Jariullah Safi

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Skills

C++/C#/Python/JS	Robot Operating System	LiDAR Processing	GraphSLAM
3D Visualization	Linux/Git	Particle Filtering	Systems Modeling
GUI Design	Blender/Gazebo/rviz	Real-time Control	Kalman Filtering

Work and Research Experience / Projects

MathWorks
Intern - Robotics Software Engineer for the Robotics System Toolbox, fall 2016, Supervisor: Remo Pillat
- Expanding the Robotics System Toolbox's repertoire of supported hardware and software.

Simbe Robotics
Intern – Perception and Engineering, summer 2016, Supervisor: Mirza Shah
- Integrated myself in a highly motivated and fast moving team in a way to maximize my impact.
- Filtered noisy pointclouds from an Intel Realsense depth camera in realtime with low CPU usage.
- Created path planning and maneuvering routines for docking of a mobile robot.
- Evaluated vision systems, wrote camera interfaces. and developed autofocus codes.

Penn State University – Intelligent Vehicles and Systems Group
Graduate Research Assistant, spring 2015 – spring 2016, Advisor: Dr. Sean Brennan

Algorithm Development for the ClearPath Husky Robot, VOLVO ROAR Project
- Developed an approach to detect the pose of a trash-can using multiple augmented reality markers.
- Created an immersive VR teleoperation environment fusing information from multiple sensors.
- Implemented an extended Kalman filter that uses GPS information to learn an instantaneous center of rotation based model of skid steer robots and extended it to work indoors using SLAM.

Map and Environment Generation from Dense Point Clouds, VOLVO ROAR Project
- Developed an interactive region growing segmentation program using Point Cloud Library (PCL) and OpenSceneGraph (OSG) to extract smooth surfaces from dense FARO scans.
- Created a program for automatically generating simple meshes complete with a UV map and texture derived from the colorized point cloud for use in visualization and simulation.

Interface for Monitoring and Supervisory Control of an Autonomous Robot, VOLVO ROAR Project
- Designed a web-app user interface using Blend4Web and roslibjs with the mesh created from the scans.

Velodyne LiDAR Scan Registration, Pose Estimation, and Calibration
- Registered scans from the HDL-32E sensor and Estimated its pose from the registered scans.
- Implemented an unsupervised optimization to discover LiDAR pose in reference to the GPS/IMU

ROS – Simulink Realtime Integration for Vehicle and Robotics Research, GATE Program
- Developed a way to interface high speed realtime controllers with ROS over UDP.

ROS – Oculus Rift DK2 Integration
- Wrote a ROS node for reading head tracking data using OpenHMD and Python-Rift.
- Connected it to a WebGL app to create an immersive VR experience in Google Chrome.

ROS – Arduino Integration for Robotics Education Platform, Independent study in spring 2014
- Developed a Robot Operating System (ROS) based interface for Sparkfun's RedBot for education.
- Wirelessly controlled it using an Xbox 360 gamepad, closed the loop on wheel encoders.

Microsoft – Applications and Services Group
Dev Intern at Bing, June 2015 to August 2015, Manager: Shital Shah, Mentor: Chao Gao

Internal Tool Development and Search Improvement Research
- Developed an internal graphical tool to visualize the Bing entity resolution pipeline.
- Investigated overmatched entities and large clusters in order to improve entity resolution accuracy.

Penn State University – Control Optimization Lab
Graduate Research Assistant, Jan 2013 - fall 2014, Advisors: Drs. Hosam Fathy and Sean Brennan

Battery Pack Estimation Research, funded by ARPA-E under the AMPED project.
- Researched state and parameter estimation for lithium-ion cells using equivalent-circuit models.
- Developed a collective state of charge estimator for cells connected in series that improved accuracy by an order of magnitude compared to the academic standard (publication 1).
- Formulated a capacity estimator for cells connected in series that was more robust to current sensor noise than conventional methods (publication 2).
- Verified results in simulation using Monte Carlo methods.
- This work led to my master thesis (publication 5).

Idaho State University – Department of Mechanical Engineering
Undergraduate Research Assistant, Oct 2010 – Aug 2012, Advisor: Dr. Brian Williams

Studies of Deteriorated Heat Transfer in Prismatic Nuclear Reactor Cores, funded by NEUP
- Determined flow geometries for a flow loop test section that could approximate gas flow and heat transfer inside a high temperature prismatic nuclear reactor.
- Designed and constructed an inexpensive particle image velocimeter.
- Senior Design Project: Led a three person team in designing the test section geometry, actuation, and heater placement as well as a supporting structure.

Undergraduate Research Assistant, Feb 2008 – Apr 2010, Advisor: Dr. Alba Perez
Smart Prosthetic Hand Technology Phase 1
- Studied kinematics of the human hand using high speed video.
- Designed, built, and tested a two finger (index and thumb) prototype.
- Co-wrote a grant proposal to the Undergraduate Research Committee (awarded for 2008-2009).

Pennsylvania State University – Toshiba Westinghouse Fellowship Program
Undergraduate Fellow, summer 2010, Advisor: Dr. Kostadin Ivanov

Nuclear Fuel Loading Patterns Research, funded by Toshiba-Westinghouse
- Maximized power output of the VVER 1000 reactor by optimizing fuel cycle patterns in simulation.
- Programmed scripts to streamline the otherwise manual and unwieldy process of simulation setup.

Personal Projects

GPU Based Particle Filtering in Matlab for Localization, Class project in spring 2013
- Developed particle filters for range based localization of a vehicle to run on GPU 2.5x faster than CPU.

Illumivote, AngelHack Seattle 2015
- Designed a Django backend for AngelHack Seattle 2015 **winner** Illumivote.
- Served in a managerial capacity for the team, setting goals and keeping things on track.

Egg Painting Machine, Class project in spring 2012
- Programmed an Arduino microcontroller to control an egg printing machine.
- Developed a Python based interface for the machine which made it work like a USB printer.

Top-Down Shooter Video Games, Personal projects in 2010 and 2011
- Created an engine for a top down shooter in C++ following object oriented programming principles.
- Recreated and expanded above game in Java, tested on mobile phones.

Box.com Client, Personal project in 2013
- Developed a client in Python to sync local folders with Box.com for use in Linux.

Cooperative Control of Tethered UAVs, Class project in spring 2013
- Constructed a 2D model for a twin rotorcraft assisting a damaged twin rotorcraft in flight.
- Developed an LQG controller for the system and tested it in simulation (publication 4).

Publications

1. **J. Safi**, M. Beeney, M. Kehs, J. Anstrom, S. Brennan, H. K. Fathy, "Improving SOC Estimation Accuracy Using Collective Information for Lithium Ion Battery Cells in Series" (**Invited paper**, ACC 2014)
2. **J. Safi**, J. Anstrom, S. Brennan, H. K. Fathy, "Differential Diagnostics for Lithium Ion Battery Cells Connected in Series" (ASME DSCC 2014)
3. M. Ghanaatpishe, AA. Mamun, **J. Safi**, "Analytical Study of Health Conscious Charging in Li-Ion Batteries Using the Pontryagin Minimum Principle" (ECS 2014 Fall Meeting)
4. **J. Safi**, N. Goel, V. Pesce, J. Liu, "Quadrotor UAV Assisted Flight Control" (Penn State CERS 2014, winner of **best paper in session**)
5. **J. Safi**, "On State of Charge Estimation Accuracy for Battery Cells Connected in Series" (Penn State Master Thesis)
6. C. Miller, K. Wolkowicz, **J. Safi**, S. Brennan, "State of Charge Estimation for an Electric Wheelchair using a Fuel Gauge Model" (ASME DSCC 2016)

Awards and Activities

- Member of AngelHack Seattle 2015 winning team, Illumivote.
- Idaho State University (ISU) Outstanding Student Achievement Award, class of 2012.
- ISU College of Science and Engineering Dean's List, fall 2007 – spring 2012.
- Essay contest winner at Idaho State University, fall 2007.
- Member and president of the Tau Beta Pi engineering honor society (Idaho Beta chapter).
- Volunteer for high school student outreach programs as a member/officer of American Society of Mechanical Engineers, Society of Physics Students, American Nuclear Society, and Tau Beta Pi.

Education

Master of Science – Mechanical Engineering
Penn State University, Aug 2012 – May 2015 GPA: 3.94/4.00

Bachelors of Science – Mechanical and Nuclear Engineering
Idaho State University. Aug 2007 – May 2012. GPA: 3.99/4.00

Coursework

Linear Control	Estimation Theory	Computer Vision	Mechatronics
Optimal Control	Probability/Statistics	Machine Learning	Hardware in the Loop
Robust Control	Nonlinear Systems	System Dynamics	Classical Mechanics