**Chandan Sikder**
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**Summary:**
- 5+ years' experience in design of rotating electric machines using electromagnetic FEA tools (Flux2D, Maxwell, Comsol). Motor topologies include, but not limited to Switched Reluctance, Synchronous Machine, Brushless DC, IPM, Surface PM and Flux Switching PM machines. Developed a novel technique for cogging torque minimization by rotor pole shaping.
- 4+ years' experience of using structural FEA tools (Ansys Workbench 2D/3D) for structural design and NVH analysis of unibody and segmented stator for analysis of natural mode frequencies, stator deformation, noise and vibration. Developed a novel technique for mitigation of noise and vibration in a segmented stator structure by stator pole shaping.
- 5+ years' experience of complete motor drive operation, debugging, hardware implementation and troubleshooting from fractional HP to several HP three-phase drives. Drive topologies include standard 3-phase 6-switch inverter, controlled rectifiers, and custom switched reluctance drive topologies.
- 4+ years' experience with C-based implementation of control of several electric machine technologies including three-phase Induction Motor, IPM, BLDC, Flux Switching PM and switched reluctance machines using Microchip and TI Fixed Point DSP.
- 4+ years of experience in model based controller development and implementation using Matlab/Simulink and dynamic co-simulation with Flux2D. Developed and tested several control techniques including Volts/Hz and Field Oriented Control and custom multi-loop controller for SR drive.
- Professional experience in Embedded Programming for implementation of several motor control algorithms using both Autocode generation and hand coding using C/C++.
- Professional experience in developing and implementing model based control for power electronics converter/inverter and motor drives using Matlab/Simulink and TI C2000 series DSP.

**Education**

Ph.D.      NC State University
Electrical Engineering, Graduated May 2016
Dissertation title: *Design and Controller Optimization of Switched Reluctance and Flux Switching PM Machines.*

B.S.      Bangladesh University of Engineering and Technology
Electrical Engineering, Graduated November 2006

**Employment History**

**Senior Firmware Engineer, June 2016- Present**
**Low Voltage Drives Business, Rockwell Automation Global HQ, Mequon, Wisconsin**
- Real time control in motor drive and power electronics applications.
- Matlab/Simulink based design, modeling and automatic code generation for control of Front End Converter (FEC)
- Implementation and continuous improvement of Rockwell's High Performance Control (HPC) algorithm in FEC using TI C2000 series DSP microcontroller.
- Experimental verification and lab testing of HPC on FEC.

**Research Assistant, January 2012- May 2016**
**NSF Freedm Systems Center, NC State University**
- Lead the project of Flux Switching PM machine and collaborated with ABB USCRC accordingly.
- Performed detailed and extensive electromagnetic design and analysis of FSPM using FEA (Flux2D, Maxwell).
- Developed a novel cogging torque reduction method and design rule by geometric pole shaping using FEA (Flux2D) and verifying it analytically (Matlab/Simulink).
- Developed a model to predict natural mode frequencies for segmented structure. Developed a novel method and design guideline for reducing noise and vibration based on the model of segmented 12/10 FSPM by pole shaping, verified it analytically (Matlab/Simulink) and using structural FE (Ansys Workbench 3D).
- Designed a low-cogging torque, low-noise FSPM and built a prototype.
- Developed stator field oriented vector control of FSPM drive considering saturation and cross coupling using a complete co-simulation model with Matlab/Simulink and Flux2D.

- Experimentally implemented the dyno test setup of FSPM drive with the prototype built. Developed the required embedded C code to control the FSPM drive using Field Oriented Control technique in TI F28035 DSP. Tested and verified the machine performance parameters. Performed a steady state heat run.
- Published 2 papers and accepted for 2 more based on the research on FSPM.

**Intern Engineer, Machine Design, August 2013 – December 2013**
**ABB US Corporate Research Center, Raleigh, NC**
- Performed complete electromagnetic design, analysis and simulation of electrically excited synchronous machine with damper bars in the rotor using Matlab/Simulink and Flux2D.
- Performed theoretical analysis of placing damper bars and their optimum number/placement in the rotor using Matlab/Simulink
- Performed detailed design and analysis of electrically excited synchronous machine with damper bars using Flux2D.

**Research Assistant, January 2010 – December 2011**
**University of Akron, Akron, OH**
- Developed a novel controller to maximize efficiency and minimize ripple for a wide speed range for switched reluctance generator (SRG) operation using Matlab/Simulink.
- Implemented and verified the algorithm in Matlab/Simulink using a geometry based analytical model.
- Implemented and tested the controller performance on a 1kW SRG drive system using embedded programming into TI 320 F2812 DSP.
- Published 2 papers based on the development, implementation and testing of the novel SRG controller.

**Other Major Research Projects and Experiences:**
**Volts/Hz control and indirect vector control for a 3-Phase Induction Motor.**
**April 2012, NC State University**
- Developed and implemented Volts/Hz and Vector Control using Texas Instrument F28335 DSP and the drive board (HybridPack) by Infineon.
- Volts/Hz was tested experimentally (using Autocode generation) and Indirect vector control was verified in simulation (Matlab/Simulink).

**Battery modeling and management**
**April 2012, NC State University**
- Modeling of EDLC based on the charge/discharge data collected using ARBIN battery cycler module.
- Used the model for different discharge mode simulation and verified it with experimental results.

**Motor drive implementation and testing of a 200 W SRM**
**April-July 2011, University of Akron**
- Debugged the power converter circuit and interface control circuit of the SRM.
- Developed standard commutation angle based control for the three phase, 12/8 SRM.
- Developed the associated C++ code for TI 320 F 28035 microcontroller and tested it to successfully commission the SRM.

**Design, analysis and implementation of a closed-loop, current mode buck converter with output voltage control**
**March-June 2011, University of Akron**
- Designed the converter performing a theoretical analysis using perturbation method.
- Modeled and simulated the converter in open loop and closed loop using Matlab/Simulink
- Implemented and tested the open loop and closed loop converter for different range of input voltages.

**Skills/Software Knowledge and Proficiency**
- Electromagnetic FEA tools: Flux, Comsol and Ansoft Maxwell.
- Structural FEA for NVH analysis of electromechanical systems using Ansoft Mechanical APDL (2D) and Ansys Workbench (2D/3D).
- Design and verification of electric machines using CD-Adapco Speed.
- Modeling, design and simulation of motor-drives, controls and power electronic converter in Matlab/Simulink.
- Dynamic co-simulation of the motor-drive system using Simulink-Flux2D coupled simulation.
- Electric circuit design and analysis using Spice.
- Microcontroller programming using TI (F28xx family) and Microchip DSPs in C/C++.
- Standard laboratory equipment including oscilloscope, power analyzer, torque transducer and four quadrant induction motor drive for dyno speed/torque control.

**Major Course works:**
- Electric Motor Drives; Digital Signal Processing; System Simulation; Modeling and Control of Renewable Energy Systems; Power Electronics; Dynamics and Control of Electric Machines; Dynamics and Control of Power Electronic Circuits; Design of Electromechanical Systems; Electric Vehicle Systems; Power System Stability and Control.

**Publications:**
- *C. Sikder and I. Husain; "Stator Vibration and Acoustic Noise Analysis of FSPM for a Low-Noise Design," Accepted for Energy Conversion Congress and Exposition (ECCE), 2016 IEEE, 18-22 Sept. 2016.*
- *C. Sikder, I. Husain and W. Ouyang; "Design, Control and Implementation of a Non Rare Earth Flux Switching Permanent Magnet Machine," Accepted for Energy Conversion Congress and Exposition (ECCE), 2016 IEEE, 18-22 Sept. 2016.*
- *C. Sikder, I. Husain and W. Ouyang; "Cogging Torque Reduction in Flux-Switching Permanent Magnet Machines by Rotor Pole Shaping." September-October, 2015 issue of IEEE transactions on Industrial Applications, vol. 51, no. 5, pp. 3609-3619.*
- *C. Sikder, I. Husain and Y. Sozer; "Switched reluctance generator control for optimal power generation with current regulation," January/February, 2014 issue of IEEE transactions on Industrial Applications, vol.50, no.1, pp.307-316.*
- *C. Sikder, I. Husain and W. Ouyang; "Cogging Torque Reduction in Flux-Switching Permanent Magnet Machines by Rotor Pole Shaping." Energy Conversion Congress and Exposition (ECCE), 2013 IEEE, vol., no., pp.1555-1562, 15-19 Sept. 2013.*
- *C. Sikder, I. Husain and Y. Sozer; "Switched reluctance generator controls for optimal power generation with current regulation," Energy Conversion Congress and Exposition (ECCE), 2012 IEEE, vol., no., pp.4322-4329, 15-20 Sept. 2012.*

**References:**

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2. **Dr. Yilmaz Sozer**
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