelligent Aelos Robot *Jul. 2021 - Sep. 2021*
Core Member & Developer *Intelligent Robots Design*
- Developed a highly functional **Aelos robot with PYNQ**, featuring precise visual self-localization, robust obstacle avoidance, and efficient motion planning.

Leaderships & Activities

Chair of the Electronic Engineering Hardware Group *2021-2023*
30-Person Team, Tsinghua University [Website] *Tsinghua University*
- Organized two major annual, university-wide competitions, engaging over **450 participants**.

Leader of Hardware and Vision Team in Future Robot Club *2021 - 2023*
15-Person Team, Tsinghua University [Website] [GitHub] *Bordeaux, France*
- Led the team of Tinker, a domestic service robot, participating in annual **RoboCup@Home** Competition.

Teaching Experience

2022	**Head Teaching Assistant**, 40231212: Intelligent Robots Design and Implementation	*Tsinghua University*
2021	**Head Teaching Assistant**, 20230292: Project Design and Making of Electronic System	*Tsinghua University*
2021	**Head Teaching Assistant**, 01550013: Synthetical Practice of Electronics System Design	*Tsinghua University*

Honors & Awards (selected)

Oct, 2024	**Science and Technology Innovation Scholarship (1 %) , Three times: 2021, 2023, 2024**	*Tsinghua University*
Oct, 2024	***Grand Prize* of International Study Scholarship (0.2 %) , Only 2 in 1018 People**	*Tsinghua University*
Jul. 2023	**Top 8 in the world in RoboCup@Home Competition (2 %)**, Domestic Service Robot	*Bordeaux, France*
Dec. 2021	**Winner Price (5 %)**, The 23rd Electronic Design Competition	*Tsinghua University*
Apr. 2021	**Third Prize (5 %)**, The 4th Software Design Competition	*Tsinghua University*
Apr. 2021	**Third Prize (5 %)**, The 4th Artificial Intelligence Challenge	*Tsinghua University*

Skills

Programming	**Python** (PyTorch, NumPy, OpenCV), **C/C++**, Linux Shell, MATLAB, Verilog, LaTeX
Software Tools	Git, Anaconda, Docker, **ROS1/2**, **PyBullet**
Hardware System	**Mechanics** (Solidworks, Blender, Cura), **Electronics** (STM32, ESP32, Arduino, FPGA, **PCB Design**)
Robotics	**Gelsight Mini**, **UR5e Robot Arm**, **RealMan Humanoid Robot**, FR5 Robot Arm, Realsense, Kinect