Liwei Yang

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EDUCATION

Carnegie Mellon University - School of Computer Science (CMU SCS) — Pittsburgh, PA
Master of Science in Robotic Systems Development — (expected) May 2025
Courses: Planning in Robotics, Optimal Control & Reinforcement Learning, Talking to Robots, Robot Autonomy, Manipulation & Estimation & Control, Advanced Computer Vision, Robot Mobility

National Taiwan University (NTU) — Taipei, Taiwan
Bachelor of Science in Biomechatronics Engineering — Jun. 2022
Courses: Robotics, Machine Learning, Medical Mechatronics and Control, Data Structures and Algorithms, Digital Image Processing
Honor: Prof. Takasaka Memorial Scholarship, Presidential Award

SKILLS

Programming: C/C++, Python (PyTorch, OpenCV), Java, MATLAB, Julia
Robotics: Motion Planning, Optimal Control, Computer Vision
Software/Tools: ROS2/ROS, MoveIt2, Gazebo, SolidWorks, 3D Slicer, Qt, Git, Arduino, Android Studio, Google Test

WORK EXPERIENCE

Smith+Nephew — Pittsburgh, PA
R&D Intern (Robotics System Verification Engineering Intern) — May 2024 - Aug. 2024
- Analyzed and visualized registration algorithm results for total hip arthroplasty, boosting registration efficiency by 75%.
- Crafted and automated 20 C++ tests using GoogleTest, enhancing code reliability and reducing testing time by 50%.
- Executed 15 manual test cases, identifying multiple bugs for the development team and accelerating product launch.

RESEARCH EXPERIENCE

MRSD Capstone (Sponsored by Smith+Nephew) — Pittsburgh, PA
Project Manager, topic: Tekkneeca – Assistive Surgical Robot for Orthopedics — Nov. 2023 - Nov. 2024
- Integrated novel registration algorithm to replace invasive IR trackers for surgical robots, achieving drilling accuracy of 2 mm.
- Adapted MoveIt2 hybrid-planning architecture with KUKA LBR Med 7 to account for bone motion and define recovery behavior.
- Designed **MPC** controllers to compensate for subtle bone motion during the surgery, achieving a compensation speed of 6 mm/sec.

Center for Artificial Intelligence and Advanced Robotics — Taipei, Taiwan
Research Assistant, topic: Companion Healthcare Aid Robot Manager — Feb. 2022 - Oct. 2022
- Developed a voice-interactive module, enhancing facial recognition capabilities and user engagement.
- Leveraged **SQLite** to centralize physiological data from multiple users, improving system scalability and user management.
- Integrated a smartwatch with the robot using Bluetooth Low Energy protocol, optimizing data synchronization capabilities.

Robots and Medical Mechatronics Lab — Taipei, Taiwan
Undergraduate Researcher, topic: Remote Swabbing Robot — Sept. 2020 - Mar. 2022
- Constructed a statistical morphing oral model using CT images in **3D Slicer**, achieving landmarks' accuracy of 2 mm.
- Won **sponsorship** worth $1600 USD from Taiwan's Ministry of Science and Technology.
- Won the best student paper award at the Conference on Advanced Robotics and Intelligent Systems.

PUBLICATIONS

Peer-reviewed Journal Articles
A Morphology Model for the Cyber-physical Operation of a Remote Swabbing Robot.
- **Yang, L. W.** & Yen, P. L., International Journal of iRobotics.

SELECTED PROJECTS

I Can't do it – Bimanual Robotic Arm Collaboration — Dec. 2024
- Harnessed the reasoning capabilities of OpenAI **GPT-4o** to foster intelligent cooperation between two robotic arms.
- Enabled talking to robots by integrating OpenAI Whisper speech-to-text model to ROS2.
- Developed generalized Pilz industrial motion planning stack using MoveItCpp and ROS2 parameters.

Blind Swarm – Formation Planning for Swarm Robots — Dec. 2024
- Simulated drone formation changes while avoiding collisions with static obstacles and other drones.
- Designed and implemented **conflict-based search planning** and imposing constraints on motion primitives based RRT.

ARoboT – Autonomous Pixel Art Builder — May. 2024
- Integrated symbolic task planner to stack 3D-printed blocks to form a pixel art.
- Utilized MoveIt with the RRTConnect planner to plan Franka Emika Panda trajectory to pick-and-place building blocks.
- Conducted eye-in-hand **extrinsic camera calibration** to enhance the accuracy of object detection and pose estimation.

MLF6110 - Mobile Lost and Found Robot — Jan. 2022
- Led a team of 4 to integrate an object-searching mobile robot using depth camera and lidar.
- Utilized DWA **navigation** and AMCL **localization** methods using ROS.
- Applied BRISK and RANSAC algorithms in object searching and found all lost items.