BUYAO LYU

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Education Background

University of Michigan, Ann Arbor (UMich) Ann Arbor, MI, USA

- Master of Science in Mechanical Engineering (Control Track) 08/2020-12/2021
- Overall GPA: 4.0/4.0
- Award: James Lu and Qingni Li Engineering Graduate Scholarship

University of Michigan-Shanghai Jiao Tong University Joint Institute (UM-SJTU) Shanghai, China

- Bachelor of Science in Mechanical Engineering 09/2016-08/2020
- Overall GPA: 3.71/4.0; Ranking: 3/44
- Award: Silver Award for Capstone Project (Structure& Control of Lifting Type Installation Plate of Refrigerator Compressor)

Invention Patents

- **Buyao Lyu**, *A Method, Device, and Vehicle Used for Generating High Frequency Road Sense*, Patent for Invention, Application Number: 2023109938469. (Already accepted, not open for public until 18 months later due to Li Auto's confidential regulation)
- **Buyao Lyu**, Jianfeng Wan, Shushan Cui, *Preparation of Porous Mn-Al-C Ferromagnetic Shape Memory Alloy*, Patent for Invention, Bulletin Number: CN110093528A

Work Experiences

Li Auto Co. Ltd., Department of Chassis Electronic Shanghai, China

Chassis Electronic Control Engineer, SBW (Steering by Wire) Group 06/2022- present

--Project 1: SBW Demo Software Development

- Developed a scene display based on the SBW test bench, incorporating MAB-III and kvaser for sensor data capture, allowed for the visualization of vehicle dynamics using PreScan.
- Engineered an amplification circuit to enhance sensor electrical signals from brake and accelerator pedals, enabling more precise data collection.
- Designed and implemented a rack force observer, enhancing feedback on position and velocity through the application of Kalman Filters, which significantly expanded the bandwidth of the original rack force observer.
- Innovated a high-frequency hand force generation algorithm based on the enhanced rack force observer, leading to a PATENT application.
- Resolved the long-standing occasional frame loss issue by implementing a complementary filtering algorithm.

Project 2: SBW in Chassis Integration Function: DST (Dynamic Steering Torque)

- Researched and analyzed the existing mu-estimation algorithm, successfully integrating it into the DST perception function for mu-split road detection.
- Designed a sophisticated PID controller, incorporating a feed-forward control algorithm within the DST control logic. Leveraged the vehicle's yaw rate as a feedback signal and brake pressure at the cylinders to generate feed-forward signals, optimizing DST performance.
- Independently executed calibration tasks for DST at a proving ground, including fine-tuning P, I, D values, and other critical calibration parameters.
- Conducted a comprehensive Functional Safety analysis of the DST control system within the SBW framework.

Researches & Projects

UMich: Mechatronic System Design Labs and Projects 08/2021-12/2021

- Gained comprehensive knowledge of all six labs, including Electronic Circuit (Lab 1), Magnetic Levitation System (Lab 2), DC Motor Servo System (Lab 3), Inverted Pendulum System (Lab 4), Inertial Sensors (Lab 5), and Stepper Motor (Lab 6).
- Successfully assembled hardware components and established circuit connections, showcasing the ability to

design a lead controller for Lab 2, a PID controller for Lab 3, and an LQR controller for Lab 4.

- ☞ Leveraged Simulink for system simulations in Labs 2, 3, and 4, refining system analysis and design skills.

UMich: Machine Learning (Individual work and team work) 09/2021-12/2021

- ☞ Conducted a literature review on multi-label learning, analyzed and evaluated five papers, highlighting their algorithmic pros and cons.
- ☞ Actively contributed to implementing an image annotation algorithm, thoroughly comprehend paper's algorithm.
- ☞ Wrote Python code for dataset feature extraction, optimized the main algorithm code with a teammate, developed code for result visualization.

UMich: An App by Python-Travel Around the US 01/2021-05/2021

- ☞ Developed and implemented a travel planning application using Python, incorporating various APIs and packages, including Flask, to enhance user experience and streamline trip planning processes.
- ☞ GitHub link: https://github.com/wqrydqk/SI507_Final_Proj
- ☞ Demo video link on YouTube: https://www.youtube.com/watch?v=Bso_EGK6IBc

UMich: Energy Recovery System Modeling and Control 01/2021-05/2021

- ☞ Analyzed existing research findings on ECMS and DP algorithms through a comprehensive literature review.
- ☞ Developed and implemented an Energy Consumption Minimization Strategy (ECMS) controller using MATLAB/Simulink, aimed at reducing fuel consumption rates in a vehicle system.
- ☞ Conducted extensive simulations of the vehicle system using Simulink, reduced fuel consumption rates.

UM-SJTU: Automatic Robot with Transformable Wheels Based on Double Four-Bar System 06/2019-08/2019

- ☞ Designed precise dimensions for the four-bar linkages and wheel size, creating detailed CAD models and producing components through 3D printing.
- ☞ Orchestrated the overall cart structure, ensuring seamless operation while adhering to competition requirements.
- ☞ Contributed to Arduino coding and subsequent modifications, enhancing the robot's functionality.

MIT Universal Village Program Boston, USA

-- The Usage of Sums of Square Methods in Solving Camera Relative Pose Problem 08/2019-09/2019

- ☞ Researched and analyzed existing methods for solving the camera relative pose problem, including the naïve eight-point method, Zhao's convex relaxation method, and Briales's convex relaxation method. Evaluated the strengths and weaknesses of each approach and learned the Sums of Square (SOS) method.
- ☞ Utilized MATLAB to simulate the camera relative pose problem and developed code to implement each method.
- ☞ Conducted in-depth data analysis, highlighting the comparative advantages and disadvantages of each method in relation to the SOS approach. Authored a response paper summarizing the findings.

UM-SJTU: Study of Manganese-Based Intelligent Alloys and Corresponding Properties 06/2018-12/2018

- ☞ Controlled alloy composition to Mn 85% based on phase diagrams, utilizing CO(NH2)2 as a pore-forming agent, and fabricated samples with varying porosities and pore diameters through solid-state sintering.
- ☞ Calculated porosities and measured pore diameters using mass-volume and surface metallographic methods.
- ☞ Analyzed alloy microstructures, surface topography, compositions, and crystal textures using SEM and XRD.
- ☞ Applied a PATENT for invention.

Skills & Interests

- ☞ Technical Skills:
  --Programming: Python, MATLAB/Simulink, Stateflow, LabVIEW
  --Software: Microsoft Office, LaTeX, Dspace (Configuration Desk and ControlDesk), UG (Unigraphics)
  --Automotive Tools: Proficient in using CANoe and CANape, Familiar with CAN communication
- ☞ Language Skills: Chinese (Native), English (Proficient)
- ☞ Interests: Xiao (Chinese Flute), Piano, Singing, Badminton, Table Tennis, Photography, Travel