

Ananth Jonnavittula

Contact Information

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Research Interests

My research interests are in the areas of robot learning and human robot interaction

Education

PhD in Mechanical Engineering Virginia Tech, Blacksburg, VA	May 2024 (expected)
Master of Science in Robotics Engineering Worcester Polytechnic Institute (WPI), Worcester, MA	May 2017
Bachelor of Technology in Electronics and Instrumentation Engineering SASTRA University, Tamil Nadu, India	May 2015

Research Experience

Graduate Student Researcher Aug 2020 - Current

Institute: Mechanical Engineering, Virginia Tech

Advisor: Prof. Dylan Losey

- Developed an algorithm to learn from imperfect user demonstrations (inclusive reward learning)
- Simulated Lunar Lander (OpenAI Gym) environment with multiple reinforcement learning algorithms
- Developed a multi-robot swarm simulation to test inclusive reward learning

Graduate Student Researcher 2016

Institute: Robotics Engineering, WPI

Advisor: Prof. Marko Popovic

- Analyzed range of motion and dynamic requirements for a 2 DOF hydro-muscle actuated leg that can carry the weight of an adult human
- Designed a coupling mechanism that locks the leg while maintaining pose in case of serious failure
- Implemented closed-loop control system for leg actuation using four pairs of hydro-muscles
- Developed on-board system operation for hydraulics and coupling mechanism using Arduino microcontrollers
- Established communication between on-board controllers and PC using MATLAB for decision making and trajectory generation

Work Experience

Graduate Research Assistant – Virginia Tech Dec 2020 – Current

- Developing algorithms for human robot interaction

Graduate Teaching Assistant – Virginia Tech Aug 2020 – Dec 2020

- Helped undergraduate students derive the transfer function for a padlock attached to a DC motor
- Conducted experiments related to unlocking a padlock using a connected electric motor
- Clarified questions related to the experiments in the padlock lab

Robotics/Vision Engineer – Parker Hannifin Corporation Jun 2017 – May 2020

Primary responsibilities included feasibility analysis of manufacturing processes for automation, analysis on appropriate robot choice, development of electrical drawings and programming automation equipment in three manufacturing facilities. Secondary responsibilities include development of data collection applications and

maintenance of automation equipment.

- Developed an automated cell using FANUC robot for palletizing over 100 different SKUs
- Developed an automated laser marker with barcode scanning abilities to etch filter casings
- Conducted a feasibility analysis on automated cabinet welding using robots
- Conducted several Kaizen events for process efficiency improvement
- Developed an automated cell using UR5 robot and cameras for part recognition and filter end capping
- Developed a urethane end capping cell using FANUC robots

Engineering Intern – Parker Hannifin Corporation

Jan 2017-May 2017

- Conducted feasibility analysis on automated end capping using collaborative robots
- Programmed controllers for automated part feeding using vibratory feeders
- Implemented image recognition using Keyence CV-X series to detect orientation of parts

Conference Publications

- A. Jonnavittula and D. P. Losey, "Learning to Share Autonomy Across Repeated Interaction", IEEE International Conference on Intelligent Robots and Systems (IROS), 2021
- A. Jonnavittula and D. P. Losey, "I know what you meant: Learning human objectives by (under)estimating their choice set", IEEE International Conference on Robotics and Automation (ICRA), 2021

Patents

US20170368696A1: Biologically inspired joints and systems and methods of use thereof

Selected Projects

Path planning and Semantic segmentation for Self-Driving Cars (Udacity)

- Developed traffic light detection, control and waypoint following for a self-driving car
- Designed Fully Convolutional Networks using a GPU to identify pixels of a road in an image
- Implemented behavior planning for a self-driving car utilizing sensor fusion to localize other moving cars on a highway
- Generated collision free smooth trajectories with lane changing and speed/jerk considerations

Sensor Fusion and Control for Self-Driving Cars (Udacity)

- Implemented controllers using model predictive control to drive a self-driving car around a simulated racetrack using cross track error and 100ms latency
- Developed a 2D particle filter to localize a self-driving car using noisy sensor and control data
- Utilized an Unscented Kalman Filter to estimate the state of a moving object with noisy lidar and radar measurements

Computer Vision and Deep Learning for Self-Driving Cars (Udacity)

- Developed a software pipeline to detect vehicles in a video using Support Vector Machines
- Identified lane boundaries using color, perspective transforms and polynomial curve fitting
- Implemented a Convolutional Neural Network to classify traffic signs from the German Traffic Sign Dataset

Path planning and navigation for UAVs (WPI)

- Implemented Simultaneous Localization and Mapping using ultrasonic sensors for a quadcopter
- Programmed a constant altitude path planner using A star to generate optimal paths with obstacle avoidance
- Designed a ROS based Q-learning Neural Network as a platform agnostic motion planner

Motion Controller for a Fixed Wing UAV (WPI)

- Developed controllers for Trim stabilization, autopilot, and airspeed stabilization for the Aerosonde fixed wing UAV
- Implemented Extended Kalman Filter for sensor fusion using simulated GPS, accelerometers, and gyroscope data

- Programmed a PID controller to follow Dubin's trajectories in a simulated airfield

Technology Summary

- **Software:** MATLAB, ROS, TensorFlow, OpenCV, Arduino IDE, Keyence CV-X series, Click PLC, Studio 5000, FactoryTalk, FANUC TPP, FANUC PalletTool Turbo II, KUKA WorkVisual
- **Languages:** C, C++, python, URScript, KUKA KRL