Barzin Moridian, M.Sc.

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Experience

Since 2012 Nonlinear and Autonomous Systems Lab, Michigan Tech, Houghton, MI
Research Engineer

- Developed multi-robot system capable of establishing small electrical power grids collaboratively in unknown environments. Developed the software for ROS on Linux that administers mission planning, communication, path planning, and actuation control. Assembled the hardware using a combination of off-the-shelf and in-house designed/modified components. Developed Bash/Tcl scripts to automate deployment, mission tests, package synchronization, and post-processing logged data.
- Developed agile collision avoidance control software for mobile robots. The result enabled robots to avoid head-on and side collision with dynamic objects in unknown and cluttered environments.
- Established communication networking system over TCP/IP and designed messaging protocol to enable communication between any number of robots. The network is also used for sending position information to robots in a small footprint layout for real-time localization.
- Achieved %25 improvement on lateral error and %30 on trajectory traversing time in ground robot navigation by adding fuzzy logic and velocity control to the control architecture.
- Developed flight management system in ROS for aerial robots that automatically controls the take-off, trajectory following, target following, and landing. Accomplished by adding an embedded Linux system on the vehicle and communicating with onboard systems through serial communication. The software is multithreaded to simultaneously perform communication with onboard devices, communication with ground system network, target tracking, generating control commands, and monitor mission health. Developed Bash/Tcl scripts to automate deployment, mission tests, package synchronization, and post-processing mission logged data.
- Developed automatic mission designer software to generate energy efficient trajectories for multiple aerial robots collaborating on a mission with automated energy-cycling. The software uses object oriented paradigm and can be effortlessly modified to support different numbers/types/combination of robots.
- Performed system engineering for repurposing a tracked vehicle into a robot using off-the-shelf components. Established communication between sensors, actuators, and embedded systems.
- Designed and prototyped mechanical and electrical components for supporting mechanisms, sensors, electronics, and electrical power transfer on robots.
- Mentored 11 volunteers and special topic students.

Fall 2013 Dynamic Systems and Controls Lab, Michigan Tech
Instructor

Spring 2013 Manufacturing Precision and Metrology Lab, Michigan Tech
Instructor

2012 - 2013 Energy Mechatronics Laboratory, Michigan Tech
Controls Graduate Researcher

- In collaboration with UC Berkeley (Dr. Sangiovanni-Vincentelli) developed real-time state/parameter estimation algorithm for use in adaptive control systems. The resulting publication was best student paper award finalist.

Summer 2011 Zav Co., Tehran, Iran
Controls Engineering Intern

Self Learning

- Deep Learning by Google at Udacity
- Reinforcement Learning lecture videos by David Silver (Google DeepMind)
- Deep Reinforcement Learning lecture videos by John Schulman (Berkeley University)
- Reinforcement Learning by Michael Littman and Charles Isbell at Udacity
- Convolutional Neural Networks for Visual Recognition lecture videos by Andrej Karpathy (Stanford University)
- Machine Learning by Andrew Ng. at Coursera

Personal Projects

2016 - Now	• Deep reinforcement learning experimentation with a ground wheeled robot to train a curiosity driven policy (in progress).
2016 - Now	• Applied Double/Dueling Deep Q-Network and Actor-Critic Policy Gradient Optimization to OpenAI environments. Currently working on applying A3C method.
2016	• Developed a software tool that keeps track of dynamic IP of any number of remote Linux systems to enable remote SSH login over internet without need for static IP.
2015 - 2016	• Prototyped gasoline powered flying vehicle with a heavy aluminum frame that is estimated to be able to lift an extra 70~100 lbs load (constrained tested).
2015	• Performed design and data-driven tuning of smart cruise control system for improvement of energy efficiency in commercial electric vehicles using distance information (simulation).

Publication

1. B. Moridian, N. Mahmoudian, W. W. Weaver, R. D. Robinett, "Post-Disaster Electric Power Recovery Using Autonomous Vehicles", In Transaction on Automation Science and Engineering Special Issue on Safety, Security, and Rescue Robotics. IEEE, 2017. (Accepted)
2. B. Moridian, N. Mahmoudian, W. W. Weaver, and R. D. Robinett, "Design of mobile microgrids hierarchy for power distribution," in ASME 2015 Dynamic Systems and Control Conference. American Society of Mechanical Engineers, 2015
3. B. Moridian, N. Mahmoudian, W. W. Weaver, and R. D. Robinett, "Robotic power distribution system for post-disaster operations," in International Symposium on Safety, Security, and Rescue Robotics. IEEE, 2015
4. B. Moridian, D. Bennett, N. Mahmoudian, W. Weaver, and R. D. Robinett, "Autonomous power distribution system," in International Federation of Automatic Control. World Congress (19th). International Federation of Automatic Control, 2014.
5. M. Maasoumy, B. Moridian, M. Razmara, M. Shahbakhti, and A. Sangiovanni-Vincentelli. "Online simultaneous state estimation and parameter adaptation for building predictive control." In ASME 2013 Dynamic Systems and Control Conference. American Society of Mechanical Engineers, 2013.
6. E. M. Ficanha, M. Rastgaar, B. Moridian, and N. Mahmoudian. "Ankle Angles during Step Turn and Straight Walk: implications for the design of a steerable ankle-foot Prosthetic Robot." In ASME 2013 Dynamic Systems and Control Conference. American Society of Mechanical Engineers, 2013.

Software Skills

Languages: Python (expert), C++, Matlab, Bash, Tcl/Expect, Labview
Libraries: TensorFlow, ROS, OpenCV
Low level: Networking, UDP and TCP/IP, Serial Communication

Education

2014 **M.Sc. Mechanical Engineering**
Michigan Technological University, Houghton, MI

2012 **B.Sc. Aerospace Engineering**
Tehran Polytechnic (Amir Kabir), Tehran, Iran

Professional Service

- Reviewer of IEEE Transaction on Automation Science and Engineering, IEEE Transactions on Control of Network Systems, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), IEEE International Conference on Robotics and Automation (ICRA).
- **2016** Team Mentor in NSF Innovation Corps Site program.
- **2016** Judge in Michigan Tech's Design Expo 2016.
- **2015** Session Chair of Multiagent Network Systems session in ASME 2015 Dynamic Systems and Controls Conference (DSCC 2015).

Award and Certificate

- **2015** Innovation Corps (I-Corps) site program certificate from National Science Foundation and Michigan Technological University.
- **2013** Best Student Paper Award Finalist in ASME 2013 Dynamic Systems and Control Conference.
- **2013** Certified LabVIEW Associate Developer (CLAD).