Group 3

3.4 Optimized Switching Pattern Generator Embedded into an SoC, PI: C. Hatziadoniu, SIUC

Optimized Switching Pattern Generator For a SoC-Based Motor Drive

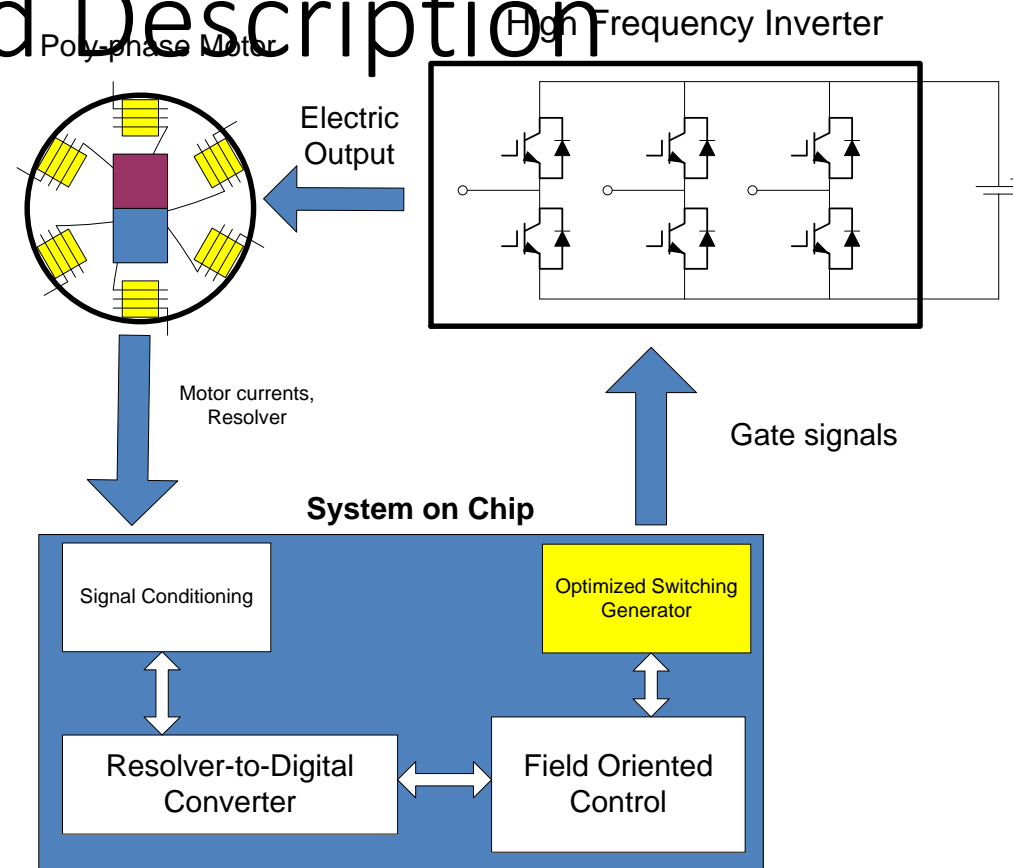Constantine J. Hatziadoniu, Professor, SIUC

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Project Overview and Description

- Project Description

  Develop and integrate into an existing SoC-based motor drive a switching pattern generator to reduce the inverter harmonic output.

- Problem

- Optimize the switching pattern of the inverter valves to reduce harmonic currents.

- Reduce EMI, inductive filter size.

- Implement the generator into the fabric of the SoC.

Poly-phase Motor

High Frequency Inverter

Electric Output

Motor currents, Resolver

Gate signals

System on Chip

Signal Conditioning

Optimized Switching Generator

Resolver-to-Digital Converter

Field Oriented Control

Approach

- <u>Approach:</u> Sigma/Delta Modulation;
  - Randomized switching spreading the harmonic spectrum of the currents.
- <u>Novelty:</u> Provide a complete motor control into the SoC.
- <u>Benefits:</u> The proposed project will result in significant reduction of hardware, including inductive filters to the motor. It will also reduce EMI.

Project Tasks/ Deliverables

	Description	Date	Status
1	Initial research	August	
2	Develop SIMULINK model	October	
3	Fabric programing	May	

- Initial research will determine the most effective switching technique for the motor.
- A SIMULINK model will be developed to assist in studying and optimizing the method
- The optimized switching generator will be programed into the fabric.

Executive Summary

- Inverter harmonics produce high frequency harmonic stator currents.

- Typically an inductive filter is needed to reduce these currents.

- A optimized switching pattern generator will reduce the harmonic output of the inverter and assist in reducing the inductive filter size.

- The proposed generator will be embedded into a SoC. The SoC already includes the motor drive control.

- The proposed project will create a complete motor-drive control integrated into a SoC.

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