

QIYAO WANG

Theoretical and Applied Mechanics & Aerospace Engineering
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EDUCATION

Tsinghua University

2021.09 – Present

B.S. in Theoretical and Applied Mechanics & Aerospace Engineering

GPA: 3.85/4.00 (rank: 4/29)

Relevant Courses: Mathematical Analysis(2) (A), Introduction to Complex Analysis (A+), Introduction to Partial Differential Equations (A), Programming Fundamentals (A), Fluid Mechanics (A), Introduction to Intelligent Systems (A+)

Language: TOEFL 103

PUBLICATION

- **Qiyao Wang***, Yuhang Zheng*, Chengliang Zhong, He Liang, Bo liang, Zhengxiao Han, and Yupeng Zheng, Enhancing Daily Life through an Interactive Desktop Robotics System*, *CAAI International Conference on Artificial Intelligence* (in press)
 - * Qiyao Wang and Yuhang Zheng contribute equally to this work.
 - ✧ Won the Best Demo Award in CICA 2023.

SELECTED AWARDS AND HONORS

- **1st Place**, ICRA Preparation and dish Up of an English Breakfast with Robots (PUB.R) competition 2023
- **4th Place**, RoboCup 2023 Humanoid League – kid size 2023
- **First Prize**, 2nd “Five Elements Cup” Scientific Research and Innovation Competition 2023
- **Overall Excellence Scholarship**, University-level Scholarship of Tsinghua University 2023
- **Technology Innovation Excellence Scholarship**, Scholarship of Tsinghua University 2023
- **First Prize**, 6th CoreTech Winter Camp Smart Car Competition 2022
- **Overall Excellence Scholarship**, University-level Scholarship of Tsinghua University 2022

RESEARCH EXPERIENCE

1. Dual MLP controller for pneumatic artificial muscle fiber bundles

2023.10 – Present

Advisor: Prof. Huichan Zhao, THU Soft Robotics Research Group, Department of Mechanical Engineering, Tsinghua University

This work aims to build and control a 7-dof multi-jointed soft robotic arm driven by multiple bundles of pneumatic artificial muscle (PAM). Positional control of single PAM fiber bundle should be accomplished firstly. To cope with the nonlinearity, hysteresis, and viscosity of PAM, this work designed a dual MLP controller and verified its control effect through experiments.

In this work, I'm:

- In charge of designing the controller and training the neural networks;
- In charge of setting up the experiment table and conducting the experiment;
- Participate in the fabrication of the PAM fiber bundles.

2. Research on organizing drawer interactively by a desktop robotics system

2023.05 - 2023.07

Advisor: Prof. Guyue Zhou, Discover Lab, Institute for AI Industry Research, Tsinghua University

This work uses a collaborative robotic arm with a Realsense d455 camera and a Robotiq two-finger gripper as the hardware. We apply Yolov7, Affordance and 3D Implicit Transporter for object detection, MoveIt for motion planning, and ChatGPT as a voice interface. We finally realized the job of making the robotic arm put the specified items into or take out from the specified drawer through natural language voice interaction.

This work produced a demo paper of CICA 2023, and won the Best Demo Award in the conference.

In this work, I'm:

- In charge of end-to-end trajectory planning work of robotic arm, and designing gripping posture.
- Participate in the optimization of natural language human-computer interaction.
- Participate in the design of robotic arm operation process based on task objectives

3. Design and control of breakfast-making robotic system 2023.01 – 2023.06

Advisor: Prof. Guyue Zhou, Discover Lab, Institute for AI Industry Research, Tsinghua University

The hardware for this work is a collaborative robotic arm with a Realsense d455 camera and a Robotiq two-finger gripper, with a movable chassis and LIDAR on it. We apply Yolov7 for object detection, MoveIt for motion planning, GraspNet for assisting grasping, and ChatGPT as voice interaction interface. We finally realized the cooking, serving and presentation of several English breakfast dishes, including hot tomatoes, grilled toast, fried eggs, bean dip, etc.

This work won the 1st Place of the PUB.R competition in ICRA 2023.

In this work, I'm:

- In charge of target object position estimation based on RGBD image and 2D marker.
- In charge of end-to-end trajectory planning work of robotic arm, and designing gripping posture.
- In charge of the design of robotic arm operation process based on task objectives
- Participate in the low-level work of the six-axis robotic arm, including coordinate system calibration, inverse kinematics solving, and safety and protective function design.
- Participate in object detection programming based on RGB images

4. Research on vision and navigation of humanoid robot soccer player 2022.10 - 2023.07

Advisor: Dr. Li Liu, Department of Mechanical Engineering, Tsinghua University

This work aims to build a humanoid robot soccer team, and focuses on the vision and navigation work of the robots. We apply Yolo-Fast to detect the ball, the goal and some iconic positions on the field. We then utilize some computer vision methods to accomplish distance measurement of the targets using a monocular camera. For navigation, we combined the detection results with the data from the IMU sensor, to localize our robots and navigate them to the target location.

This work won the 4th Place RoboCup 2023 Humanoid League.

In this work, I'm:

- In charge of the vision works based on monocular camera RGB images, including targets detection such as soccer balls, goal posts, other robots, etc., target distance measurement and enemy identification.
- Participate in robot localization and navigation work, including localizing the robots based on the features of the field, IMU sensor calibration and compensation.

ADDITIONAL INFORMATION

Sports and Arts

- Being a main player of Xingjian College soccer team, and helped the team win the second place in the Tsinghua University "John Ma" Soccer Cup - Grade B. 2021.10 - Present
- Being the Principal Clarinet player in the Tsinghua University Student Symphony Orchestra (TUSO), participated in many performances, and won the 1st place in the Beijing University Students' Art Exhibition with the team. 2021.08 - Present

Volunteer Services

- Xingjian College – "Forerunner" Program: Help freshmen adapt to college life and find the right direction for themselves through communication and Q&A. 2022.09 – 2023.06
- Tsinghua University Admission Volunteer: Introducing various college majors to high school graduates and assisting them in applying for a major. 2022.06
- Tsinghua University – "Alma Mater" Program: Introducing my college and department to my high school underclassmen. 2022.02