WEI DU

◇ Email: wweeii.du@gmail.com   ◇ Homepage: https://ddwwee.com

EDUCATION

Carnegie Mellon University (CMU)   *05/2019*
- Master of Science in Mechanical Engineering
- GPA: 3.89/4.0

Shanghai Jiao Tong University (SJTU)   *06/2016*
- Mechanical Engineering (Joint Program)
- GPA: 3.83/4.3

Harbin Institute of Technology (HIT)   *06/2017*
- 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 that search-based planners run into local minimum region and sampling-based planners sample blindly due to lack of cognition to environments. As a consequence, it is essential to plan with a more comprehensive world model. Specifically speaking, I am dedicated to constructing **prediction models of robots' interactions** with the world and **uncertainties** from dynamic objects and leveraging these models to **guide planners**.

RESEARCH EXPERIENCE

Multi-Resolution A* algorithm – Search-based Planning Lab (CMU)   *06/2019 - Present*
- Researched on executing multiple searches simultaneously in search-based planning to explore search spaces with different resolutions.
- Exploited different scheduling policies such as *DTS* 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.
- Enriched the *SMPL* motion planning library with mesh loading functionality.

Walker Project – Search-based Planning Lab (CMU & UBTech Inc.)   *04/2019 - Present*
- Customized SLAM algorithms for the Walker robot to assist its indoor navigation.
- Mapped out the workspace of the 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 the conveyor.

Cruzr Project – Search-based Planning Lab (CMU & UBTech Inc.)   *10/2018 - 04/2019*
- 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 the 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 the *OpenGL* library to monitor the planning process.

Research on Control Characteristic Foot Piezoelectric Ultrasonic Motor (HIT) *10/2016 - 05/2017*
- Designed a 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 the designed platform for dual-foot piezoelectric ultrasonic motor and produced the characteristic curve for reference in motion control.

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

National College "Freescale Cup" Smart Car Contest *09/2014 - 04/2015*
- Applied the PID controller to maintain smart car in high speeds.
- Applied Labview software to analyze the performance and control characteristics 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 the 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 – Egineering Optimization *02/2019 - 05/2019*
- Constructed a complex optimization model for NASA's $X-57$ Electric Research Plane.
- Implemented the Differential Dynamic Programming algorithm to solve the optimization.
- Modeled this problem as a 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 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, with the control model of the airplane based on its kinematics, dynamics, and disturbances.

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 the 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 the book organization system.

Leadership, Charitable Association to Transmit Childhood   *09/2013 - 01/2014*
- Planned and participated in public service activities for children with autism.
- Took charge of designing activities and games that benefit the mental health of autistic children.

Member, HIT Magic Club   *09/2013 - 07/2015*
- Participated in magic show design and training.
- Presented magic shows to students at HIT.

HONORS & AWARDS

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