Ananth Jonnavittula (AJ)

Contact Information

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Education

PhD in Mechanical Engineering   May 2024 (expected)
Virginia Tech, Blacksburg, VA

Master of Science in Robotics Engineering   May 2017
Worcester Polytechnic Institute (WPI), Worcester, MA

Bachelor of Technology in Electronics and Instrumentation Engineering   May 2015
SASTRA University, Tamil Nadu, India

Research Experience

Graduate Student Researcher   Aug 2020 - Current
Institute: Mechanical Engineering, Virginia Tech
Advisor: Prof. Dylan Losey

- Developed inverse reinforcement learning based algorithm to learn from imperfect user demonstrations
- Developed a variational autoencoder based algorithm for imitation learning
- Conducted theoretical analysis and developed an algorithm that influences human decision-making when interacting with robots
- Conducted stability analysis for imitation learning based methods in the context of shared autonomy

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 Teaching Assistant – Virginia Tech   Aug 2020 – Dec 2020

- Taught fundamentals of PID controller design to undergraduates
- 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

- Developed an automated cell for palletizing over 100 different SKUs reducing labor costs by $500,000/yr
- Developed an automated laser marker that doubled throughput in multiple manufacturing cells
- Conducted Kaizen events for process efficiency improvement resulting in savings of over $1 million/yr
- Developed an automated cell using UR5 robot and cameras for part recognition and end capped filters resulting in labor savings of over $150,000/yr
- Developed a urethane end capping cell using FANUC robots resulting in cost savings of over $250,000/yr

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, "Communicating Robot Conventions through Shared Autonomy", Under Review, 2022

- S. Habibian, A. Jonnavittula, and D. P. Losey, "Here's What I've Learned: Asking Questions that Reveal Reward Learning", *Under Review,* 2021

- 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

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