Timothy Dodge

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Education

Utah State University   **Expected May 2025**
Master of Science in Electrical Engineering | Control Systems and Autonomy | GPA: 3.95   *Logan, Utah*

Utah State University   **May 2023**
Bachelor of Science in Mechanical Engineering | Minor: Computer Science | GPA: 3.94   *Logan, Utah*

Experience

Sandia National Laboratories | *Autonomous Sensing and Control Intern*   **May 2024 – Present**
- Led the transition from simulation to real-world application for multi-agent reinforcement learning with quadcopters
- Achieved conversion by integrating the Vicon motion capture system with ROS2 and BitCraze's Crazyflie 2.X platform
- Developed RL models for the pursuer team in pursuer-evader problems in PyTorch, surpassing the ProNav baseline
- Improved evader and pursuer policies through competitive self-play, allowing agents to train against each other effectively
- Integrated an IMU Simulink model into Rate Table simulations, elevating the precision of rate table dynamics analysis
- Co-authored technical reports for fiscal year-end, summarizing key outcomes that contributed to securing additional project funding

Aspire Research Center | *Multi-Agent Control Research Assistant*   **May 2022 – Present**
- Created a Python simulation platform to model building thermal properties using the DOE software package EnergyPlus
- Developed a MPC algorithm to optimally organize Distributed Energy Resources, reducing peak power consumption
- Generated datasets from Python simulation to generate regression model via MatLab's System-Identification Toolbox
- Developing grey-box system identification method that allowed for control and prediction of HVAC system's response
- Optimally coordinated fleets of electric buses by developing optimal charging schedules using the Gurobi library
- Improved hardware compatibility by migrating bus simulation libraries in C++ and Python from ROS 1 to ROS 2
- Collaborated with a multi-disciplinary research team across multiple universities and industry sponsors

Utah State University | *Teaching Assistant*   **Jan 2022 – May 2023**
- Led lab sessions of 30 students focusing on interfacing with sensors including ultrasonic sensors and thermocouples
- Assited students in designing and debugging LabView VIs for interfacing with various sensors and collecting data
- Developed automated grading scripts in Python and Bash that compiled and ran student-submitted C++ code

Projects

Mars Rover Senior Design Project | *C++, C#, SolidWorks, Microcontrollers*
* Designed and implemented inverse kinematic controls for a robotic arm, allowing for efficient real-time operation
* Enhanced micro-controller software, reducing latency by 30% through integrating serial communication with ROS
* Worked with team to design novel 6-axis robotic arm design with worm-gears and linear rail actuation in SolidWorks

Epsilon Point Controller | *Nonlinear Controls, Python, Numpy, ROS2, Gazebo*
* Engineered for a smooth differential drive robot, allowing for motion to track nonlinear and time-varying trajectories
* Optimized controller for the Turtlebot3 platform to respect velocity constraints by applying LQR techniques
* Streamlined control system, achieving convergence to the true trajectory within 2 seconds of receiving a new signal

Power Consumption Forecasting | *PyTorch, Pandas, Neural Networks*
* Preprocessed a smart meter dataset of 5,000 homes to create optimal input for neural networks with the Pandas library
* Designed a deep residual network to serve as a baseline for comparison against other neural network models
* Developed a CONV-LSTM model that outperformed the baseline XGBoost model while reducing training time by 90%

UAV RRT* Path Planner | *ROS2, Python, Controls*
* Developed a Python UAV simulator with frame transformations and accurate force simulations for performance analysis
* Implemented the RRT* algorithm to enhance the UAV's 2-D pathfinding capabilities over the standard RRT algorithm
* Conducted extensive testing to validate the planner's efficiency and reliability across various scenarios

Relevant Coursework

- Linear Multi-Variable Control
- Convex Optimization
- Deep Neural Networks
- UAV Control Systems
- Robust Control
- Robotic Intelligence
- Nonlinear Control
- Distributed Control
- Embedded System Programming

Technical Skills and Certifications

Certifications : Engineer in Training (EIT), Reinforcement Learning Specialization (University of Alberta)
Languages: Python, C++, Matlab, Simulik, C, ARM-Assembly, Java
Technologies/Frameworks: Linux, ROS/ROS2, Git, Pytorch, Numpy, Pandas, Gurobi, Eigen, Boost, SolidWorks, Docker