

Chuanbeibei Shi

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EDUCATION

Beijing Institute of Technology

Aug. 2018 – Jun. 2022

Bachelor of Engineering in Mechatronics

Beijing, China

Related Courses: C Language Programming Practice(87), Reinforcement Learning: Techniques and Applications(96), Web Practical Development and Front-end Projects(87), MATLAB Application in Automation Engineering(88), Innovation Practice-Intelligent Robots I(93), Electric Circuit Lab(91), Analog Electronic Technology Experiment A(99)

Technical Skills: Python, C/C++, JavaScript, HTML/CSS, JAVA, MATLAB

Developer Tools: Git, VS Code, IntelliJ, Visual Studio, PyCharm

Libraries: pandas, NumPy, Matplotlib

TOEFL Grades: 113, speaking: 23

Data Mining and Analysis for Dockless E-scooter Sharing Systems

Jul. 2021 – Aug. 2021

Summer Research: North Carolina State University

Raleigh, USA

- Utilized the spatiotemporal data of the supply and utilization of 12 electric scooters sharing systems to study and identify similarities and differences in the use of such systems in 11 different cities.
- Used Python to conduct data mining and analyze the situation of the dockless e-scooter sharing (DES) system, helping users understand the differences in urban traffic behavior and the use of micro-transport platforms.
- Total Grade: 96/100.

Machine Learning & Artificial Intelligence

Jul. 2018 – Aug. 2018

Summer School: Massachusetts Institute of Technology

Cambridge, USA

- Mastered decision-making and the application of classic algorithm Q-learning through participating in the summer school of machine learning and artificial intelligence courses.
- Used the artificial neural network to identify the author by inputting the picture of the painting.
- Total Grade: 98/100.

PUBLICATION

- Yushu Yu, **Chuanbeibei Shi**, Yuwei Ma, Dong Eui CHANG. *Constrained Control for Systems on Lie Groups with Uncertainties via Tube-based Model Predictive Control on Euclidean Spaces*, *International Conference on Cognitive Systems and Information Processing (ICCSIP)*, 2021.
- Yushu Yu, **Chuanbeibei Shi**, Vincenzo Lippiello, Yi Yang. *Hierarchical Robust Tube-based Model Predictive Control of Multiple Aerial-Vehicle Transportation Systems with Uncertainties and State/Input Constraints*, *Applied Mathematical Modelling*, 2022.
- Chuanbeibei Shi**, Yushu Yu, Ganghua Lai, Mauro Bellone, Vincezo Lippiello. *Real-time Multi-modal Active Vision for Object Detection on UAVs Equipped with Limited Field of View LiDAR and Camera*, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2022, submitted.
- Kaidi Wang, Yishen Qi, **Chuanbeibei Shi**, Yushu Yu, Fuchun Sun, Dongjun Lee. *An Expandable Omnidirectional Aerial Vehicles Assembly: Trajectory Linearization Geometric Control Design and Real-world Prototype Implementation*, *IEEE/ASME Transactions on Mechatronics*, 2022, submitted.

EXPERIENCE

Active Vision for Object Detection on UAVs with Camera and LiDAR

July 2019 – Present

School of Mechatronical Engineering

BIT, China

- Derived and completed the preprocessing code for transforming the point cloud into multiple-channel images including point cloud accumulation, projection, and upsampling point cloud images.
- Tested the early fusion, cross fusion, and late fusion of the images transformed from the point cloud and captured by cameras, and trained the early fusion object detection CNN based on Darknet.

- Derived the perception constraints to keep the region of interest in the Field-of-view (FOV) of the camera and LiDAR, and designed the model predictive control from the perception constraints.

Geometric Tube-based MPC for Aerial Robot

Jul. 2019 – Mar. 2021

School of Mechatronical Engineering

BIT, China

- Proposed original ideas on constrained control of systems on the manifold with uncertainties and input/state constraints via tube-based MPC on Euclidean space.
- Proved the input-to-state stability and recursive feasibility of the entire control algorithm.
- Finished the simulation coding on MATLAB, applied the methodology to aerial robots, developed the real-world program of the MPC for aerial robots, and wrote related academic papers.

Robust Control of Multiple Aerial-Vehicle Transportation Systems

Dec. 2020 – Sep. 2021

School of Mechatronical Engineering

BIT, China

- Derived the mathematical model of the multiple aerial-vehicle transportation systems.
- Designed a hierarchical control scheme for multiple aerial-vehicle transportation systems to deal with the uncertainties and constraints.
- Developed the numerical simulation code on MATLAB based on the modeling and the control scheme, conducted several comparisons with other existing control schemes

Innovation Practice-Intelligent Robots I - Obstacle Avoidance Car

Sep. 2020 – May 2021

School of Mechatronical Engineering

BIT, China

- Used labeling to mark the data of car pictures and wood blocks and set up data sets for training.
- Called camera on Raspberry Pi based on Keras, TensorFlow, OpenCV and YOLOV3 for real-time deep learning to identify cars and blocks.
- Extracted rectangular boxes based on camera on Raspberry Pi and OpenCV-Python for image recognition to realize face recognition and tracking and ranging of multi-target color wood blocks.
- Avoided obstacles automatically based on camera on Raspberry Pi and ultrasonic and infrared sensors for controlling the rotation of the motor after detecting the obstacles in front and left and right by serial communication from Raspberry Pi to Arduino.

Artificial Neural Network Design and Programming Practice

Nov. 2019 – Dec. 2019

School of Computer Science and Technology

BIT, China

- Realized data training through Jupyter notebook and Python based on anaconda, used the test data set for feedback, improved the performance of the neural network and acquired the pictures of the neural network brain.
- Used the MNIST data set to train a neural network and recognize written digital pictures, which can get a more accurate neural network after feedback.

Rotor-Wing Amphibious Unmanned Aerial Vehicle (UAV)

Sep. 2018 – Oct. 2019

School of Mechatronical Engineering

BIT, China

- Established preliminary UAV model based on Matlab, retained the main structure of the submarine in the body design, and embedded the "X" layout design of the quadrotor UAV.
- Applied the numerical method of differential equations to determine the final positioning of the target motion state of the submarine.
- Predicted the integral formula value by setting the differential equation and constructing the estimation formula.
- Adopted a four-rotor retractable structure to control forward and backward, and equipped with sensors and cameras to sense and monitor changes in the surrounding environment, switch between flight and diving modes, and optimize path.

Dragon Slayer Mini Game Design

Feb. 2019 – Apr. 2019

School of Computer Science and Technology

BIT, China

- Used the C language to write functions to adapt the easyX version of the source code of Plants vs. Zombies, and add a human-computer interaction interface to get the small game Dragon Slayer suitable for the software Easy Graphics Engine (EGE).
- Improve the code running speed by changing the function nesting and realize the picture quality coordination

AWARDS/HONORS

The Best Theme Prize in Video Competition in BIT	2018
Excellence Award in the 1st BTC Fire Rescue Team-Smart Car Competition in BIT	2019
The First Prize of the 16th "Century Cup" Student Creative Competition in BIT	2019