Lei Shi

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RESEARCH INTEREST

To create unprecedentedly and robust robot algorithm that can fully exploit robot dynamical and sensing abilities to operate in natural environments. Specific areas: robotics, motion planning, control, machine learning.

EDUCATION

JOHNS HOPKINS UNIVERSITY, Baltimore, MD — Dec 2022
MSE, Robotics Engineering, (GPA 3.72) — Concentration: Motion Planning and Control

SHANDONG UNIVERSITY, Shandong, China — Jun 2020
BE, Energy and Power Engineering, (GPA 84.94) — Concentration: Vehicle Engine

RESEARCH EXPERIENCE

JOHNS HOPKINS UNIVERSITY — Baltimore, MD
Lab for Computational Sensing and Robotics (Advisor: Marin Kobilarov) — May 2022 - present

Rough Terrain Ground Vehicle Control:
- Setting up simulation environment from scratch with Carla and RoadRunner to build a time-aligned, randomized and balanced dataset, including data collection, dataset transforming and real-time plotting.
- Implemented a *CNN & LSTM* based model from scratch to make motion prediction of an autonomous ground vehicle in rough terrain area. The customized rough terrain map is from RoadRunner.
- Implemented a MPPI-Control based algorithm from scratch to guide the motion planning and control of vehicle.

TENCENT CO.LTD — Shenzhen, China
Robotics-X Lab (Advisor: Yu Zheng) — May - Aug, 2021

Robot Dexterous Manipulation:
- Designed a general dynamic hybrid manipulation strategy for *dynamic grasping*.
- Designed specific unprecedented *non-prehensile* manipulation based on UR16e, including fast dynamical grasping mechanism.
- Customized *double inverted pendulum model-based* algorithm to guide the motion planning of UR16e.

PUBLICATION

Cheng Z, Yanbo L, Lei S, Longfei Z & Yu Z: Differential Dynamic Programming based Dynamic Hybrid Manipulation Strategy for Dynamic Grasping. ICRA 2023 accepted for presentation.

SKILLS

- Theory: Optimal Control, Linear System, Nonlinear Control and Planning, Robot Motion Planning, ROS, Machine Learning, Deep Learning, SLAM, Robot Kinematics and Dynamics.
- Coding Language: Python, C++, MATLAB.
- Simulation: Carla, Mujoco, Gazebo, RViz.

TEACHING EXPERIENCE

- Graduate Course TA: "Introduction to Linear System and Theory"
    - Graded weekly homework
    - Held TA Office Hours
    - Developed computational lab assignment