

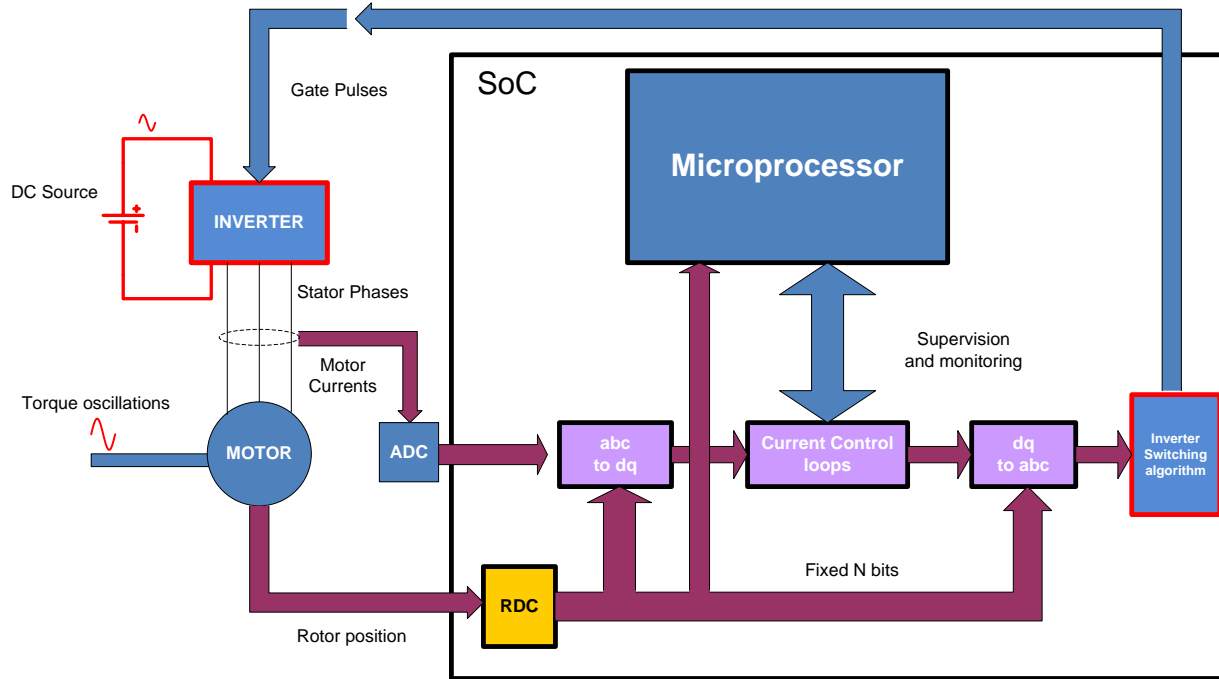
Embedded Controller for Reduction of Switching Harmonics and Torque Oscillations in a PMSM

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Project Overview and Description

- Design a control loop for an SoC embedded motor controller to:
 - Reduce overall switching harmonics and EMI.
 - Reduce motor torque pulsations.
- This project extends the work of two previous projects aimed at developing an SoC embedded controller for the PMSM:
 - Position resolving
 - Speed regulation
 - Low order harmonic current cancellation.

Project Overview and Description



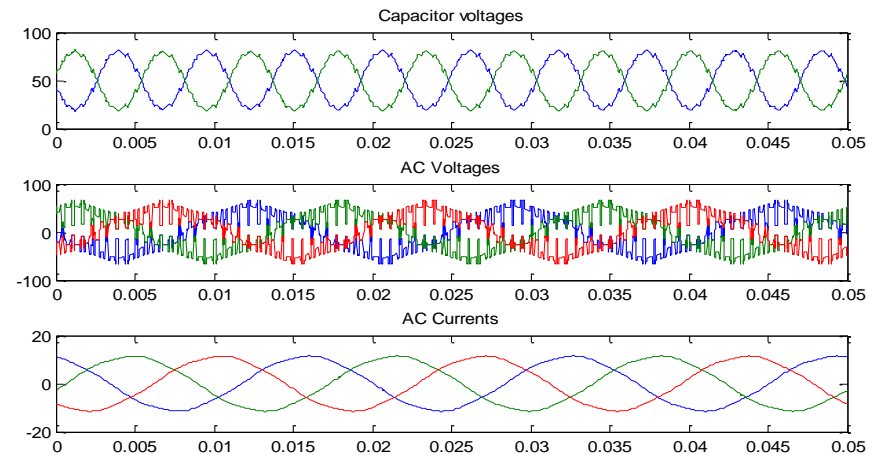
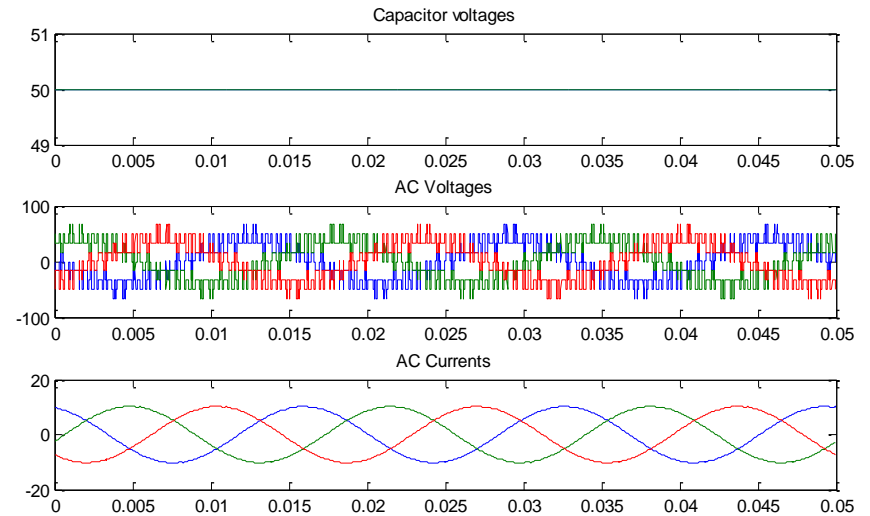
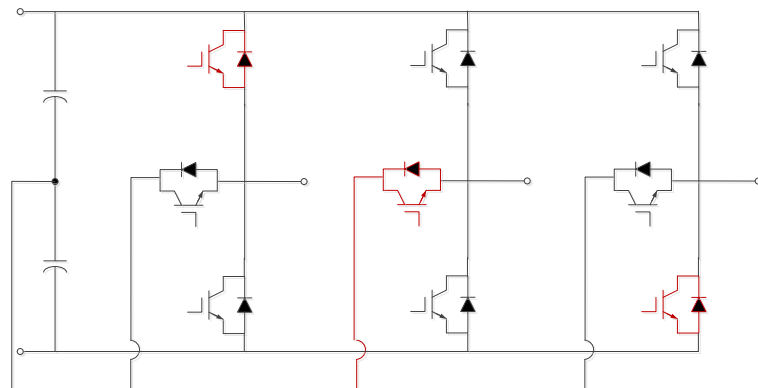
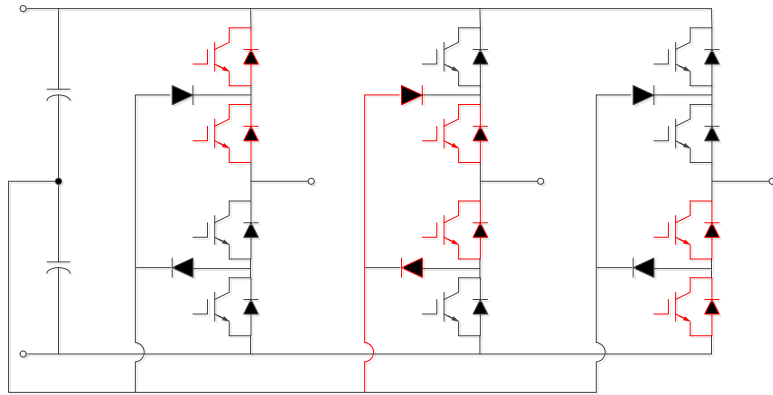
Problems:

- The motor of interest is the trapezoidal PMSM with an inherently distorted back emf.
 - This creates low order harmonics on the stator currents and on the torque.
- The switching action of the 2-level inverter creates high magnitude switching harmonics.
 - Increases EMI and filter size.

Approach

- Extend the harmonic cancellation methods developed in the previous project to address the torque pulsation.
- Investigate the application of the 3-level inverter to provide a smoother control of the motor decreasing the switching harmonics.
- The potential benefits from this project include an improved control of the PMSM and a reduced hardware size by embedding the control functions into a single chip.

Three-Level Inverter Arrangements



Project Tasks/ Deliverables

	Description	Date	Status
1	Literature review	Aug to Dec	
2	Development of methods	Dec to April	
3	Method testing	April to May	
4	Development of the deliverables (reports, models, programming).	May	
5			
6			

Executive Summary

- The PMSM controller is embedded into a SoC
- The controller has multiple functions
 - Speed regulation
 - Position resolving
 - Harmonic cancellation
- The project will
 - Investigate new inverter topologies for smoother control
 - Investigate techniques for decreasing torque harmonics.

