Qianwei(Robin) Wang

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EDUCATION

B.S. Computer Science,University of Michigan-Ann Arbor,MI　　　　Sep.2023-Dec.2026
GPA:3.92/4.0
B.Eng Electrical Information Engineering,Xidian University,China　　　Sep.2021-Jul.2023
GPA:3.90/4.0

RESEARCH INTERESTS

My research interests include **robotic decision-making** and **human-robot interaction (HRI)**. I aim to build robots that are closely connected to people's daily lives and possess **human-like reasoning abilities about the physical world**.

EXPERIENCE

Summer Intern,Advanced Agent-Robotics Technology Lab,Carnegie Mellon University
Advisor: Prof. Katia Sycara　　　　　　　　　　　　　　　　　　　May.2025-now
Undergraduate Research Assistant,LIVE,University of Michigan
Advisor: Prof. Vineet R.Kamat　　　　　　　　　　　　　　　　　　Sep.2023-now
Summer Intern,ARM,University of Michigan
Advisor: Prof. Dmitry Berenson　　　　　　　　　　　　　　　　　May.2024-Aug.2024

PUBLICATION

①**Wang,Qianwei**;Li, Bowen;Sycara,Katia;Xie,Yaqi."Symbolizer:Deep Predicate Invention with Pre-trained Foundation Models"　　　　　　　　　　　　　　　　(in preparation)

②**Wang,Qianwei**;Xu, Yifan;Kamat, Vineet; Menassa,Carol."OVAMOS: A Framework for Open-Vocabulary Multi-Object Search in Unknown Environments"　　　　(phase2 in AAAI)

③Xu, Yifan;Luo, Ziming*;**Wang, Qianwei***; Kamat, Vineet; Menassa, Carol."Point2Graph: An End-to-end Point Cloud-based 3D Open-Vocabulary Scene Graph for Robot Navigation." **ICRA 2025**

④Xu, Yifan; **Wang, Qianwei**; Kamat, Vineet; Menassa, Carol."Socially-Aware Shared Control Navigation for Assistive Mobile Robots in the Built Environment."
Journal of Computing in Civil Engineering

SKILLS

Programming: C/C++, Python, Matlab
Tools: ROS, PyTorch,OpenCV, Eigen,Ceres

AWARDS

CMU RISS Summer Scholar (8000 USD)
University of Michigan,SURE(6000 USD)
James B. Angell Scholar(University of Michigan)
University Honors x2 (University of Michigan)
First Prize in The Chinese Mathematics Competitions
Second Prize in University Championship-RoboMaster (held by DJI)-RMUC

SLECTED PROJECTS

Neuro-Symbolic Bilevel Learning Framework for Bilevel Planning①
Supervised by Dr.Katia Sycara,CMU   May.2025-now
Working on improving learning neural predicates directly from demonstrations.

Open-Vocabulary Multi-Object Search in Unknown Environments②
Supervised by Dr.Vineet R.Kamat,LIVE,University of Michigan   Nov.2024-now
I am working on enabling the robot to simultaneously build beliefs about **multiple types of objects while exploring the environment**.

Socially-Aware and Shared Autonomy-based Wheelchair④
Supervised by Dr.Vineet R.Kamat,LIVE,University of Michigan   Sep.2023-now
We have designed a navigation framework for wheelchairs that integrates **user preferences** into both the local planner and the global planner. In addition to basic obstacle avoidance capabilities, we developed a **SS (Socially Aware)-MPC-DCBF (Dynamic Control Barrier Function)** framework to enable the wheelchair to effectively and safely **avoid dynamic pedestrians.**
My contribution:
☺I utilized Gazebo to **establish a simulation environment** and **built an experimental platform** on a wheelchair equipped with a LiDAR, camera, IMU, and CAN communication system in real-world settings. Additionally,I **implemented state-of-the-art odometry and mapping algorithms**, such as FASTER-LIO, LEGO-LOAM, and RTAB-Mapping, to evaluate and enhance the system's performance in both simulated and real-world environments.
☺In the physical-world experiments of our research, I was responsible for transferring the algorithms from the simulation environment to the real robot. This process included using **PID** control to compensate for errors in the wheelchair's actual motion and fine-tuning the parameters of the **MPC-based local planner**.

Tool Retrieval in Agricultural Environments
Supervised by Dr.Dmitry Berenson,ARM,University of Michigan   May.2024-Aug.2024
This project aimed to enable the Spot robot to operate in **outdoor** agricultural environments by responding to human instructions. The robot was designed to navigate to the vicinity of the specified tool, identify the target tool from a **cluttered set of tools** in an **open-vocabulary** setting, and perform the pick-up and subsequent delivery to the user's hand.
My contribution:
During the experiments, I identified that the current open-vocabulary detector performed poorly in scenarios involving **long distances or objects in cluttered environments**. To address these challenges:
☺For long-distance detection, I adopted a strategy inspired by VLFM (Vision-Language Frontier Map), leveraging the scene reasoning capabilities of Vision-Language Models (VLMs) to guide the robot to regions where the target object was likely to be located.
☺For object-in-clutter scenarios, I designed a solution combining **a real-time detector (YOLO-World) with a dynamic scanning** approach, enabling the robot to collect **multiple viewpoints** and improve detection accuracy.

3D Open-Vocabulary Scene Graph for Robot Navigation③
Supervised by Dr.Vineet R.Kamat,LIVE,University of Michigan   Mar.2024-Sep.2024

We developed Point2Graph, a point cloud-based 3D open-vocabulary scene graph framework for robot navigation that **eliminates reliance on RGB-D images** while integrating room and object detection with open-vocabulary classification.

My contribution:

☺My contribution lies in identifying the limitations of learning-based room segmentation methods in complex real-world scenarios. To address this, I incorporated room boundary information derived from further processing point cloud data, which was then used for **denoising the scene density map**, achieving improved segmentation performance.