

Chengjie Zhang

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EDUCATION

University of Michigan Ann Arbor

09/2023-04/2025 (expected)

Mechanical Engineering MSE

GPA: 3.763 (Year 1)

University of Nottingham Ningbo China

09/2019-06/2023

BEng Hons Aerospace Engineering

GPA: 3.93/4.0 (Rank: Top 10%)

RESEARCH INTERESTS

Legged robots, Robotics control, Optimization, Robotics learning.

RESEARCH EXPERIENCE

Deep Learning Models for Predicting Occupant Impact Response in Frontal Crashes

Individual project

09/2024-12/2024

- Developed a deep learning model to predict occupant kinematics in frontal vehicle crashes, leveraging a dataset of finite element (FE) simulations with validated human body and vehicle models.
- Preprocessed a 200 people database of crash simulation data, including diverse occupant characteristics (sex, age, stature, BMI) and 3D point clouds generated by FEA software LS-Prepost.
- Feature extraction methods are implemented using a fusion network of Pointnet++ and LSTM to capture occupant body shape and size features and temporal variations in collision dynamics.
- Rapid predictions can accurately forecast human kinematics in frontal collisions within 10 minutes, contributing to improved vehicle safety design and injury causation understanding.

Bipedal Humanoid Robot Control Framework Using NMPC and WBC with MuJoCo Simulation

Individual project

09/2024-12/2024

- Leveraged MuJoCo for simulation by exporting robot drawings from SolidWorks using URDF plugin and converting them to compatible XML files.
- Implemented MPC using OCS2, and solved optimization problems through OCS2 interface, using multiple shooting methods and Sequential Quadratic Programming (SQP) for Nonlinear Programming (NLP) problem.
- Implemented WBC, described as a Quadratic Programming (QP) problem, and solved QP problems using the qpOASES solver.
- Employed a linear Kalman filter for torso state estimation, and applied a PD controller for smooth and stable low-level control at the execution layer.
- Successfully achieved dynamic walking control of a 12-DOF bipedal humanoid robot in the Mujoco simulation environment.

Automated Block Stacking with Color Recognition and Robotic Arm Manipulation

Course-based Project

01/2024-04/2024

- Build autonomy for a 5-DOF robotic arm, utilizing computer vision techniques, kinematics, and path planning to enable the robot to manipulate various objects. Developed autonomy for a 5-DOF robotic arm

using computer vision, kinematics, and path planning.

- Utilized AprilTag for camera calibration and DH method for forward kinematics.
- Employed OpenCV and a depth camera to detect and locate color blocks, achieving successful grasping.

Autonomous Maze Exploration and Mapping with A* Navigation on Mbot

Course-based Project

01/2024-04/2024

- Use an autonomous maze-solving robot to perceive its surroundings, map the environment, and implement A* algorithm for self-navigation.
- Assembled and controlled an MBot, including the design of a gripping mechanism.
- Implemented PID feedback control for motor speed and developed a velocity-command-based robot motion controller.
- Utilized Lidar for 2D mapping, built a SLAM system for environment mapping and localization.
- Implemented A* algorithm for map navigation.

Sensorless field-oriented control of Brushless DC motor used in unmanned aerial vehicle

Individual project

09/2022-05/2023

- Established mathematical model of Brushless DC motor, simulated in Matlab/Simulink, and analyze the output of the motor model.
- Examined the control methods, including LQR method, sliding mode control method, and FOC method.
- Established nonlinear observer model to observe the parameters of BLDC motor.
- Realized sensorless field-oriented control of Brushless DC motor.

INTERNSHIP

Software Engineer

05/2024-08/2024

Dassault Systemes

- Developed robot surfacing, drilling and riveting interfaces using C++ in Visual Studio and implemented functions and methods for Enterprise Knowledge Language (EKL) scripts in 3DEXPERIENCE.

TECHNICAL SKILLS

- Programming languages: C++, Python, Matlab.
- Software capabilities: ROS, Mujoco, RViz, Git, Matlab/Simulink, SolidWorks, 3DEXPERIENCE, Cura.
- Hardware capabilities: Nvidia Jetson Nano, RX200 Arm, Intel RealSense Lidar camera, IMU.
- Operating system: Linux (Ubuntu), Mac OS, Windows OS.

HONORS

Outstanding graduates of University of Nottingham Ningbo China

07/2023

Outstanding Graduate of Zhejiang Province

03/2023

Dean's Scholarship

12/2022

Dream Scholarship

11/2022

Zhejiang Provincial Scholarship

10/2022

Third Prize, Provincial Competition of ECA. Academic and Technical Works

05/2021