Xiang Zhang

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EDUCATION

Queen's University, Dept. Electrical and Computer Engineering, *Kingston, Canada*
Master of Applied Science, Advisors: Dr. Praveen Jain and Dr. Shangzhi Pan *Jan. 2021 – Now.*
GPA: 4.00 / 4.00

Wuhan University, School of Electrical Engineering and Automation, *Wuhan, China*
Bachelors of Electrical Engineering, Advisor: Dr. Meng Huang *Sep. 2016 – Jun. 2020*
GPA: 89.33 / 100, Rank 27/304, Graduation with honor

Mcmaster University, Dept. Electrical and Computer Engineering, *Hamilton, Canada*
International Exchange Student *Jun. 2019 – Nov. 2019*
One of 30 selected students across all undergraduates in Wuhan University funded by CSC

PUBLICATIONS & AWARDS

Publicaitons:

1. **[Draft] X. Zhang**, S. Pan, and P. Jain, "Multiphase symmetrical coupled resonant converter: Enhanced current balancing and Rotation phase-shedding Control" Submitted to IEEE Transactions on Power Electronics.
2. **[Draft] X. Zhang**, S. Pan, and P. Jain, "Current sharing in multi-phase/multi-module converters: a technical review" prepared to be submitted to IEEE Transactions on Power Electronics.
3. **[trans TPEL] X. Zhang**, S. Pan, and P. Jain, "A Discrete Coupled Multiphase Interleaved LLC Converter With Symmetrical Components Analysis," IEEE Transactions on Power Electronics, vol. 38, no. 11, pp. 14150–14165, Nov. 2023, doi: 10.1109/TPEL.2023.3279822.
4. **[ECCE' 2023] X. Zhang**, S. Pan, P. Jain, "Discrete Symmetrical Coupled Inductor Structure and its Matrix-type Implementation for DC-DC Converter," in 2023 IEEE Energy Conversion Congress and Exposition, Nashville, TN, 2023.
5. **X. Zhang**, T. Li, S. Peng, C. Hu, R. Sun, and M. Huang, "Control system of Internet of Things energy router," Chinese Patent, CN209608395U, Nov. 08, 2019.

Scholarships:

- NSERC Graduate Research Fellowship of Queen's university ($23000/year, 2021-2023)
- Graduate Fellowship of Mitacs Globalink, Canada ($15000, 2022)
- Outstanding undergraduate intern scholarship awarded by China Scholarship Council ($5400, 2019)
- Scholarship of Academic Excellence of Wuhan University (Once a year, 2x first class, 5%, 1x second class 10%, 2017-2020)

Awards:

- Prize for Outstanding Undergraduate Thesis of Wuhan University(15%)
- First Prize in 2019 "The Challenge Cup Academic Competition" in Hubei Province (10%)

RESEARCH EXPERIENCE

Discrete Symmetrical Coupled Magnetics application in Multi-phase Interleaved LLC Converters
Guide: Dr. Praveen Jain, Dr. Shangzhi Pan, Kingston, ON *May. 2022 – May. 2023*

- Innovatively introduced the symmetrical components theory into high frequency resonant converters to explain the current sharing behavior of the mulitphase system, expanding the coupled magnetics application to all odd-phase interleaved resoannt converters, providing an assessment method of current balancing ability under sequence impedance;
- Proposed a magnetics coupling structure that inherently balances the current in the multiphase interleaved LLC converter, reducing the current sharing error from 40-60% to 2-5% in multiphase system;
- Implemented a complete control architecture that incorporates both enhanced current balancing algorithm and phase-shedding operation, further reduce the current sharing error from 2-5% to 0.3-0.5% level.

Precise Digital Control Architecture for Multi-phase Resonant Converter with Adaptive Voltage Positioning
Guide: Dr. Praveen Jain, Dr. Shangzhi Pan, Kingston, ON *Jun. 2021 – May. 2022*

- Investigated the mechanisim of charge bang-bang control, state trajectory control in resonant converters, constructed a detailed time-series model of CLL and LLC resonant tank, with VHDL based control algorithm;
- Expanded the adaptive voltage positioning techniques from multi-phase buck converter to multi-phase resonant converter.

Three-phase PV Micro Inverter with Power Decoupling Quad Active Bridge
Guide: Dr. Shangzhi Pan, Kingston, ON *Jul. 2020 – May. 2021*

- Investigated and modeled magnetic power decoupling characteristic of quad active bridge structure, formulated a numerical based modulation algorithm for ripple cancellation to minimize the micro inverter capacitors' requirement;
- Carried out the verification experiment of the proposed three-phase micro inverter based on GaN switches, resolved driver design and corresponding testing problems of wide-band-gap devices.

Modular Design of low-power Iot Smart Switch System
Guide: Dr. Meng huang, Wuhan, China *Nov. 2019 – May. 2020*

- Designed a smart switch system with integrated flyback regulators, aiming for the smart home lighting application;
- Implemented a stable output voltage positioning using the programmed current controller with a feedback optocoupler;
- Constrained energy loss to mW criteria by deploying burst-mode control to providing intermittent operation;
- Installed replaceable Bluetooth modules to the system to achieve IoT versatile operational commands.

Power System Dynamic Database
Guide: Dr. Tang Chi, Hamilton, ON *Jun. 2019 – Nov. 2019*

- Organized and Reprocessed the dynamic data from online technical reports and government official documents referring bulk electrical system in Ontario to simplify the structure of Ontario power grids;
- Designed an adaptive online database to sort, store and modify the changing data in Mysql;
- Coded a users' interface program to export information from the database to PSS/E using python and SQL;
- Verified the dynamic model under system disturbance and proposed an optimum generation planning for the current Ontario power grid in PSS/E software.

Controlling Strategy for DC Micro-grid with Multi-port Converter
Guide: Dr. Meng huang, Wuhan, China *Jan. 2018 – Jul. 2019*

- Modeled and analyzed the stability of the system with rapidly changing load and nonlinear load, hardware verification are implemented with single DC bus with paralleled DC-AC inverters and DC-DC converters, and ARM-FPGA co-processor;
- Tested Droop and P&O and MPPT control strategies for cascaded converters under islanded mode and grid-tied mode;
- Compiled control strategies based on C language with high-speed ADC with a DMA controller, ameliorated the system by attaching a communication platform to the microgrid, under Modbus protocol.

WORK EXPERIENCE

SPARQ SYSTEMS Inc, *945 Princess Street, Kingston, ON, K7L 0E9*
Testing Engineer *Aug. 2022 – Jun. 2023*

- Responsible for the massive production burning test design and setup for the industrial Quad-2000 micro inverter;
- Performed as overseas communicator for factory manufacture, user manual, datasheet proofreading and translation.

HUAWEI Digital Power Technologies Co. Ltd, *Wuhan, China*
Hardware Application Intern *Aug. 2020 – Nov. 2020*

- Completed process of single-board hardware development from component selection, schematic design to SDV testing.

TEACHING & SERVICE

Journal Reviewer: IEEE Transactions on Power Electronics
Teaching Assistant: ELEC371: Microprocessor Interfacing and Embedded Systems, Queensu, 2022; APSC200: Engineering Design and Practice II, Queensu, 2021
Community: Undergraduate summer exchange intern with Wuhan University and Cambridge University (Language, Culture & Society Track), 2017; Debate club leader in School of Electrical and Automation Engineering, Wuhan University, 2016-2018; Representative of external affairs department in students' union, Wuhan University, 2017-2018

SKILLS & OTHERS

Programming Skills: Excellent in C/C++, Proficient in Python, VHDL/Verilog, SQL, and JavaScript
Hardware Skills: TI C2000 DSP, STM32 M3/4, Altera/Xilinx FPGA, Zynq, Arduino
Software Skills: Matalab, Simulink, LabVIEW, PSIM, SIMPLIS, LTSPICE, PLECS, PSS/E, PSCAD, Altuim Designer, PSS/E, ANSYS Maxwell, SolidWorks
Research Interests: Resonant Converter, Current Sharing, Symmetrical Coupled Magnetic, High precision digital Control
Language Capability: TOEFL 108(S22), GRE 323/ V154(64%)/ Q169(95%)/ Aw 3.5(39%)