

WEI DU

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EDUCATION

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| Carnegie Mellon University (CMU) | 05/2019 |
| <ul style="list-style-type: none">- Master of Science in Mechanical Engineering- GPA: 3.89/4.0 | |
| Shanghai Jiao Tong University (SJTU) | 06/2016 |
| <ul style="list-style-type: none">- Mechanical Engineering (Joint Program)- GPA: 3.83/4.3 | |
| Harbin Institute of Technology (HIT) | 06/2017 |
| <ul style="list-style-type: none">- Bachelor of Engineering in Mechanical Design, Manufacturing and Automation- GPA: 3.76/4.00 | |

PUBLICATIONS

Wei Du, Fahad Islam and Maxim Likhachev. *Multi-Resolution A**. (under review)

Wei Du, Sung-Kyun Kim, Oren Salzman and Maxim Likhachev. *Escaping Local Minima in Search-Based Planning using Soft Duplicate Detection*, Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2019

Wei Du and Yingxiang Liu.(2017). Design on Test System and Experimental Research of Foot Piezoelectric Ultrasonic Motor. School of Mechatronics Engineering, Harbin Institute of Technology, Harbin, China.

RESEARCH INTERESTS

In model-based motion planning, it is common search-based planner runs into local minimum region and sampling-based planners sample blindly due to a lack of consciousness to this world. As a consequence, it is essential to empower planners with cognition. Specifically speaking, I am attracted to constructing **prediction models of robots' interacting** with world and **uncertainties** from dynamic objects and leveraging models to **guide planners**.

RESEARCH EXPERIENCE

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| Multi-Resolution A* algorithm – Search-based Planning Lab (CMU) | 06/2019 - Present |
| <ul style="list-style-type: none">- Researched on executing multiple searches simultaneously in search-based planning to explore search spaces with different resolutions.- Exploited different scheduling policies such as <i>DTS</i> to speed up the search.- Conducted experiments in 2D, 3D and 7D planning and succeeded with highly increased success rates of planners and drastically accelerated planning processes.- Supplemented the <i>SMPL</i> motion planning library with mesh loading functionality. | |
| Walker Project – Search-based Planning Lab (CMU & UBTech Inc.) | 04/2019 - Present |
| <ul style="list-style-type: none">- Customized SLAM algorithms for Walker robot to assist its indoor navigation.- Mapped out the workspace of Walker robot with respect to the conveyor.- Implemented ARA* algorithm on Walker robot for manipulation tasks on conveyor.- Constructed perception-planning-grasp pipeline for grasping tasks, e.g., grasp a box from conveyor. | |
| Cruzr Project – Search-based Planning Lab (CMU & UBTech Inc.) | 10/2018 - 04/2019 |
| <ul style="list-style-type: none">- Customized SLAM algorithms for Cruzr robot to assist its indoor navigation.- Constructed a state machine to coordinate planning and SLAM. | |

- Constructed local controllers to execute plans returned from planner.

Planning Using Soft Duplicate Detection – Search-based Planning Lab (CMU) 12/2017 - 02/2019

- Explored search-based planning approaches in continuous state space with soft duplicate detection scheme.
- Implemented decision trees in prioritizing states and map pattern recognition.
- Wrote one visualization software with *OpenGL* library to monitor planning process.

Research on Control Characteristic Foot Piezoelectric Ultrasonic Motor (HIT) 10/2016 - 05/2017

- Designed an mechatronics platform for the experiments.
- Conducted simulation experiments in ADAMS software for dual-foot piezoelectric ultrasonic motor and generated control characteristic curve.
- Conducted experiments with designed platform for dual-foot piezoelectric ultrasonic motor and produced the characteristic curve for reference in motion control.

Quad-rotor Trajectory Optimization – the Robotics Institute (SJTU) 05/2016 - 06/2016

- Implemented optimization techniques for quad-rotor trajectory planning with dynamic constraints.
- Adopted differential smoothing algorithm to reduce jitter.

Small Wheeled Jumping Robot – Lab of Advanced Actuation Technologies (HIT) 08/2015 - 01/2016

- Designed cellular wheel structure for the robot and conducted force analysis on it.
- Completed circuit design of single chip microcomputer based on STM32 minimum system board.
- Implemented the PID controller to maintain jumping speed at high level.

Nation College "Freescale Cup" Smart Car Contest 09/2014 - 04/2015

- Applied PID controller and used Labview software to simulate and analyze the performance of the smart car.
- Applied Kalman filter to process magnetic field signals thus localizing the smart car in real-time.

COURSE PROJECTS (CMU)

Power plant Substation-to-feeder Path Prediction – Bayesian Machine Learning 02/2019 - 05/2019

- Collaborated with Kevala company on predicting feeder-path endpoints and outperformed peer team at the Facebook company.
- Implemented CNNs to predict the endpoints of power lines with accuracy 92% .
- Employed motion planning algorithms in generating the substation-to-feeder paths.

Trajectory Optimization for Fixed-wing Airplane – Engineering Optimization 02/2019 - 05/2019

- Constructed a complex optimization model for NASAs X-57 Electric Research Plane.
- Implemented Differential Dynamic Programming algorithm to solve the optimization.
- Modeled this problem as an graph search problem and solved this problem with respect to this perspective.

Offline Hand-written Chinese Characters Recognition – Pattern Recognition Theory 09/2018 - 12/2018

- Implemented CNNs in recognizing hand-written Chinese characters with accuracy 98%.
- Implemented decision-trees, SVM as baselines against CNNs in recognizing hand-written Chinese characters.

Inserting A Curve Into Mesh – Advanced Engineering Computation 03/2018 - 05/2018

- Succeeded in leveraging the *OpenGL* Library to load and render 2D mesh with the C++ language.
- Reproduced the work of one research paper about inserting a curve into one mesh figure and increased the smoothness on the edges between different components of this figure.

Aviation Game – Engineering Computation 09/2017 - 12/2017

- Designed a GUI for an aviation simulator which gained popularity among the class.
- Achieved the basic functionality of an aviation game including control model of an airplane based on kinematics and dynamics.

ACTIVITIES

The IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Macau 11/2019

- Co-Chaired the *Motion and Path Planning III* session.
- Presented my research *Escaping Local Minima in Search-Based Planning using Soft Duplicate Detection*.

Visitor, HIT Robot Group Inc. 07/2015

- Technical communications on combination of production and academia research about industrial robots.

Volunteer, HIT Library 02/2014 - 07/2014

- Provided consultation services to students.
- Worked with librarians on book organization system.

Leadership, Charitable Association to Transmit Childhood 09/2013 - 01/2014

- Planned and participated in public service activities for children with autism.
- In charge of designing activities and games that benefits the mental health of autistic children.

Member, HIT Magic Club 09/2013 - 07/2015

- We communicate with each other in magic performance designs and skills.
- Given magic shows to students at HIT.

HONORS & AWARDS

- People's Scholarship in China for **three consecutive years** 12/2013 - 12/2015
- SMC Scholarship 09/2015
- 2nd Prize in Nation College *Freescall Cup* Smart Car Contest 04/2015
- Shanghai Huiyi Scholarship 09/2014
- 2nd Prize in annual project at HIT 09/2014

RELATED COURSEWORKS

- Datastructures and Algorithms for Engineers;
- Engineering Computation;
- Advanced Engineering Computation;
- Planning Techniques for Robotics;
- Java for Application Programmers;
- Pattern Recognition Theory;
- Bayesian Machine Learning for Scientists and Engineers;
- Robot Localization and Mapping;
- Engineering Optimization;

SKILLS

- Programming Language: C/C++, Java, Python, MATLAB;
- Software: ROS, OMPL, SMPL, SBPL, AutoCAD, Solidworks, ADAMS