Achyuthan Unni Krishnan

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Career Objective

Passionate and dedicated engineer looking to contribute in the field of robotics and human-robot interaction.

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++

Experience

Rober 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

Augmented Reality and Haptic Cues for Remote Manipulation Interfaces **Aug 2021– Present**

- Developed a motion mapping control interface for a robot arm (Kinova Gen3) using a Virtual Reality controller.
- Designed and implemented 4 levels of assistive autonomy to support object manipulation and obstacle avoidance.
- Developed a vibro-tactile interface to indicate object and obstacle proximity, successful object grasping and placing.
- Developed Augmented reality interfaces indicating intent of autonomy, environmental obstacles and task success.

Gaze Based Intent Inference and Workload Estimation **Jan 2022– May 2023**

- Implemented a gaze adaptive visual interface for manipulation based on gaze motion detected by a screen-based tracker.
- Identified operator intent using gaze allocation during teleoperation to optimize perception assistance.
- Developed a novel real-time cognitive workload index using gaze motion, gaze allocation and pupil-based stress inference

Projects

Object Localization and Grasping for Robotic Manipulation **Aug 2021– Dec 2021**

- Implemented an object detection and localization system using a Mask-RCNN model for a Realsense RGB-D camera.
- Developed grasp point candidates for 2-finger grippers for household items using Nvidia Graspnet architecture.
- Created a grasp-angle based filter to refine results and eliminate difficult robotic arm-postures.

Reward Engineering for Autonomous Pick and Place Actions **Aug 2019– Dec 2019**

- Engineered autonomous pick and place actions for a robotic 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

- Achyuthan Unni Krishnan, Tsung-Chi Lin and Zhi 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.
- Achyuthan Unni Krishnan, Tsung-Chi Lin, and Zhi Li, "Design interface mapping for efficient free-form telemanipulation.", IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022.