Siyuan MENG

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Education

University of Southern California Jan.2023 -- Present

Major: Mechanical Engineering (Dynamics and Control) GPA: 3.75/4

Degree: Master of Science in Mechanical Engineering

Shanghai University Sep. 2018 -- July 2022

Major: Mechanical Engineering and Automation GPA: 82.9/100 (Ranking: 21/117)

Degree: Bachelor of Engineering

Publications

[1] S. Liu, J. Tang, **S. Meng** and F. Qian, "Proprioceptive Sensing Enabled Granular Media Estimation for Locomotion Gait Adaptation," in *IEEE Robotics and Automation Letters (RA-L)*, (in submission, Sep. 2024)

[2] **Co-Inventor**, "An Air-Ground Coordinated UAV Takeoff and Landing System," *Chinese Invention Patent Application No. CN202310006312.2, China*, (under substantive examination, Apr. 2023)

[3] S. Liu, S. Pradeep, S. Gao, D. Jerolmack, J. Bush, **S. Meng**, J. Tang, J. Ruck, F. Qian, "Proprioceptive sensing to aid with locomotion adaptation in mud," in *Bulletin of the American Physical Society*

Research & Innovation Experience

Research volunteer at University of Southern California (RoboLAND Advisor: Feifei Qian) Jan.2023 – Present

- Researched on Mud skipper robot locomotion on muddy terrain. Including whole robot mechanical design, robot motor and motor driver testing, control and finding locomotion failure key features for adaptation algorithm
- Improved robot controllability and maneuverability by derive robot forward/inverse kinematics for control input calculation
- Increased robot communication by assembled control code on raspberry pi and CAN communication with motor drive
- Improved muddy terrain experimental setup reproducibility by design automated CNC muddy terrain flatten machine
- Found locomotion failure key features which could largely affect robot forward speed on muddy terrain (**Published in *IEEE Robotics and Automation Letters (RA-L)***)
- Successfully Sensed robot muddy-flipper interaction force by calibrating direct drive motor with static/friction force compensation
- Deployed an adaptation locomotion algorithm which can enhance robot ability to traverse on muddy terrain using sensed force (**Submitted to *IEEE Robotics and Automation Letters (RA-L)***)

Research assistant at Tsinghua University June.2022 – Jan.2023

- Designed a long-range multi terrain Air/Land reconnaissance vehicle which has off-road chassis with UAV to collect data on complex terrain.
- Literature review on all types of Multi-Modal Robots and summarized key features of design and evaluation of Multi Modal Robots for improving current Multi Modal robot
- Achieved tilted terrain Air/Land robot's UAV take off and land ability by designing a 6 DOF UAV airport with communication of robot IMU to provide a horizontal airport.
- Increased robot's UAV stability by designing a locking mechanism on airport
- Achieved robot's airport 6 DOF accurate control by derive inverse kinematics for control inputs and using LQR control for all states control
- Achieved robot's airport 6 DOF control and assist UAV landing by LQR control and GPS communication with robot and UAV

MIT Research Project: 3D Reconstruction of Medical Image Based on Deep Learning June 2021 -- Sep.2021

- Worked as the team leader, responsible for task assignment, schedule tracking and reporting to professor
- Completed literature review, applied 3D-R2N2 algorithm and made the 3D medical image datasets for training, trained it on Google Colab and wrote a research report

Research assistant at Shanghai University Oct.2020 – Jun.2021

- Designed the controller and control scheme of Automated Mechanical Transmission (AMT) using Altium Designer and simulated on MATLAB
- Made PID Control simulation of AMT hydraulic cylinder by MATLAB and AMESim
- Designed and tested a hydraulic circuit to actuate clutch hydraulic cylinder

University Technology Innovation Project: ROBOMASTER Intelligent Car Sep.2020 -- Nov. 2020

- Worked as the team leader, completing the mechanical and electrical design of an all-round obstacle avoidance intelligent locomotion robot
- Responsible for the speed, orientation closed-loop control on STM32

College Student Innovation Project: An Intelligent Car for Helping the Aged Dec.2019 -- Aug. 2020

- Took charge of the car mechanical structure design and C++ control programming on STM32 for vehicle mobility.

Course Project

AME532 Flight Vehicle Stability and Control Jan. 2024 - Apr. 2024

- Analyzed Glider aerodynamics and stability using MATLAB/SIMULINK and deployed different control method to make comparison: Root locus, P-D, P-I, P-I-D, LQR, Sliding mode control.

AME552 Nonlinear Dynamical Systems, Vibrations, and Chaos course project Aug. 2023 - Dec. 2023

- Using Poincare Map to analyze 2-D rimless wheel's nonlinear dynamical system stability, bifurcation and system behaviors, and using Lyapunov function to analyze system stability

AME556 Robot dynamics and control (quadruped robot MPC control project) Jan. 2023 - May. 2023

- Using MATLAB SIMULINK to conduct quadruped robot with Model Predict Control. Including robot dynamics derivation, trotting/bounding gait switch design, robot foot displacement and velocity trajectory design, robot MPC ground force control, quadruped foot PD control and nonlinear trajectory optimization.
- Tested for robot walking, running, turning and climbing stair.

Teaching Experience

AME308: Computer-Aided Engineering (Instructor: Bocheng Jin) Aug. 2024 - Present

Course producer, TA, Grader

- Siemens NX Modeling, Assembly, Drafting, Finite element and kinematics analysis.

AME563: Computational Design of Machine Components (Instructor: Bocheng Jin) Aug. 2024 - Present

Course producer, TA

- Siemens NX Modeling, Assembly, Drafting, Finite element and kinematics analysis.

Internship Experience

Dome Intelligent Technology (Shanghai) Co., Ltd. Jun. 2021 - Sep. 2021

Intern Mentor

- Taught teenagers to make land wheel/legged locomotion robot including structure design in SOLIDWORKS, 3D printing and Arduino gait control programming.

Beijing Macwell Packaging Machinery Co., Ltd. Jan. 2021- Mar. 2021

Intern Mechanical Engineer

- Participated in improving the packaging machine technique including CAD modeling and Automation.

Award

- Distinction graduates in Shanghai University Jun. 2022
- First Prize Academic Scholarship of Shanghai University Nov. 2021
- Self-improvement Scholarship of Shanghai University Nov. 2021
- Arts and Sports Scholarship of Shanghai University Nov. 2021
- MIT courses certification: Applying Machine Learning to Engineering and Science Sep. 2021

- The Fourth Place in University Bodybuilding Competition May 2021
- The First Prize of "GENGQI" Scholarship of Shanghai University Mar. 2021
- The Second Prize of Shanghai "SHANGTU Cup" Technology & Innovation Competition (Siemens NX) Nov. 2020
- Leadership Scholarship of Shanghai University Nov. 2020
- The (team) First Prize in Chinese University American Football League, Shanghai Division Dec. 2019
- The Fourth Place in Shanghai College Student Powerlifting Competition (Men's 102kg category) Apr. 2019

Activity

- Student Body-Building club of Shanghai University, Minister Oct. 2018 – Jun. 2019
- Student athlete on Football team "Bombers" at Shanghai University, (OL) Mar. 2019 – Jun. 2022

Skill & Certificate

Computer: Programming: Python, C/C++, ROS, ROS2

Professional Software: MATLAB/SIMULINK, CATIA, Siemens NX, SolidWorks, Altium Designer, Abaqus

Certificate: Siemens Digital Industries Software Certified CAD Associate Engineer