Tianyu Qiu

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Education

University of Texas at Austin *Austin, TX, USA*
Ph.D. Student in Aerospace Engineering 2023.09 – Present

Shanghai Jiao Tong University *Shanghai, China*
Master of Engineering in Automation 2023.03

Shanghai Jiao Tong University *Shanghai, China*
Bachelor of Engineering 2020.08
Major: Electrical & Computer Engineering Minor: Data Science

Research Interests

Navigation & Motion Planning of Robots, Game Theory, Reinforcement Learning & Optimal Control

Publications

Inferring Occluded Agent Behavior in Dynamic Games with Noise-Corrupted Observations [Link]
Authors: **Tianyu Qiu**, *David Fridovich-Keil*
ArXiv Preprint (ICRA 2024 Submission)

Pedestrian Trajectory Prediction and Mobile Robot Navigation Based on Dynamic Games
Author: **Tianyu Qiu**, Advisor: *Prof. Han Zhang, Prof. Jingchuan Wang*
Master Thesis

Nash Pursuit Strategy for Nonzero-sum MPC Game via Inverse Optimal Control [Link]
Authors: **Tianyu Qiu**, *Han Zhang, Jingchuan Wang*
13th Asian Control Conference (2022)

Research Experience

CLeAR Lab, University of Texas Austin *Austin, TX, USA*
Research Assitant, Advisor: *Prof. David Fridovich-Keil* 2021.12 – Present

Adversarial Attack on Deep Learned Visual Odometry 2023.08 – Present
Collaborators: *Randy Chen, Negar Mehr, David Fridovich-Keil*

Reinforcement Learning with Dense Demonstrations 2023.08 – Present
Collaborators: *Tyler Westenbroek, Po-han Li, Cevahir Koprulu, Ruihan Zhao, David Fridovich-Keil*

Inferring Occluded Agent Behavior in Dynamic Games with Noise-Corrupted Observations 2021.12 – 2023.09
Collaborator: *David Fridovich-Keil*

- Proposed a dynamic game model to describe agents' behavior during interactions, further applied inverse dynamic game technique to recover the game model and estimate agents' trajectory simultaneously.
- Conducted Monte Carlo studies in simulated scenarios to evaluate the robustness and accuracy of our technique.
- Authored and submitted the manuscript to ICRA 2024.

Autonomous Robot Lab, Shanghai Jiao Tong University *Shanghai, China*
Research Assitant, Advisor: *Prof. Jingchuan Wang* 2020.09 – 2023.03

Game-theoretic Optimal Collision Avoidance for Mobile Robots 2022.03 – 2023.03
Collaborators: *Guanfeng Yu, Ting Zhang, Han Zhang, Jingchuan Wang*

- Proposed a collision avoidance algorithm in social environments based on a forward dynamic game.
- Applied cost function linearization and feedback linearization to solve for optimal control inputs for differential drive robots analytically.
- Implemented the collision avoidance algorithm in ROS and tested the algorithm on real robot platforms.

Pedestrian Trajectory Prediction based on Inverse LQ Game 2021.04 – 2023.03

Collaborators: *Guanfeng Yu, Ting Zhang, Han Zhang, Jingchuan Wang*

- Proposed a trajectory prediction model to depict pedestrian social behaviors based on an inverse dynamic game.
- Collected and labeled a bird-eye view pedestrian trajectory dataset with VICON to train the prediction model.
- Implemented the training of the prediction model via inverse dynamic game techniques with YALMIP.

Nash Pursuit Strategy for Pursuit-Evasion Games 2021.10 – 2022.05

Collaborators: *Han Zhang, Jingchuan Wang*

- Proposed a decoupled pursuit & evasion game model based on model predictive control and solved for the Nash pursuit strategy with YALMIP.
- Implemented the inference of weighting parameters in the game model via inverse optimal control techniques.
- Presented orally the work "Nash Pursuit Strategy for Nonzero-sum MPC Game via Inverse Optimal Control" at the 13th Asian Control Conference (ASCC 2022).

Institute of Mechatronics & Logistics Equipment, Shanghai Jiao Tong University *Shanghai, China*

Research Assitant, Advisor: *Prof. Liang Gong* 2019.03 – 2019.09

Dynamic Vision-based Intelligent Patrolling Snooker Robot 2019.03 – 2019.09

Collaborators: *Heng Liu, Yuxuan Han, Zhengfan Zhang, Gengjie Lin, Siyue Yao, Jiangtong Qi, Liang Gong*

- Set up an Arduino-controlled cradle to rotate the camera on the snooker robot for object detection.
- Implemented a pneumatic snooker cue with an Arduino-controlled valve for hitting the cue on the robot.
- Implemented a customized Bluetooth control program for complete control of the motion of the robot with a PS2 joystick.
- Served as the main controller of the whole robot, participated in the 1st JAKA Robot Snooker Cup, and won 3rd place (as the only undergraduate team).

Project Experience

Healthcare Telepresence Robot for the Elderly 2019.09 – 2019.12

Bachelor Capstone Design, Advisor: *Prof. Pradeep Ray, Prof. Yunlong Guo*

Collaborators: *Chongdan Pan, Niyiqiu Liu, Ruixing Zhou, Fernando Boaro*

- Designed the circuit structure and connected all motors and sensors on a Raspberry Pi board for the robot prototype.
- Wrote several Python scripts and used a webpage to control the motion and function of the robot remotely.
- Designed the chassis structure and medicine dispenser of the robot with SolidWorks and 3D-printed the structure.
- Built the robot prototype enabling telepresence talking and medicine dispensation services and demonstrated the prototype at the Design Expo.

Professional Experience

Advanced Intelligent Maintenance Systems (AIMS) *Hangzhou, Zhejiang Province, China*

Hardware Engineer Intern 2019.12 – 2020.04

Teaching Experience

University of Texas at Austin *Austin, TX, USA*

Teaching Assistant

Scientific Computation (undergraduate-level) 2023 Fall

Shanghai Jiao Tong University *Shanghai, China*

Teaching Assistant

Scientific Writing, Integrity and Ethics (graduate-level) 2021 Fall

Science and Technology Innovation (Part 4-E) (undergraduate-level) 2021 Spring

Discrete Maths (undergraduate-level) 2020 Summer, 2019 Summer

Intro to Engineering (undergraduate-level) 2019 Fall, 2018 Fall

San He Junior High School *Sanhe, Yunnan Province, China*

Voluntary Teacher

8th Grade Geography 2018 Winter