

Wenhao Liu

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EDUCATION

University of Southern California (USC)
Master of Science in Electrical Engineering

Los Angeles, United States
Starting Spring 2024

Beijing Information Science & Technology University (BISTU)
Bachelor of Engineering in Electrical Engineering and Automation
Overall GPA: 86.8/100 (Top 5%)

Beijing, China
Sep. 2018 - Jun. 2022

Honors & Awards:

Second Place Scholarship for Academic Excellence (2020 & 2021), Second Place Technological Innovation Scholarship (2021), Third Place Technological Innovation Scholarship (2020)

Second Prize in 2021 China Intelligent Manufacturing Challenge (North China), First Prize in 2020 School-wide College Students' 'Internet+' Innovation and Entrepreneurship Competition, Second Prize in the Rescue Robot - Environment Independent Mapping Project in 2019 China Robot Competition

PUBLICATION

Liu, Wenhao. "Application of EEG in wearable brain-computer interfaces." *International Conference on Intelligent Traffic Systems and Smart City (ITSSC 2021)*. Vol. 12165. SPIE, 2022.

RESEARCH EXPERIENCE

Design and Implementation of Permanent Magnet Synchronous Motor Control System Based on CAN

Bus

Feb. 2022 - Jun. 2022

Graduate Project, instructed by Senior Experimentalist Ming Xiong, BISTU

- Learned the mathematical model and derivation process of permanent magnet synchronous motor and magnetic field-oriented control through reading literature
- Calculated the initialization parameters of the motor driver chip and the device selection parameters in detail; selected the appropriate inverter circuit and protection device according to the results; designed and welded the hardware circuit
- Realized the functions of CAN communication, timer PWM trigger ADC injection sampling and magnetic field-oriented control by programming based on the latest version of the HAL library
- Debugged the PI parameters of the current loop, speed loop and position loop and achieved the control effect basically

Design of Wearable ECG/EEG Sensor Technologies

Jun. 2021 - Jul. 2021

Online Learning Program, instructed by Prof. Patrick Mercier, University of California, San Diego

- Developed a low-power biomedical instrument amplifier for electrocardiography (ECG) and electroencephalography (EEG) detection in need of higher gain, specified bandwidth, high common-mode rejection ratio (CMRR) and low noise
- Utilized analog front-end of wearable brain-computer interface (BCI), especially electrode and amplifier, in LTSpice
- Exploited classical machine learning algorithms which were suitable for EEG signals like common spatial pattern and long short-term memory network

INTERNSHIP EXPERIENCE

Institute of Automation, Chinese Academy of Sciences

Research Intern

Beijing, China
Aug. 2020 - Sep. 2020

- Implemented a convolutional neural network model to boost garbage classification efficiency and accuracy
- Applied ReLU activation function to avoid gradient vanishing problem
- Optimized training time by implementing residual neural network, which utilizes shortcut connections

- . Set the automatic decline learning rate, including the learning rate decay period and decay multiplier factor, for stability and convergence of the model
- . Trained the model with thousands of common garbage pictures with 100 iterations per training, which lasted around half an hour, resulting in a model accuracy of 0.85

PROJECT EXPERIENCE

Simulation of Asynchronous Motor Vector Controlled Frequency Conversion and Speed Regulation System Based on MATLAB Sep. 2021

- . Built circuit modules in Simulink to generate current hysteresis band pulse-width modulation
- . Regulated rotating speed after inserting asynchronous motor equivalent dynamic model, Clarke and Park transforms, rotor flux linkage
- . Tuned parameters that affected overvoltage and overcurrent in order to maintain voltage and current within the allowed range and short response time
- . Adjusted to preset rotating speed in a short period of time after sudden big load and barely fluctuated after sudden small load during simulation

Product Analysis of Schneider Electric (China) Co. Ltd Jul. 2021

- . Researched from EcoStruxure, Schneider's Internet of Things (IoT) platform, on the key products, including uninterrupted power supply (UPS), Programmable Logic Controller (PLC), Contactor, etc.
- . Read the above-mentioned product catalog and corresponding product description, namely Back-UPS, Modicon PLCs, and TeSys Giga Contactors, then picked UPS as the main research object based on their application scenarios, working principle, function characteristics, and much more
- . Listed four recommendations for improvements on functionalities and batteries after looking up the UPS BR550G-CN user manual and common problems
- . Extracted related electric automation standards after consulting national criteria, such as energy efficiency through automation systems, Technical specifications of the intelligent remote terminal unit of distribution automation, etc.
- . Understood Schneider's market advantage and profit model via financial reports

Design of Switching Power Module Parallel Power Supply System Mar. 2021

- . Calculated capacitance and inductance based on ripple voltage and current requirement
- . Drew the PCB circuit in Altium Designer with proper electronics such as microcontroller unit, power circuit, voltage and current sensor circuit, and much more
- . Programmed the algorithms for tracking differentiator, linear automatic disturbances rejection controller (ARDC), and extended state observer in MATLAB

Industrial Automated Visual Inspections for Camera Lens Defect Based on MATLAB May. 2020

- . Used MATLAB to develop computer vision approaches to detect and localize anomalies in the camera lens on the phone automatically so as to substantially reduce the workload and costs
- . Cropped and merged camera lens images by using imbinarize, imfill, bwareaopen, and imincomb functions
- . Obtained coordinates and completed design via imfindcircle and ndgrid functions
- . Awarded third prize in 2020 school-wide mathematical modeling and computer application

SKILLS

- . Language Ability: Chinese (Native), English (Professional)
- . Programming Language: Python
- . Professional Software: MATLAB, Simulink, Altium Designer, Autodesk Fusion 360