

Boyang Ti



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EDUCATION

Dalian University of Technology (2013.7-2017.6)

Liaoning, China

Bachelor of Mechanical Design manufacture and Automation

- GPA: Major **90.7**/100.0
- Rank: **2/64**
- Top Grade Scholarship (5%), twice, 2013-2014 & 2014-2015

Harbin Institute of Technology (2017.9-Present)

Heilongjiang, China

Ph.D. candidate, Mechanical Engineering

- Research Topic: **Imitation Learning; Robot Skill Learning; Optimal Control; Riemannian Manifold**

Idiap Research Institute (2021.2-2022.9)

Martigny, Switzerland

Research Intern

- Research Topic: **Optimal Control; Riemannian Manifold**

RESEARCH EXPERIENCE

Research on human-robot collaboration technology and application for aerospace manufacturing

Project Participant

Sep. 2022-Present

- Solving the algorithm problem about robot skill learning part.
- Solving the representation problem on the assembly angle
- Propose a method based on Dynamic Movement Primitives to solve the generalization problem of assembly motion.
- Verify the effectiveness of the proposed algorithm in Simulation and UR10 robot platform

Funded by Major Research Plan, National Nature Science Foundation of China (Grant No. 92048301)

--PhD project and main research.

Efficient Human-Machine Collaboration and Intelligent Planning Technology Based on Multiple Operational Modes

Project Participant

Nov. 2022-Present

- Collaborative Task Planning and Mutual Adaptation in Robot-Doctor Cooperation
- Researching theoretical methods for task allocation, motion planning, and mutual adaptability in various operational modes (collaborative, partially autonomous) when a robot performs vertebral plate excision surgery alongside a doctor.

Funded by National Key Research and Development Program of China (Grant No. 2022YFB4700701)

Learning by Switching Roles in Physical Human-Robot Collaboration

Project Participant

Feb. 2022-Sep. 2022

- Solving the algorithm problem about robot skill learning part
- Propose a method based on geometry and optimal control framework for online planning and robustness to human disturbances.
- Verify the effectiveness of the proposed algorithm in Simulation and Franka Panda robot platform

Funded by the Swiss National Science Foundation SWITCH project (<https://switch-project.github.io/>)

--Visiting PhD project

Memory of Motion

Project Participant

Feb. 2021-Feb. 2022

- Solving the algorithm problem about robot skill learning part.
- Propose a method based on geometry and optimal control framework to generalize the robot learned skill.
- Verify the effectiveness of the proposed algorithm in Simulation and Franka Panda robot platform.

Funded by European Commission's Horizon 2020 Programme Memory of Motion, <https://www.memmo-project.eu/>, Grant Agreement 780684

--Visiting PhD project

Fundamental Researches on Cooperative Dual-Arm Mobile Robot

Project Participant

Sep. 2017-Sep. 2022

- Solving the algorithm problem about robot skill learning
- Propose a strategy to extract the feature of demonstration trajectory encoded by Dynamic Movement Primitives (DMPs)
- Verify the effectiveness of the proposed algorithm in Simulation and UR10 robot platform
- Considering to apply neural network to construct the model between task parameters and trajectory parameters

Funded by Major Research Plan, National Nature Science Foundation of China (Grant No. 91648201)

--PhD project and main research

Automatic Grinding Platform Based on Laser Cleaning

Project Participant

May. 2019-Sep. 2021

- Build the communication links PC between SIMENS PLC, MiYi range sensor and KUKA KR6
 - Design the upper computer software to control the automatic grinding platform
- Funded by Shanghai space research institute*

Ant Colony Algorithm in the Mobile Robot Path Planning Simulation Research

Project Leader

Dec. 2016-Jun. 2017

- Propose an optimization algorithm of ant colony algorithm to speed up the stochastic search for the optimal path
- Propose an adaptive parameter optimization and correction strategy to improve the planning path
- Built the simulation platform using MATLAB/GUI for planning the optimal path and export the planning file

2019 JCAR Cup Inclusive Robot Industrial Application College Invitational Tournament

Team Leader

May. 2019-Aug. 2019

- Build the simulation grasping platform in Gazebo and complete the grasping task
- Complete the task of the physical platform to grasp the specified fruit from the stacked objects

Freescall Cup National Smart Car Competition

Competition Participant

Dec. 2015-May. 2016

- Responsible for PCB Layout of smart car main control circuit board
- Propose the obstacle avoidance and climbing strategy to deal with the changing track

PUBLICATIONS

Journal Article:

- **Ti B**, Razmjoo A, Gao Y, et al., A geometric optimal control approach for imitation and generalization of manipulation skills[J], Robotics and Autonomous Systems, 2023
- **Ti B**, Gao Y, Shi M, et al. Generalization of orientation trajectories and force–torque profiles for learning human assembly skill[J]. Robotics and Computer-Integrated Manufacturing, 2022.
- **Ti B**, Gao Y, Shi M, et al. Movement generalization of variable initial task state based on Euclidean transformation dynamical movement primitives[J]. International Journal of Advanced Robotic Systems, 2021.
- **Ti B**, Gao Y, Li Q, et al. Human intention understanding from multiple demonstrations and behavior generalization in dynamic movement primitives framework[J]. IEEE Access, 2019.

Conference Article:

- **Ti B**, Gao Y, Zhao J, et al. Imitation of Manipulation Skills Using Multiple Geometries[C] 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE, 2022.
- **Ti B**, Gao Y, Li Q, et al. Dynamic movement primitives for movement generation using GMM-GMR analytical method[C] 2019 IEEE 2nd International Conference on Information and Computer Technologies (ICICT). IEEE, 2019.
- Shi M, Gao Y, **Ti B**, et al. Obstacle avoidance methods based on geometric information under the dmeps framework[C] Intelligent Robotics and Applications: 14th International Conference, (ICIRA). Springer. 2021.
- Li Q, Gao Y, **Ti B**, et al. Model-Error-Observer-Based Control of Robotic Manipulator with Uncertain Dynamics[C] 2019 IEEE 2nd International Conference on Information and Computer Technologies (ICICT). IEEE, 2019.

AWARDS and SCHOLARSHIPS

<i>HIWIN Scholarship</i>	<i>(Twice) 2013-2015</i>
<i>Learning Excellence Award (First Prize)</i>	<i>(Twice) 2013-2015</i>
<i>Three-Good Students of Dalian University of Technology</i>	<i>(Twice) 2013-2015</i>
<i>Technology Innovation Award of Dalian University of Technology</i>	<i>2013-2014</i>
<i>Excellent Graduate of Dalian University of Technology</i>	<i>2016-2017</i>
<i>National Scholarship</i>	<i>2017</i>

SKILLS

- Computer Skills:
 - Python, MATLAB, C, C#.
 - ROS, Gazebo, MATLAB, PyCharm, Visual Studio, AutoCAD, SolidWorks.
 - Latex, Word, PowerPoint, Excel, Visio.
- Language Skills:
 - Chinese (Native), English (Fluent), Japanese (Some knowledge of) and French (Learning)

LANGUAGE PROFICIENCY

- College English Test Band 6 (CET6): **499/710** (Listening: 170, Reading: 191, Writing and Translating: 138)
- Japanese Language Proficiency Test (N2): **104/180** (Reading: 38, Listening: 32, Language Knowledge: 34)