HUANG HEJUN

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EDUCATION

Master of Science | ***Mechanical and Automation Engineering*** Aug. 2019 – Nov. 2020
The Chinese University of Hong Kong Hong Kong

Bachelor of Engineering | ***Mechatronic Engineering*** Aug. 2015 – Jun. 2019
North China Electric Power University Hebei, China

RESEARCH INTEREST

- Sum-of-squares program (SOSP)
- Control Lyapunov barrier function
- Region of attraction (ROA)
- Gaussian Processes (GP)
- Reinforcement Learning (RL)
- Safe Learning

PROFESSIONAL EXPERIENCE

Research Assistant Sept. 2021 – Feb. 2022
with Dr. Han Dongkun at The Chinese University of Hong Kong Hong Kong

- Working in local GP to enhance computation efficiency over region of attraction estimation
- Developing a theoretical framework to guarantee safety of RL processes via SOSP controller

Junior Research Assistant Sept. 2020 – Sept. 2021
with Dr. Han Dongkun at The Chinese University of Hong Kong Hong Kong

- Clustered and clipped teaching experience from 10 exemplary teachers into 20 micro-modules for junior teaching staff and assistants
- Constructed and operated 2 websites to demonstrate these teaching and learning materials
- Proposed a tractable method to generate a barrier certified ROA with probability bounds in partially unknown autonomous systems and submitted a manuscript to 2022 Chinese Control and Decision Conference

Intellectual Property Department Intern Mar. 2019 – Jul 2019
Daimler Greater China Investment Co., Inc Beijing, China

- Updated the company's internal intellectual property database in the CN region through patent searches
- Assisted Daimler AG colleague to finish Freedom to Operate reports of fuel cells and batteries of CN market

PUBLICATION

On Estimating the Probabilistic Region of Attraction for Partially Unknown Nonlinear Systems: An Sum-of-Squares Approach | *Hejun Huang, Dongkun Han*
Under review of 2022 Chinese Control and Decision Conference

Estimating the region of attraction for partially unknown nonlinear systems is a challenging issue. In this paper, we propose a tractable method to generate an estimated region of attraction with probability bounds, by searching an optimal polynomial barrier function. Chebyshev interpolants, Gaussian processes and sum-of-squares programmings are used in this paper. To approximate the unknown non-polynomial dynamics, a polynomial mean function of Gaussian processes model is computed to represent the exact dynamics based on the Chebyshev interpolants. Furthermore, probabilistic conditions are given such that all the estimates are located in certain probability bounds. Numerical examples are provided to demonstrate the effectiveness of the proposed method.

Teaching Experience

Summer Research Project (11 Weeks Program) | $\times 2$ 2020, 2021
Teaching assistant at The Chinese University of Hong Kong Hong Kong

- Guided students to learn and compare the performance of different single agent RL algorithms
- Guided students to employ RL algorithms in a path programming simulation via Carla simulator
- Guided students to parameterize control barrier functions by SOSPs to shape and enlarge the ROA

Projects

E-Learning Platform for Junior Teaching Staffs in the Faculty of Engineering Sept. 2020 – Sept. 2021
Second contributor $(2/6)$ of this project

- Categorized and documented different pedagogical approaches in engineering education into a group of micro-modules, like flipped classroom, teaching activities design, and online teaching.

Reinforcement learning of the autopilot simulation Feb. 2020 – Jun. 2020
First contributor $(1/1)$ of this M. Sc Project

- Implemented DDPG and MADDPG algorithms for single and multiple cars of a 2D virtual highway simulation environment, respectively, to validate the efficiency of obstacles avoidance

Rehabilitation Exercise Assistant Robot for Patients with Cerebral Palsy Oct. 2017 - Jun. 2018
First contributor $(1/3)$ of National Mechanical Product Digital Design Competition

- Completed the robot chassis, cable-driven manipulator design and modeling, stress analysis of key joints transmission and 3D animation. Have a preliminary understanding of robotic products.

ReadyGo Maker: Self-service Hot Dog Making Machine Oct. 2016 – Jun. 2017
First contributor $(1/3)$ of National Mechanical Product Digital Design Competition

- Inspired by the Automated Parking System, we proposed a method based on space mechanical fixtures for automatic assembly of hot dogs. 3D modeling and 3D animation were also completed simultaneously.

Honors and Awards

Pedagogical Innovation SILVER | **People's Poster Prize** 2021
Recognition for one of the best projects of 2021 Teaching and Learning Innovation EXPO at Hong Kong

Hao Peng Mechatronic Scholarship $\times 2$ 2016, 2018
Merit based grant for students top 15% in Mechatronic Engineering

First Class Scholarship | **Second Class Scholarship** $\times 2$ 2017 | 2016, 2018
Merit based scholarship for students top 5% and 20% within the Engineering Faculty

Second Prize | **Third Prize** 2018 | 2017
Recognition for top 8% and 15% participants in the National Mechanical Product Digital Design Competition

Technical Skills

Languages: English (IELTS 7.5), Cantonese (Native), Mandarin(Native)
Developer Tools: Linux, WordPress, Google/AWS/Alibaba Cloud Platform
Programming: Python, MATLAB (Smrsoft, Sostools, Sosopt, Chebfun, GPML toolboxes)
Modeling: Autodesk Inventor, Solidworks, 3DS Max
Document Creation: Microsoft Office Suite, LaTex, Markdown

Activities and Leadership

Ni Nan Yi Band 2015 – 2018
Band leader and Saxophone player Hebei, China

- Participated 2016 Baoding Band Competition and won the first prize.
- Participated 2017 Quyang Musical Festival
- Held a 2018 charity performance at school to raise funds for poor children in Daliang,Sichuan