Hang Yin

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PROFESSIONAL EXPERIENCE

Research Engineer - Stanford Vision & Learning Lab *Jan. 2024 – present*

- Implemented parallel environments in OmniGibson for reinforcement learning workflows, achieving optimized performance through vectorized operations across robot control stack, object state computation, and transition rules processing
- Refactored OmniGibson rigid-body & cloth simulation and robot control stack to be fully GPU-based, leveraging USDRT/Fabric from Isaac Sim; implemented both PyTorch-based internals and an optional NumPy backend for single-environment robot control speed-up
- Integrated cuRobo CUDA-accelerated motion planning library into OmniGibson's primitive actions library, enabling efficient execution of bi-manual manipulation and object-centric navigation; this supported synthetic data generation from human demonstrations, incorporating both reachability and collision constraints
- Developed a bi-manual mobile manipulator teleoperation system with VR and GELLO-inspired arms, featuring kinematic teaching, viewpoint constraint, and tactile feedback mechanisms to ensure high-quality demonstration collection

Robotics and Controls Software Intern - Johnson & Johnson MedTech *Jun. 2023 – Sep. 2023*

- Contributed to software development for instruments on a novel robotic surgical system using kinematics and control theory
- Redesigned and implemented the existing Kalman filter torque estimation model, achieving comparable performance while significantly reducing the calibration time required for diverse instruments
- Optimized configuration and URDF file formats, reducing memory requirements to roughly 20% of the original size, to enable efficient storage on embedded devices with memory limitations
- Undertook the refactoring of C++ controls and kinematics libraries, increasing code efficiency, readability, and maintainability

EDUCATION

Northwestern University **Evanston, IL**

M.S. in Robotics *Sep. 2022 - Dec. 2023*

B.S. with honors in Computer Science, summa cum laude *Sep. 2019 - Jun. 2022*

PROJECTS

Action Chunking with Transformers for Human-Robot Co-Manipulation *Northwestern Center for Robotics and Biosystems*

- Implemented Action Chunking with Transformers (ACT) for human intent prediction in co-manipulation tasks, training on 250 demonstrations across 5 distinct goals with both force and position control modes; developed evaluation metrics through a "Gauntlet Game" task measuring completion time and force magnitude
- Built an efficient data collection pipeline with synchronized RealSense cameras (2 external + 1 onboard) and force sensors; developed a ROS2 package for automated data recording across distributed compute, reducing per-demonstration collection time to 40 seconds through optimized ROS bag recording and AprilTag-based pose tracking
- Migrated 14 ROS1 Melodic packages to ROS2 Iron and integrated ros2_control framework, implementing novel velocity interfaces for omnidirectional base control; developed Docker environment with Ubuntu 22.04 for seamless hardware testing and deployment

Autonomous Robot Chef *Independent Research*

- Engineered a voice-controlled, robot-assisted cooking system leveraging a custom Alexa skill for intuitive interaction, a Flask app interfacing with an LLM for context-sensitive recipe generation, and a RealSense camera with CLIP model for robust object detection and spatial awareness in the kitchen environment
- Developed a hand-action recognition module using MediaPipe and an LSTM neural network to facilitate cooperative human-robot tasks, with feedback mechanisms enabling dynamic task progression based on user actions

EKF Simultaneous Localization and Mapping from Scratch *ME 495 Sensing, Navigation, and ML for Robotics*

- Implemented Extended Kalman Filter SLAM pipeline in ROS2, using C++ for a Turtlebot3 differential drive robot
- Developed a robust cylindrical landmark detection method from LiDAR data, integrating unsupervised point clustering and supervised circular regression methodologies
- Built a comprehensive simulated environment in RViz from scratch and wrote custom C++ libraries for differential drive kinematics, collision detection, 2D transformations, and odometry

Robot Jenga Assistant *ME 495 Embedded Systems in Robotics*

- Programmed a 7 DoF Franka Emika Panda robot arm to interactively play Jenga, leveraging ROS2, MoveIt 2, OpenCV, and Tensorflow, with calibration facilitated through AprilTag alignment
- Constructed a custom MoveIt library to guide the end effector along Cartesian paths via inverse kinematics, calculate feasible joint positions, and simulate an environment for collision avoidance in RViz
- Augmented gameplay intelligence by applying transfer learning on a MobileNet-based convolutional neural network, trained specifically to discern the presence of hands in the game scene

Quadrotor Design and Control *ME 410 Mechatronics - Quadrotor-based Project*

- Designed and built a WiFi-enabled quadrotor drone with a Raspberry Pico and onboard IMU, incorporating PID closed-loop control, rigorous safety measures, and joystick interface for both autonomous and manual flight control
- Integrated Vive Lighthouse with four IR sensors to capture and leverage 3D spatial data, enabling real-time autonomous flight adjustments based on quadrotor positioning

Skills: Python, C++, C, MATLAB; Isaac Sim, PhysX; ROS2, Gazebo; NumPy, OpenCV; Git, Linux, Docker; OpenAI Gym; CI/CD, Unit Testing, pytest