

ACHYUTHAN UNNI KRISHNAN

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Education

Worcester Polytechnic Institute (WPI)

Aug 2020 – Present

PhD, Robotics Engineering, GPA: 4.0/4.0

Worcester Polytechnic Institute (WPI)

Aug 2018 – Aug 2020

Master of Science, Mechanical Engineering, GPA: 3.93/4.0

Amrita University, Coimbatore, India

Aug 2012 – Aug 2016

Bachelor of Technology, Mechanical Engineering, GPA: 8.52/10.00

Skills

System and Software: ROS, Unity, OpenCV, Tensorflow, Pytorch

Programming Languages: Python, Matlab, C#, C++

Specializations: Human-Robot Interaction, Robot Teleoperation, Reinforcement Learning, Deep Learning

Experience

Robert Bosch Engineering And Business Services

Sept 2016– May 2018

Associate Design Engineer

Coimbatore, India

- Designed and developed heating solutions for diesel exhaust treatment systems
- Worked on sensor integration for level sensing applications in coolant pumping systems.

Research Topics

Assisted Bi-manual Control Interfaces for Free-form Teleoperation

Aug 2022– Present

- Developed control interfaces for bi-manual teleoperation to perform general purpose nursing tasks involving object manipulation and workspace surveillance.
- Implemented motion-based intent inference and scaling assistance, eliminating unintended motions and enabling precise control.
- Optimized assistance availability based on operator physical fatigue, reducing task completion times 11% and physical workload by 28%.

Action and Perception Assistance for Remote Manipulation Interfaces

Aug 2021– Present

- Designed Human-Robot shared control paradigms for task support during remote manipulation of a Kinova Gen3 arm.
- Implemented Augmented Reality cues to notify users of robot state, autonomy intent and workspace information.
- Created a real-time cognitive workload estimator and intent inference system using gaze motion and pupil tracking to estimate mental workload and optimize perception assistance.
- Improved control efficiency by 50% and reduced cognitive workload by 30% while enhancing robot state awareness.

Projects

Object Localization and Grasping for Robotic Manipulation

Aug 2021– Dec 2021

- Developed grasp point candidates for 2-finger grippers for household items using Nvidia Graspnet architecture.
- Created a grasp angle and position based loss function resulting in 91% grasp success with Shapenet dataset objects.
- Integrated Mask-RCNN for object localization with grasp detection for autonomous grasping with Baxter robot arms.

Reward Engineering for Autonomous Pick and Place Actions

Aug 2019– Dec 2019

- Trained pick and place motions for a Franka Emika Panda arm using a DDPG based model in OpenAI Gym.
- Implemented several reward designs using distance and motion heuristics to optimize robot motion efficiency.
- Achieved a 40% improvement on baseline performance in terms of time of convergence for optimal solution.

Selected Publications

- A.U.Krishnan, T.C.Lin and Z.Li, “Human Preferred Augmented Reality Visual Cues for Remote Robot Manipulation Assistance: from Direct to Supervisory Control.”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2023.
- A.U.Krishnan, T.C.Lin and Z.Li, “Design interface mapping for efficient free-form telemanipulation.”, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022.