Andong Yang

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Current status: Ph.D. student
Mobile robot, Motion planning, Motion control

EDUCATION

DALIAN UNIVERSITY OF TECHNOLOGY, B.S. 2015 - 2019

Major: Software Engineering and Cyber Security. **GPA:** 3.57

Join Liaoning Provincial Key Laboratory of Ubiquitous Network.

Award: Outstanding Contribution Award in the Dalian University of Technology Alpha Laboratory

UNIVERSITY OF CHINESE ACADEMY OF SCIENCES, Ph.D.: 2019 - Dec 2024 (Anticipate)

Major: Computer Science.

Advisor: Yu Hu (胡瑜), Wei Li (李玮)

Joined the Intelligent Computer Research Center, Institute of Computing Technology (ICT), Chinese Academy of Sciences. Research directions: motion planning and motion control for mobile robot in the wild environments.

Award: Outstanding Student of the Intelligent Computer Research Center, ICT

EXPERIENCE

COLLABORATOR RECOMMENDATION

Nov 2017 - Oct 2018

Related technologies: Python, Gephi, DCT function **Role:** Team member

- Background: The data is based on lab-built datasets that include scholar partnerships and skills (5673 samples). The object is to build a collaborator recommendation system for researchers.
- Content: 1) Academic team identification based on clustering algorithm. 2) Scholar relationship matrix compression based on DCT function. 3) Collaborator recommendation based on hypergraph.
- Results: A collaborator recommendation system; Skill Ranking of Researchers via Hypergraph (PeerJ2019).

GAME AGENT BASED ON IMPROVED DQN

Nov 2018 - May 2019

Related technologies: KL Divergence, DQN, Gym **Role:** Completed individually

- Background: Undergraduate final project. Leveraging KL divergence to measure network differences and provide faster convergence speed.
- Content: 1) Train a DQN-based game agent. 2) Complete undergraduate design thesis report.
- Results: 10% increase in convergence speed when training agent.

DATASETS IN THE WILD

Sep 2020 - May 2021

Related technologies: Multi-sensor configuration, Time synchronization **Role:** Team leader

Installing sensors on mobile robots and constructing a software stack for them, then collecting a dataset based on those robots, provides a foundational basis for subsequent experiments. The dataset is collected by performing random actions in unstructured environments and includes various types of data such as RGBD images, lidar data, robot pose, speed, etc.

PATH TRACING IN WILD ENVIRONMENTS

Feb 2021 - Nov 2021

Related technologies: MPC, Generative adversarial network, Gazebo **Role:** Team Leader

- Background: Reducing the time consumption and avoid compounding-error of the multi-step prediction process in model predictive control.
- Content: 1) The single-model simultaneous framework. 2) An adversarial dynamics model. 3) Building a simulation platform and a real-world mobile robot experiment platform, which weighs 68kg.
- Results: A path tracing algorithm; SMS-MPC: Adversarial Learning-based Simultaneous Prediction Control with Single Model for Mobile Robots (IROS2022)

PARTICIPATING IN BUILDING A SELF-DRIVING CAR
May 2021 - Nov 2021

Related technologies: C++, Sensors, QT, RRT, OMPL **Role:** Team member

- Background: Building a self-driving car that drives in the plateau environment without HD map and road.
- Content: 1) Vehicle modifications: installation of LIDAR, cameras, GPS, and can bus. 2) Developing global path planning software. Specific details include drawing the road network based on satellite images; Based on the generated road network using traditional methods to plan paths to generate data, then using GAIL to learn the planning policy of traditional method to improve planning efficiency. 3) Participating in the design of path planning algorithms.
- Results: A global path planning software; an autonomous vehicle for unstructured environments.

ACTIVE SLAM BASED ON HIERARCHICAL RL
Apr 2022 - Mar 2023

Related technologies: Hierarchical reinforcement learning, SLAM **Role:** Team member

- Background: The object is to increase the efficiency of exploration.
- Content: 1) Designing a map reconstruction module to correct the error of incremental mapping when a loop-closure occurs. 2) Designing a novel reward function of the hierarchical reinforcement learning policy. 3) Conducting comprehensive experiments in different simulated and real environments.
- Results: Active Visual SLAM Based on Hierarchical Reinforcement Learning (IROS2023)

SPEED PLANNING IN RUGGED ENVIRONMENTS
May 2022 - Mar 2023

Related technologies: CRL, Optimization based planning, ROS **Role:** Completed individually

- Background: The object is to extend the capability of speed planning methods in wild environments for mobile robots.
- Content: 1) Designing a terrain constraint extraction module to extract terrain information from RGB-D images. 2) Terrain-aware CRL is introduced to handle the terrain constraint and all other nonlinear constraints. 3) A self-supervised learning-based feedback structure is introduced to further improve the performance of all network during the testing.
- Results: A speed planning module for mobile robots in Rugged environments that can be easily integrated into an existing hierarchical framework; Speed Planning Based on Terrain-Aware Constraint Reinforcement Learning in Rugged Environments (RA-L 2024)

MOTION PLANNING IN WILD ENVIRONMENTS
Mar 2023 - Sep 2023

Related technologies: Octomap, Kinodynamic RRT*, Optimization based trajectory optimization, Offline reinforcement learning, ROS **Role:** Completed individually

A planner for mobile robots in wild environments that can reduce the local optimum solutions and utilize terrain information.

Publications: F3DMP: Foresighted 3D Motion Planning of Mobile Robots in Wild Environments (ICRA2024)

CITY-SCALE NEURAL RADIANCE FIELDS
Sep 2023 - Feb 2024

Related technologies: Depth-Supervised NeRF, quadrotor, ROS **Role:** Collaborating with Hao Zhao (Tsinghua University)

Under Review

OTHER EXPERIENCE & INTERESTS

Teaching Fellow: Prepared course material. Supervised students in projects, graded exams and homework

Member of the Career Development Association of ICT

Member of the Student Union of the University of Chinese Academy of Sciences

Patent: A Scholar Skill Assessment Method Based on Hypergraph (CN108510205A)

Patent: A Training Method for Generative Models for State Prediction Based on Adversarial Neural Networks (CN115453880A)

Patent: A Method for Synchronous Localization and Mapping Based on Hierarchical Reinforcement Learning (202311229497.X)

World Intelligent Driving Challenge: Second prize in the obstacle avoidance and highway driving

Interests: Amusement park, video game, Mountain biking.