Chuanbeibei Shi

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Address: No. 5 Zhongguancun South Street, Haidian District, Beijing

Education

Beijing Institute of Technology (Project 985&211)   **Beijing, China**

B.Eng. in Mechatronics Engineering (English Teaching Major)   09/2018~present

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).

Computer Skills: C, Python, HTML, C++, MATLAB.

Summer Research: North Carolina State University   **Raleigh, USA**

Data Mining and Analysis for Dockless E-scooter Sharing Systems Based on Python   07/2021~08/2021

Supervised by Prof. Muhamad Shahzad and Hassan Ali Khan

- ✧ 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.

Summer School: Massachusetts Institute of Technology   **Cambridge, USA**

Machine Learning & Artificial Intelligence   07/2019~08/2019

- ✧ 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), *published and awarded as the best paper finalist.*
- ✧ Kaidi Wang, Yishen Qi, **Chuanbeibei Shi**, Yushu Yu, Fuchun Sun, Dongjun Lee. Towards Expandable Aerial Vehicles Assembly: Trajectory Linearization Geometric Control Design and Real-world Prototype Implementation, IEEE/ASME Transactions on Mechatronics, submitted.
- ✧ **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.
- ✧ 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

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Constraints. Applied Mathematical Modelling, submitted, in revision

Research Experience

Active Vision for Object Detection on UAVs with Camera and LiDAR   07/2019~present

Advisor: Prof. Yushu Yu, Prof. Vincenzo Lippiello and Prof. Mauro Bellone

- ◇ 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   07/2019~03/2021

Advisor: Prof. Yushu Yu

- ◇ 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   12/2020~09/2021

Advisor: Prof. Yushu Yu

- ◇ 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 Based on   09/2020~05/2021

Raspberry Pi and Arduino

Advisor: Prof. Zhangguo Yu and Prof. Qing Shi

- ◇ Used labelimg 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 zhion from Raspberry Pi to Arduino.

Artificial Neural Network Design and Programming Practice with Python   11/2019~12/2019

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Advisor: Dr. Hao Wu

✧ 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.

College Students' Innovative Entrepreneurial Training Plan Program   09/2018~10/2019

Rotor-Wing Amphibious Unmanned Aerial Vehicle (UAV)

Advisor: Prof. Qingsheng Luo

✧ 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   02/2019~04/2019

Advisor: Prof. Fengnian Zhao

✧ 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.

Grade Management System Design   12/2018~02/2019

Advisor: Prof. Qing Xue

✧ Used C language to write functions, arrays and pointers to implement a simple score statistics management system on Dev-C++, which can arrange the input score data.

Awards/Honors

✧ Excellence Award in the 1st BTC Fire Rescue Team-Smart Car Competition in School of Mechatronics, BIT.   10/2019

✧ The First Prize of the 16th BIT "Century Cup" Student Creative Competition   05/2019

✧ The Best Theme Prize in 2018 Autumn Semester Video Competition in BIT's Green Wind Volunteer Association   12/2018