QI YAN

Intended PhD program: robotic perception and planning

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EDUCATION

Swiss Federal Institute of Technology, Lausanne (EPFL) Sep. 2019 - Present
MSc in Mechanical Engineering, focusing on perception, planning and control for robotics
Core courses: *Artificial Neural Network* *Deep Learning for Autonomous Vehicles*
Computer Vision *Image Analysis and Pattern Recognition*

Shanghai Jiao Tong University (SJTU), China Sep. 2015 - June 2019
B.E. in Nuclear Engineering, School of Mechanical Engineering (Honors Degree)
GPA: **3.76/4.0** (88.45/100), Ranking: **2/33**

PUBLICATIONS & SUBMISSIONS

Y. Liu, **Q. Yan**, A. Alahi. "Social NCE: Contrastive Learning of Socially-aware Motion Representations", **under review**, short version accepted by *NeurIPS 2020 Workshop on Self-Supervised Learning*, 2020. [arXiv] [code]

Q. Yan, L. Jiang and S. S. Kia, "Measurement Scheduling for Cooperative Localization in Resource-Constrained Conditions," in *IEEE Robotics and Automation Letters*, vol. 5, no. 2, April 2020 (also selected for ICRA'20 conference presentation). [arXiv] [code] [video]

Q. Yan, R. Li, and X. Meng. "Tribo-Dynamic Simulation and Motion Control of a Rotating Manipulator Based on the Load and Temperature Dependent Friction", *Journal of Engineering Tribology*, September 2020. [paper] [code]

RESEARCH EXPERIENCES

Contrastive Learning for Socially-aware Robot Navigation
Project student, EPFL, Switzerland July. 2020 - Present
Advisor: *Prof. Alexandre Alahi*, Lab of Visual Intelligence for Transportation, EPFL

- Aimed to address the distributional shift between training and testing domains, a key challenge for attaining a robust DRL navigation policy in multi-agent social scenarios.
- Employed contrastive learning to formulate an auxiliary task to learn socially-aware motion representations, and used prior knowledge on unfavorable events to create negative samples.
- The proposed method, simple yet effective, significantly boosts off-policy RL sample efficiency and offline RL performance for the state-of-the-art Rainbow DQN agent.

Visual Absolute Localization in a priori Known Environments
Project student, EPFL, Switzerland Feb. 2020 - Present
Advisor: *Dr. Iordan Doytchinov*, Laboratory of Geodetic Engineering, EPFL

- Intended to develop a vision-only 6D pose estimation scheme for flying systems w/o GNSS signals, in large a priori known environments with available aerial photogrammetry data.
- Adopted Cesium Ion to synthesize point cloud and RGB data from the terrain LiDAR model and the satellite orthophotos. Also collected real-world equivalent images.
- Employed implicit differentiation to backpropagate PnP solver in the 2D-3D matching localization approach, which enables fast uncertainty propagation for the 6D pose.
- Utilized supervised contrastive learning to enhance 3D coordinate regression network. Proposed pipeline achieves an accuracy of $\sim$10 m and $\sim$5 deg, comparable to GNSS solution.

Droplet Size Estimation Using Deep Learning Method
Undergraduate thesis, Shanghai Jiao Tong University, China Mar. 2019 - June 2019
Advisor: *Prof. Xiang Chai*, School of Mechanical Engineering, Shanghai Jiao Tong University

· Employed U-Net for semantic segmentation on droplet images from high-speed camera and obtained a size estimation of ∼10% uncertainty, comparable to manual work results.

Cost-effective Cooperative Localization Algorithm Design
Research student, UC Irvine, USA Jul. 2018 - Sep. 2019
Advisor: *Prof. Solmaz S. Kia*, Dept. of Mechanical and Aerospace Engineering, UC Irvine

· Investigated into optimization strategy to reduce cost for multi-robot cooperative localization (CL) algorithms in terms of communication and computation overhead.
· Proposed a sub-optimal communication free algorithm for the NP-hard multi-robot measurement selection problem, by minimizing the upper bound of a posterior uncertainty.
· Compared against the state-of-the-art method with similar performance, it works much faster due to the greedy approximation design and can be implemented in real-time.
· Relaxed further the full-observability requirement to make it practical for CL systems with pure relative measurements. Paper accepted by *IEEE RA-L* (also presented at ICRA'20).

Friction Dynamics Analysis and Control of Manipulator
Research student, Shanghai Jiao Tong University, China Dec. 2017 - Dec. 2018
Advisor: *Prof. Xianghui Meng*, School of Mechanical Engineering, Shanghai Jiao Tong University

· Carried out tribo-dynamic modeling of a single manipulator joint considering the effects of motor load and temperature on joint friction, which were dismissed in previous studies.
· Proposed a new adaptive fast non-singular terminal sliding mode (AFNTSM) controller to compensate for the varying joint friction, which does not require prior knowledge of system uncertainties and disturbances. Paper accepted by *Journal of Engineering Tribology*.

SKILLS

Programming proficient: Python, MATLAB; intermediate: C/C++, Java

Technical Tools PyTorch, Git, Linux, LaTeX, Solidworks, Microsoft Office
Microcontrollers: Intel MSC-51 (8051), STM32; 3D-printing

Languages Chinese: native; English: TOEFL-109(S24), GRE-322(V154,Q168,AW3.0)

HONORS & AWARDS

Outstanding Graduate of Shanghai Jiao Tong University 2019
Excellent Design Award for Undergraduate Thesis (12 out of 133) 2019
Scholarship of Nuclear Power Institute of China (2 out of 33) 2017, 2018
Scholarship of Shanghai Nuclear R&D Institute (2 out of 33) 2016

OTHERS

Reviewer: IEEE Sensors Letters, 2020.