Tianyi Xiang

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EDUCATION

- **Yale University** — New haven, US
  Master of Science (MS) in Mechanical Engineering & Material Science — *Aug.2024 – Jun.2025*

  Core Modules: Deep-learning on Graph structure, Neural networks & Learning System, Linear System, Computer-Aided engineering

- **Xi'an Jiaotong-Liverpool University (XJTLU); Rank 1/36** — Suzhou, China
  BEng Mechatronics and Robotic Systems; Major GPA: 4.0/4.0 — *Fall 2020 – Summer 2024*

  Core Modules: Dynamic Systems, Instrumentation and Control, Mechanical Engineering Design, Machine Learning, Industrial Automation and Robot Control, Robotic Systems, Pattern Recognition

PUBLICATIONS

[1] **Tianyi Xiang**[1], et al., "A Novel Approach to Grasping Control of Soft Robotic Grippers based on Digital Twin," 29th *International Conference on Automation and Computing (ICAC 2024)(Accepted)* ;

[2] **Tianyi Xiang**[1], et al., "Development of a Simple and Novel Digital Twin Framework for Industrial Robots in Intelligent Robotics Manufacturing," 20th *International Conference on Automation Science and Engineering (CASE 2024)(Accepted)* ; Video

RESEARCH EXPERIENCE

- **A Novel Approach to Grasping Control of Soft Robotic Grippers based on Digital Twin**
  Research Assistant, XJTLU, Pdf — *Sep.2023 - present*

  - Proposed a Digital Twin (DT) framework for real-time motion and pose control of pneumatic flexible gripper in Unity3D, while the result satisfy industrial application manipulation
  - Constructed the four-section piecewise constant curvature flexible gripper model kinematics and pure mathematical simulation in Unity3D, achieved maximum task space error 3.4%
  - Implemented specific mapping by OpenCV image processing calibration method with gemini-pro 3D depth camera

- **Trajectory Planning, intelligent control and rocker-bogie Coordination of Mars Rover**
  Independent Research , XJTLU, Video — *Sep.2023 - present*

  - Recreating the rover's rocker-bogie suspension dynamic modeling system with servo and DC motor
  - leveraging Radar, Depth Cameras, and Simultaneous Localization and Mapping (SLAM), incorporating deep Reinforcement Learning for obstacle detection and avoidance
  - Designing and optimizing the trajectory strategy based on the Genetic Algorithm(GA) and geometrical interactions

- **Development of a Simple and Novel Digital Twin Framework for Manufacturing Robots**
  Research Assistant, XJTLU, Advisor: Dr.Quan Zhang; Pdf; Video — *Jun.2023 - Apr.2024*

  - Enabled a Simple and Novel Digital Twin System based on C# and Robot Web Service (RWS) in Unity 3D and Web-based Platform, discarding the traditional 3rd party tools like ROS and costly device like PLC, but achieving efficient communication with $17ms$ Refreshing Rate.
  - Integrated the real-time path planning based on Levenberg-Marquard Inverse Kinematics Numerical Solution executed in MATLAB, achieving X-Y-Z Global Linear Motion Control and Multi-Joint Motion Control with Reachability 100%, and Accuracy 100%.
  - Created a User-friendly Web-based Platform by WEBGL with a Remote Surveillance Camera, and easy accessible Graphical User Interfaces (GUI) including functions like Pointer Operation, I/O System Operation in real-time control

- **The dynamic optimization of Automated Guided Vehicle (AGV)**
  2022 ABB Smart Innovation Competition: First prize; Intro — *Jun.2022 - Sep.2023*

  - Applied dynamic optimization of local trajectory planning through LQR, Dual-loop PID, stanely method, and MPC Motion control algorithms to AGV incorporating B-spline and A-star method, with simulation and modelling in Automation studio, MapleSim, and Scene Viewer
  - Designed self-supervised spline interpolation techniques to generate control points, achieving a maximum deviation of lower 50%(in unit) in critical turning areas in rare 3% occurrence probability

- Innovatively utilized intelligent visual distance-refresh methodology to compensate the non-completely homogeneous trajectory points due to B-spline planning incorporating with dual-loop PID
- Obtained the sliding friction coefficient 0.2, by tire Magic Fomula to render the control algorithm designed applicable

- **Dynamic Optimization of ROS SLAM for Autonomous Vehicles**
  Independent research, XJTLU, video   *Jun.2022 - Aug.2022*

  - Developed and implemented a SLAM-based navigation system for an autonomous vehicle with radar using ROS and Gazebo
  - Leveraged AMCL for adaptive localization and differential drive controllers, combining with Move_Base for efficient navigation in simulated environments.
  - Optimized traditional path planning methodologies (e.g., A* and RRT), achieving a 30% increase in localization accuracy and a 25% reduction in computational overhead, significantly enhancing both precision and efficiency.

- **Optimization Design and Simulation of Low Reynolds Numbers Turbojet Aircraft**
  Research Assistant, XJTLU, Advisor: Dr.Quan zhang ; Introduction   *Apr.2022 - June.2022*

  - Optimised and modeled attack angle of $10.4°$ of AVERJANO type airfoil to obtain the minimum drag-lift ratio under low Reynolds number atmosphere ($Re = 50000$) through PROFILI numerical solution;
  - Designed and built mathematics model of the turbojet engine, and analyzed the accuracy of 63.7% compared with calculation through ANSYS Fluent workbench (finite element analysis) simulation, optimizing the fuel injection rate during taking-off period performance via numerical simulation;
  - Selected manufacturing materials for enhancing environmental adaptability; designed the assembly of actuators, materials, and power supply to deliver the specified mobility, power, robustness, and compactness.

Awards and Honors

2024	*Best Overall Academic Performance (Rank 1 Overall)*	*Xi'an Jiaotong-Liverpool University*
2023	*University Academic Excellence Award (Rank 1/36)*	*Xi'an Jiaotong-Liverpool University*
2023	*University Summer Undergraduate Research Fellow*	*Xi'an Jiaotong-Liverpool University*
2022	*ABB Smart Innovation Competition: First prize(Rank 3/275)*	*ABB, B&R Industrial Automation*
2022	*University Academic Excellence Award (Rank 1/64)*	*Xi'an Jiaotong-Liverpool University*
2022	*University Summer Undergraduate Research Fellow*	*Xi'an Jiaotong-Liverpool University*

Teaching Experience

- **Research Assistant**
  XJTLU, Suzhou, China   *Fall 2023 – Spring 2024*

  - PID parameterization and tuning for the servo motors which drive for the Cartesian robot station and Tripodworkstation, respectively
  - Designed the coding and implementation platform in Automation Studio affiliated to B&R Co.
  - Applied servo motor control system and mastered the basic operation of its maintenance

Skills

- **Programming**: C/C++/C#, ARM assembly, MATLAB, RAPID, KRL, Python, ST
- **Tools**: Visual Studio, Blender, Unity 3D, SolidWorks, Fusion 360, PTC cero, CAD, Origin, MATLAB, SIMULINK, Carsim, LTspice, ANSYS Fluent, ROS, Dr. Frame, OfficeLite , RobotStudio, Automation studio
  , Malpsim, Scene viewer, Profili
- **Language**: Mandarin(Native), English(Fluent, IELTS 7.0)