Joe Dinius, PhD

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Summary Statement

I am an experienced robotics engineer seeking opportunities for both personal and professional growth. I am a fast learner, a motivating force, and have led technical efforts in sensing and estimation, path planning, localization, and computer vision. On the technical side, I enjoy solving new problems creatively and timely. On the leadership side, I focus on regular interpersonal communication, making expectations plainly known, and on identifying and providing any support necessary for optimizing team output. In everything I do, I strive to communicate clearly, candidly, and respectfully.

Professional Experience

UBTECH Robotics North American R&D Center — Los Angeles, CA
Senior Research Engineer – Navigation & Control — April 2019 – Present

- Responsibilities include: software team recruiting, system requirements development, and navigation team oversight
- Developing SLAM algorithms for operation in dynamic environments
- Oversee ongoing software development efforts for initial prototype

inVia Robotics — Westlake Village, CA
Staff Research Scientist – Perception & Controls — December 2017 – April 2019

- Responsible for development of control, navigation, and localization algorithms for wheeled mobile robots deployed in a warehouse automation application
  - Increased coarse navigation speed 2.5x in 2 months with a novel method
  - Increased navigation accuracy on precision maneuvers by over 2x while simultaneously increasing speed by 2x
- Organized ongoing efforts for personal and professional growth of team members: book club, game nights, and technical journal club
- Other responsibilities included: cycle-time reduction, build management (CI and configuration control), system identification and test, and obstacle avoidance.

Walt Disney Imagineering R & D — Glendale, CA
Senior R & D Imagineer – Contract Position — July 2017 – October 2017

- Responsible for developing scene segmentation and state estimation algorithms for multiple object tracking using 2D laser rangefinders

Ford Motor Company — Dearborn, MI
Senior Research Engineer — December 2015 – June 2017

- Responsible for conceptualizing and interpreting advanced algorithms for multiple object tracking for the Next Generation Vehicle (NGV), including state estimation, data fusion, and data association

Raytheon Missile Systems — Tucson, AZ
Senior Systems Engineer II — June 2006 – December 2015

- Led teams in simulation, control, and signal/image processing disciplines
- Directed analyses of flight test failure, operational safety, requirements development, and system performance
- Designed and developed simulation architectures for new product development efforts (DARPA/MDA/etc)
- Developed guidance, navigation, and control (GNC) algorithms in simulation, Computer-in-the-Loop (CiL) and Hardware-in-the-Loop (HiL) environments

Sample Projects

Traffic Sign Recognition using fastai — July 2019

- Built an end-to-end pipeline for performing classification on the German Traffic Sign Recognition Benchmark dataset
- Used modern techniques – including use of a residual network (ResNet34) as the back-bone architecture and learning rate annealing
- Achieved SOTA accuracy on a holdout set – 99.95% vs. competition winning 99.46% of a few years ago
- Project Writeup, Github. Technologies Used: Python, PyTorch, fastai, docker

Pose Error Compensation Using Imprecise Visual Landmarks March 2019

- Created and integrated a simple SLAM-inspired algorithm to increase precision navigation terminal accuracy 5x. The net effect was a 3-4x decrease in inventory drops.
- Visual landmarks imprecisely placed on stationary warehouse objects were used to create stable, robot-centric map markers for estimating accumulated robot localization error.
- Technologies Used: Python, OpenCV / AprilTags, Redis

Extended Object Tracking April 2018

- Developed a performant representation of a cutting-edge algorithm for extended object tracking using elliptical primitive shapes
- Built a simulation and multi-threaded infrastructure layer for testing the algorithm in a representative environment
- Project Writeup, Github. Technologies Used: C++, JUCE

Skills

OS : Windows, OS X, Ubuntu
Languages: C++ (post 11), Python (2 & 3), Fortran (77 & 90/95)
Software : Eigen, Armadillo, Scikit-image, Scikit-learn, Tensorflow, Keras, OpenCV, Matlab/Simulink, git, gdb(pdb), cmake, numpy, scipy, pandas, LaTeX, Boost, IPOPT, ROS, fastai, PyTorch, docker
Other : Kalman filtering, particle filtering, SLAM, computer vision, signal processing, optimization, machine learning (including deep learning), state-space control design, optimal control, design-of-experiments (DoE), data exploration & visualization

Selected Publications & Patents

- Sakai, A., D. Ingram, **J. Dinius**, K. Chawla, A. Raffin, A. Paques. PythonRobotics: a Python code collection of robotics algorithms. *arXiv e-print: submitted 31 Aug, 2018*. Available: `https://arxiv.org/abs/1808.10703`
- **Dinius, J.W.**, B.K. Pennington. Spatiotemporal Controller for Controlling Robot Operation. *U.S. Nonprovisional Pat. Ser. No. 16/044,344*, filed 24 July, 2018
- **Dinius, J.**, R. Furfaro, F. Topputo, and S. Selnick. Near Optimal Feedback Guidance Design and the Planar Restricted Three-Body Problem. In: *Proceedings of the AAS 24th Spaceflight Mechanics Meeting*, January 26–30, 2014.
- **Dinius, J.**, Adv. J. Lega. Dynamical Properties of a Generalized Collision Rule for Multi-Particle Systems. *Doctoral Dissertation*. Available: `http://arizona.openrepository.com/arizona/handle/10150/315858`.

Education

University of Arizona, MS/PhD Applied Mathematics

- Raytheon Advanced Scholar's Fellowship

Northern Arizona University, BS Mathematics and Physics

- University Honors Program
- Dean's List

Related Activities

Open-Source Projects

Contributor 2017 – Present

I regularly contribute to open-source projects, some of which include

- PythonRobotics
- Open Source Self Driving Car Initiative (OSSDC)

Check out my GitHub for more details.