Center for Embedded Systems

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Ground Work for Embedding a Field Oriented Motor Controller into A System on Chip

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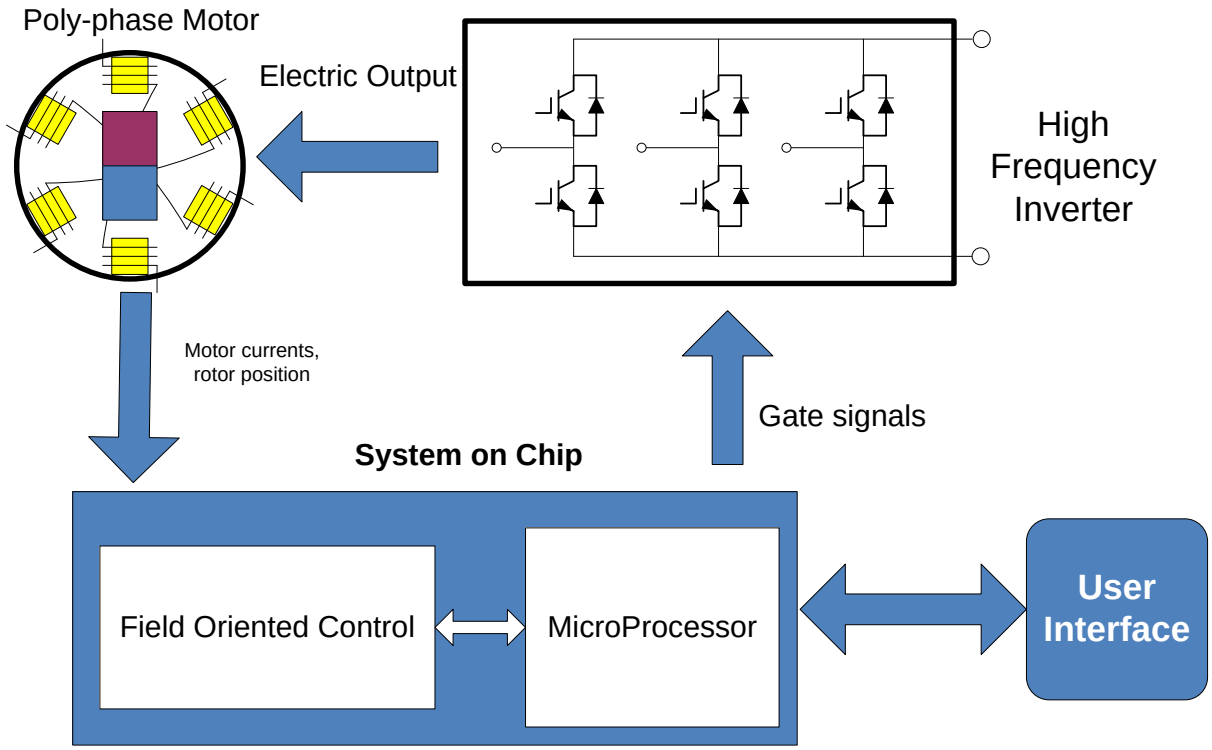
Project Overview and Description

- **This project will develop a field-oriented controller (FOC) for a poly-phase motor into a SoC.**
- **The SoC integrates an FPGA and a microprocessor.**
- **The computation intensive FOC will be implemented in the FPGA;**
- **The microprocessor will provide set points and supervision.**



Approach

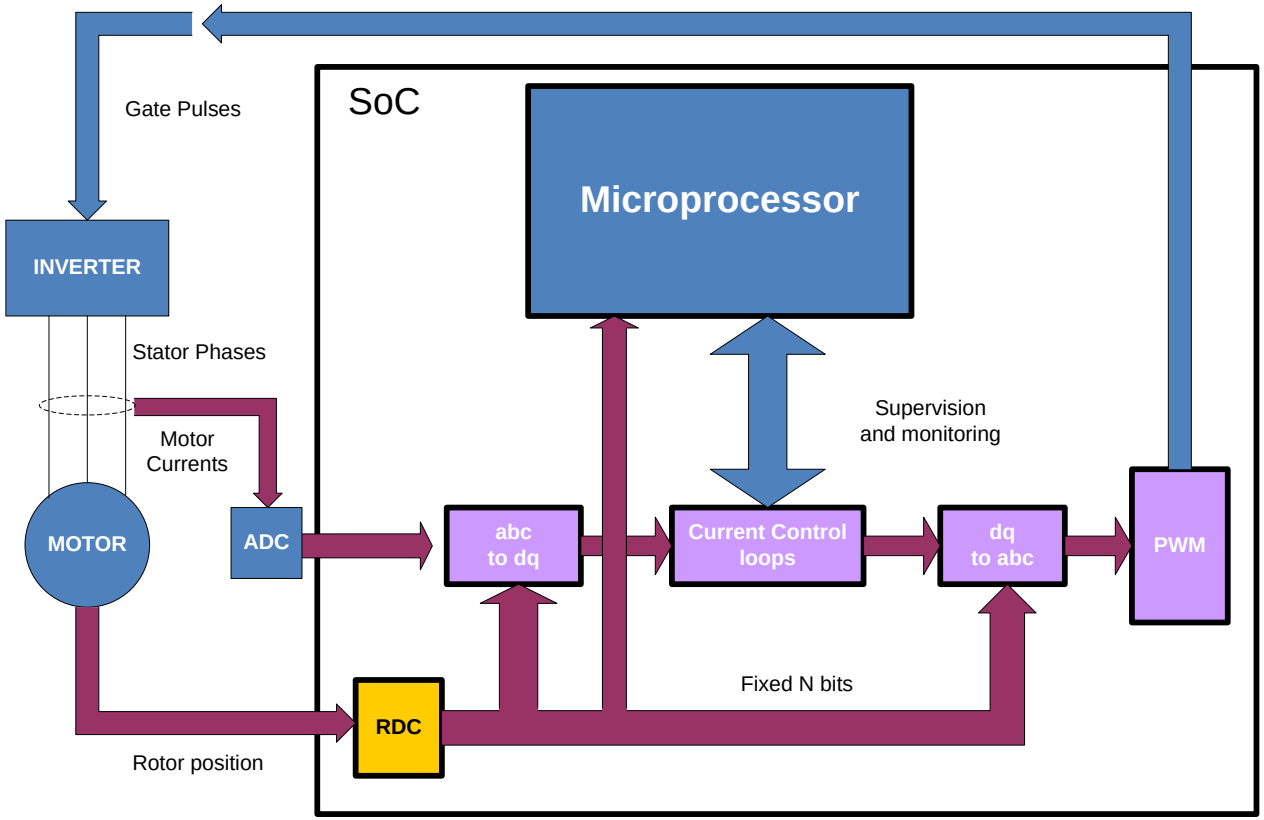
- **Development of a design method for an optimized FPGA-based FOC.**
  - Integrate the RDC developed by a previous project into the FPGA;
  - Investigate the number of bits used to represent numbers within the FPGA versus achieved control accuracy and stability.
- **The project will lay the groundwork for a subsequent development and testing of a complete motor drive controller including the high-level functions provided by the microprocessor.**
- **The project benefits electronics, heavy machinery, aerospace and other industries.**

Project Tasks/ Deliverables

	Description	Date	Status
1	Integration of the previously developed RDC into the FPGA	Aug-Nov	
2	Development of the optimized FOC algorithm	Aug-Jan	
3	Testing of the FOC algorithm into the FPGA	Jan-May	
4			
5			
6			

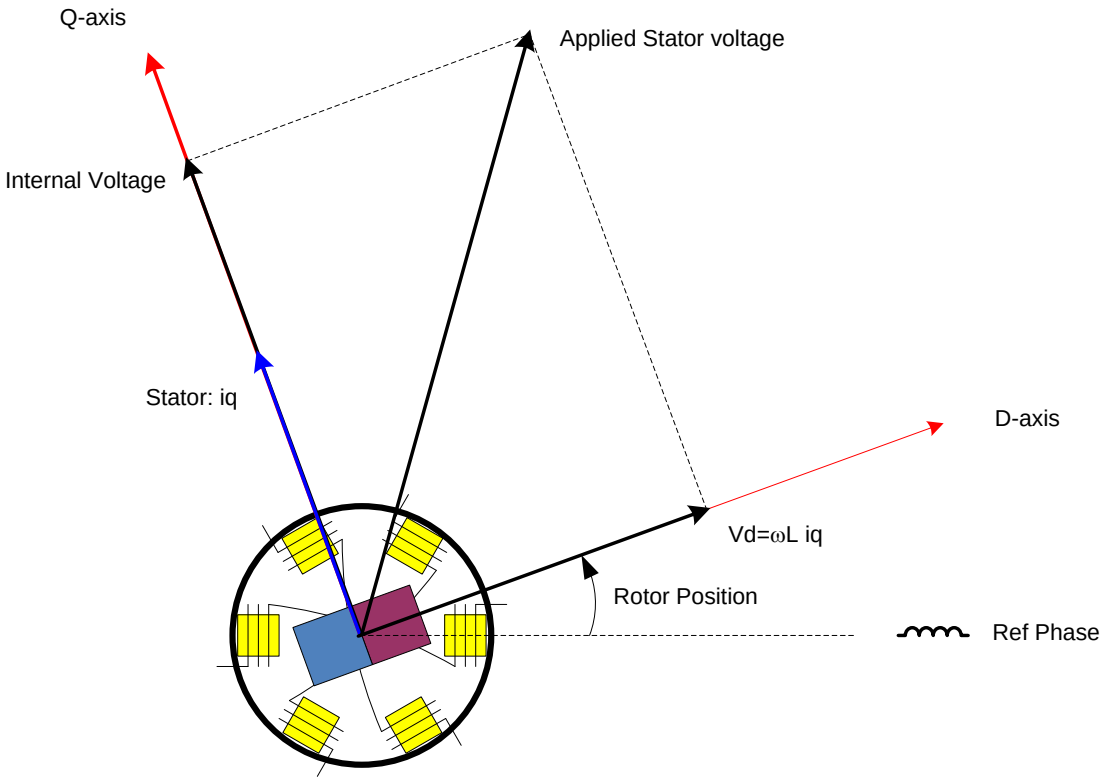
Technical Detail

- **The Closed-loop System**



Field-Oriented Control

- **Torque Generation in a PM Motor**
  - Iq is the torque producing component of the stator current.
  - Id is maintained at zero by properly applying the stator voltage



Stator Current Control