Junyi Lei

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EDUCATION

Beijing University of Technology Beijing, China
Bachelor of Engineering Sep. 2019 - Jul. 2023

- **Department:** College of Materials Science and Engineering
- **Major:** Mechanical Engineering
- **Final Result:** 86.43/100; 3.70/4.0

SELECTED RESEARCH EXPERIENCE

Design and Simulation of the Control System for Welding Torch Height Adjustment
***Graduation Design* | Supervisor: Prof. Chaoyang Yan, Beijing University of Technology** Jan. 2023 - Jun.2023

- Designed an actuator based on a ball screw, enabling precise adjustment of the welding gun height, and employed traditional PID and fuzzy PID control methods in conjunction with the characteristics of welding additive manufacturing to ensure the efficiency of the control system.
- Completed the simulation modelling of the mechanical system in the MATLAB/Simulink environment, constructed a fuzzy controller, and utilised online measured arc voltage data for dynamic feedback to adjust the welding gun height in real-time, thereby validating the reliability of the control effects.
- Addressed the suboptimal control effects caused by improper parameter settings in the fuzzy control system by referencing the designs of other similar systems and optimised the control strategy through a combination of experience and data adjustments, resulting in improved dynamic characteristics and stability of the system.

A Design of Automated Guided Vehicle Obstacle Avoidance System Based on LiDAR for Unmanned Warehouses
Research Project Jan. 2023 - Mar.2023

- Designed an obstacle avoidance system for an unmanned warehouse automatic guided vehicle (AGV) based on laser radar, utilising radar scanning technology for map construction and enabling real-time identification of sudden obstacles on the trajectory, thus achieving efficient logistics transportation.
- Employed AMCL technology for real-time localisation in the project, ensuring the accuracy of AGV positioning in dynamic environments while enhancing its navigation capabilities in complex warehouse settings.
- Addressed the conflicts between global and local trajectory planning by assigning different weights to each, allowing the AGV to flexibly adjust its path when encountering sudden obstacles.
- Completed this research with the publication of the paper, which has been included in the proceedings of the 2023 4th International Conference on Mechanical Engineering, Civil Engineering and Material Engineering (MECEME 2023).

Electromechanical System Simulation Course Design
Course Project Oct. 2022

- Served as the team leader, utilised AMESim software to build a hydraulic cylinder control model, performed systematic Laplace transformation of the transfer function, and established a control algorithm framework to ensure the accuracy.
- Employed the PID control algorithm to calculate the system's dynamic response under step and sinusoidal signal inputs, conducted simulation validation in AMESim, and performed an in-depth comparison with theoretical calculation results to analyse the control performance and stability.

Sensing and Testing Course Design
Course Project Apr. 2022

- Served as the team leader during the sensing and testing course design, utilised LabVIEW to build a virtual instrument system, and achieved real-time analysis and processing of the electrical signals collected from temperature sensors using a PC as the host computer, ensuring the accuracy of data conversion.
- Took responsibility for the design of the temperature data processing algorithm, implemented the conversion of electrical signals to temperature data through LabVIEW, optimised the data acquisition and analysis process, and improved the automation level of the experiment and the reliability of the data.

Mechanical Manufacturing Process Course Design
Course Project Oct. 2021

- Served as the team leader during the mechanical manufacturing process course design, calibrated the parameters of the reducer based on working conditions, and formulated a detailed machining process flow for the components to ensure the efficiency and accuracy of the manufacturing process.
- Utilised NX software to write the CNC machining programme and conducted simulation validation; employed DEFORM software for heat treatment simulation, which optimised the reducer components process and enhanced reliability.

Microcontroller System and Virtual Simulation
Course Project May. 2021

- Designed a closed-loop temperature control system based on the 8052 microcontroller, completed a non-electric signal conversion and data acquisition module, and implemented PID control algorithms to achieve precise temperature control.
- Utilised Proteus software to build a virtual simulation model of the temperature control system, ensured the system's stability and efficiency in practical applications through simulation testing and optimisation of the control circuit and enhanced the control accuracy.

Mechanical Principles Course Design

***Course Project* | Supervisor: Prof. Ziqiang Zhang, Beijing University of Technology** Apr. 2021

- Served as the team leader to design a flapping-wing linkage mechanism, conducted a dynamic analysis considering air resistance and gravitational forces, and derived the corresponding dynamic equations, which were solved numerically using MATLAB.
- Constructed a three-dimensional model of the linkage mechanism using ADAMS software, performed simulation validation to ensure the accuracy of the computational results, and applied a genetic algorithm for optimisation analysis of the forces acting on the mechanism to enhance its motion performance and efficiency.

ACADEMIC COMPETITION EXPERIENCE

10th National College Mechanical Innovation Design Competition: Biomimetic Centipede Robot

***National Second Prize* | Supervisor: Prof. Ziqiang Zhang, Beijing University of Technology** Sep. 2022

- Utilised ADAMS software to construct a motion model of the mechanism, calculated motion trajectories, ensured the feasibility of the design scheme, and conducted mechanical analysis of the structure, enhancing the precision and stability of the design.
- Responsible for designing the actuators and conducting finite element analysis using ANSYS to identify failure causes in load-bearing components, ensuring that the final product met functional requirements through multiple design iterations and optimisations, thereby improving overall performance.
- Gained in-depth knowledge of the entire process of machine design and assembly, enhancing practical skills, and effectively applying classroom knowledge to strengthen comprehensive abilities in the field of mechanical design.

2021 National College Student Mathematical Modeling Competition

Beijing Third Prize Sep. 2021

- Organised the team during the 2021 National College Student Mathematical Modeling Competition, researched the background information of the problem, ensured that all members had a clear understanding of the issues, and coordinated the work of each member, thereby enhancing team collaboration efficiency.
- Utilised MATLAB to develop programmes for numerical solutions of nonlinear equations, successfully transformed complex engineering problems into mathematical expressions, overcame difficulties due to unfamiliarity with the problem background, and improved the accuracy and reliability of the model.

EMPLOYMENT HISTORY

BYD Precision Manufacture Co., Ltd. Beijing, China

Structural Engineer Jul. 2023 - Feb. 2024

- Responsible for the installation and calibration of the vehicle multifunction camera (MPC) and millimetre-wave radar in advanced driver assistance systems (ADAS), ensuring their compatibility across different vehicle models and providing technical support for the enhancement of overall vehicle functionality.
- Designed a pre-calibration fixture for the camera before installation, successfully optimising the production process, enhancing production efficiency, and reducing calibration time.
- Participated in the evaluation and comparison of technical solutions from multiple suppliers, conducting on-site tests and providing improvement suggestions to ensure the fulfilment of system functional requirements and enhance the overall performance of the driver assistance system.

ADDITIONAL INFORMATION

- **Modelling and Simulation Software:** MATLAB, ANSYS, ADAMS, AMESim, Gazebo, SolidWorks, AutoCAD, Creo
- **Robots and Control Systems:** ROS, LabVIEW
- **Circuit Design and Simulation:** Proteus
- **Programming Language:** C