

# Center for Embedded Systems

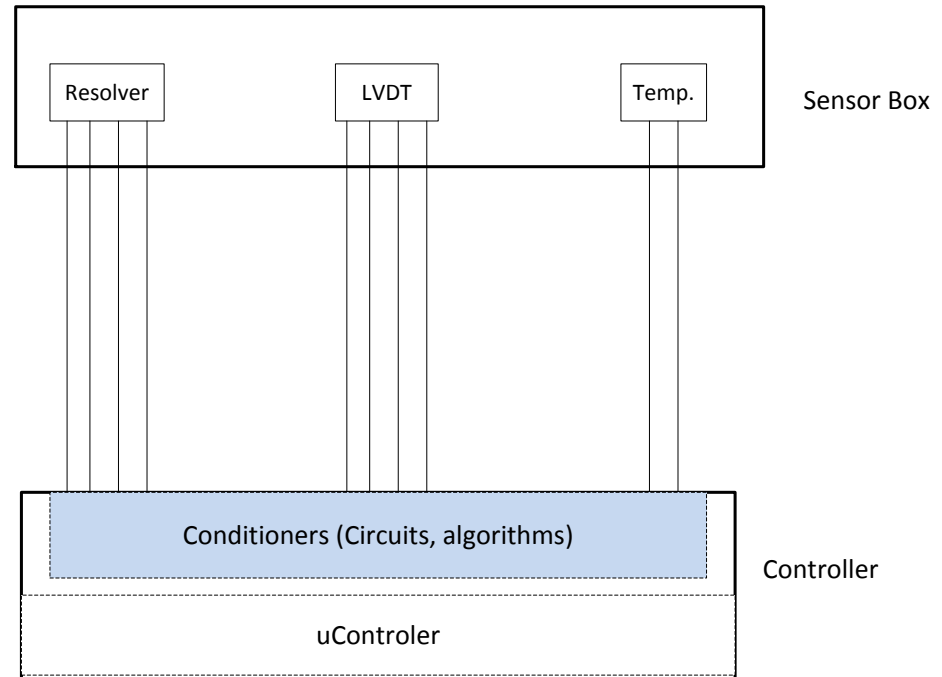
An NSF Industry/University Cooperative Research Center

Power-over-Communication approach for integrating remote  
sensors to motor drives.

C.J. Hatziadoniou  
Southern Illinois University Carbondale

# Project Overview and Description

The project proposes to eliminate heavy wiring between sensors and motor controller typically necessary in drive applications by using Power-over-Ethernet (PoE) or equivalent approach to transmit sensor output signals as well as to power sensor devices.



Presently as many as 12 wires must be connected between the sensor box and the controller, spanning a long distance.

# Approach

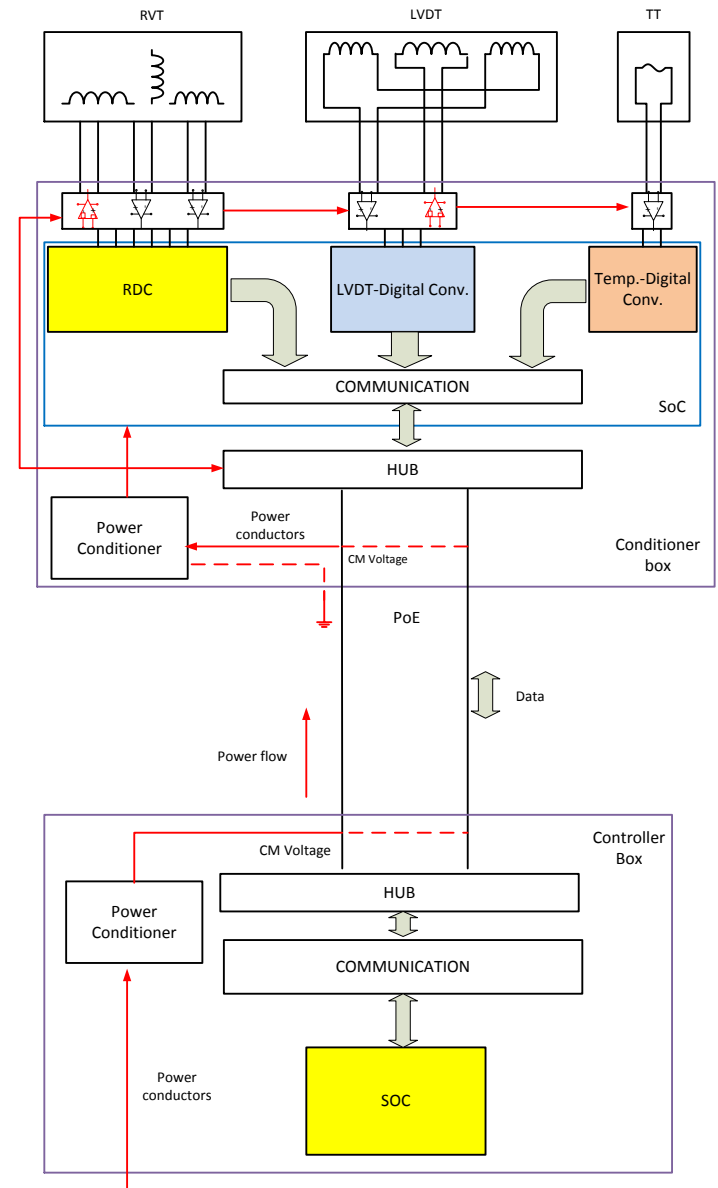
FPGA-Based Design for sensors

Integrate sensor conditioning

Include communication

Provide PoE or equivalent connection

FPGA-Based Design for controller



# Approach

- Novelty:
  - Use PoE or equivalent approach to both power sensors and transmit data from an array of sensors.
  - Integrate sensor conditioning
- Potential benefits to member companies
  - Aviation industry: reduces wire size
  - Reduces space for sensor electronics

# Project Tasks/ Deliverables

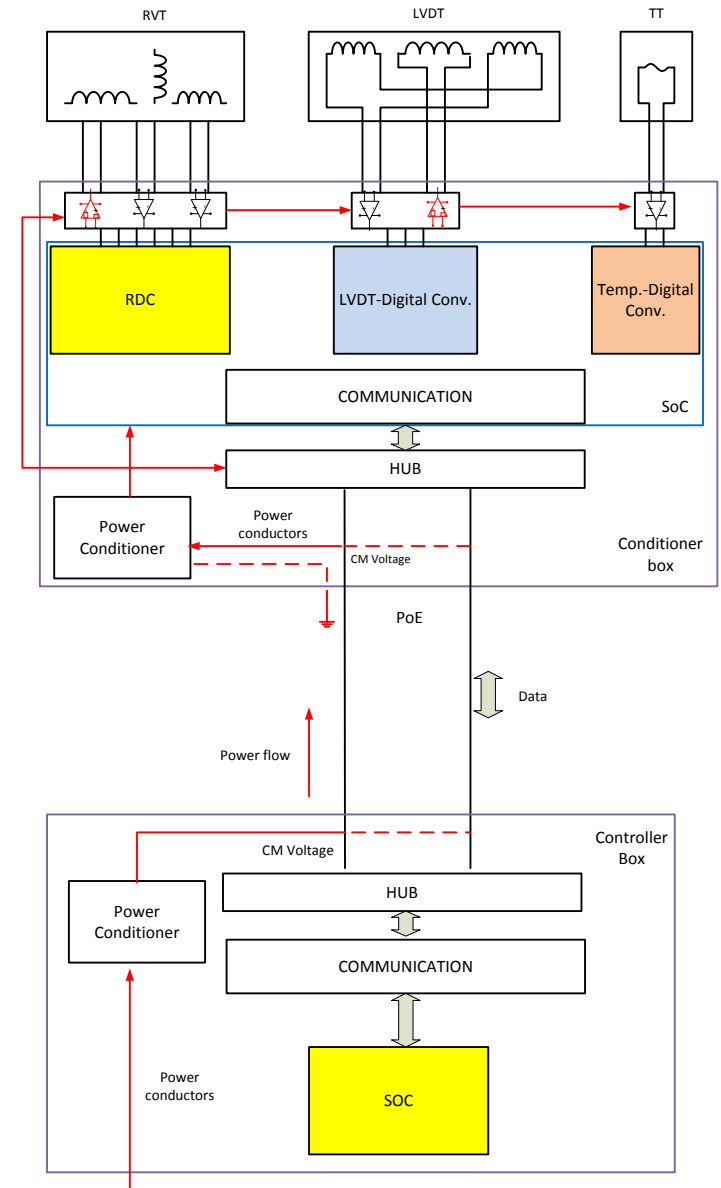
	Description	Date	Status
1	Initial investigation: development of sensor models and conditioning algorithms	August to December	
2	Development of FPGA code/ PoE integration	December to May	
3			
4			
5			
6			

# Executive Summary

The project proposes to use **Power-over-Ethernet (PoE)** or equivalent approach to integrate remote sensor devices and transmit data in motor drives.

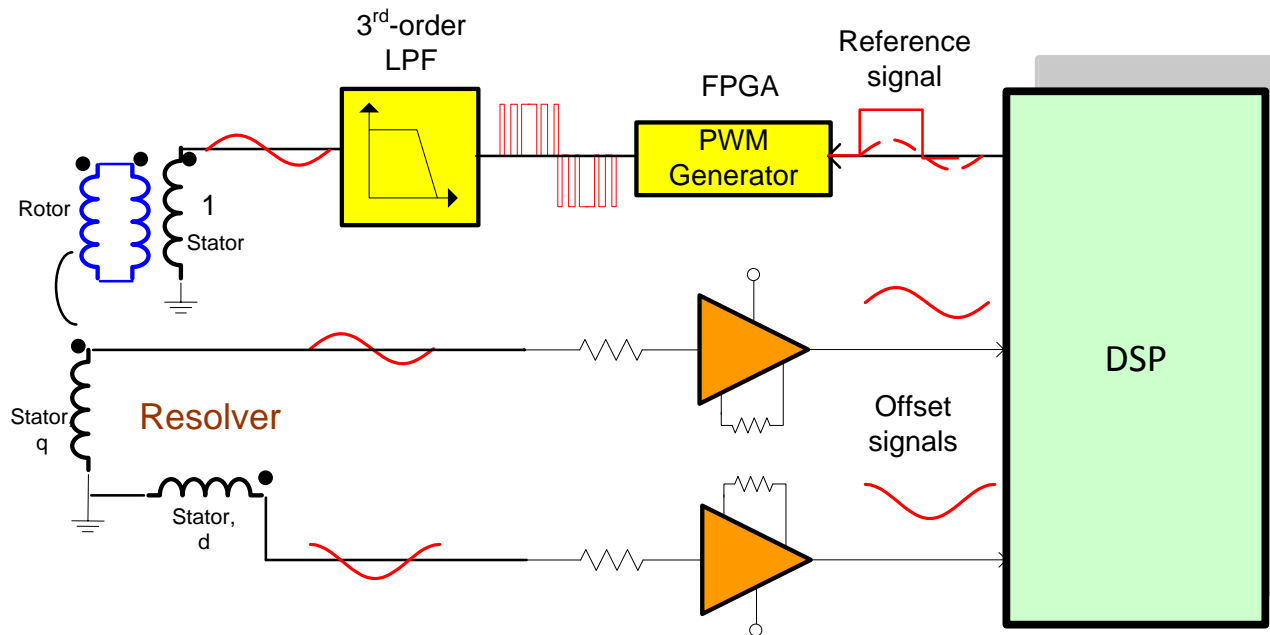
Sensor conditioning will be integrated in an SoC or FPGA device.

Potential benefits to member companies  
Aviation industry: reduces wire size  
Reduces space for sensor electronics



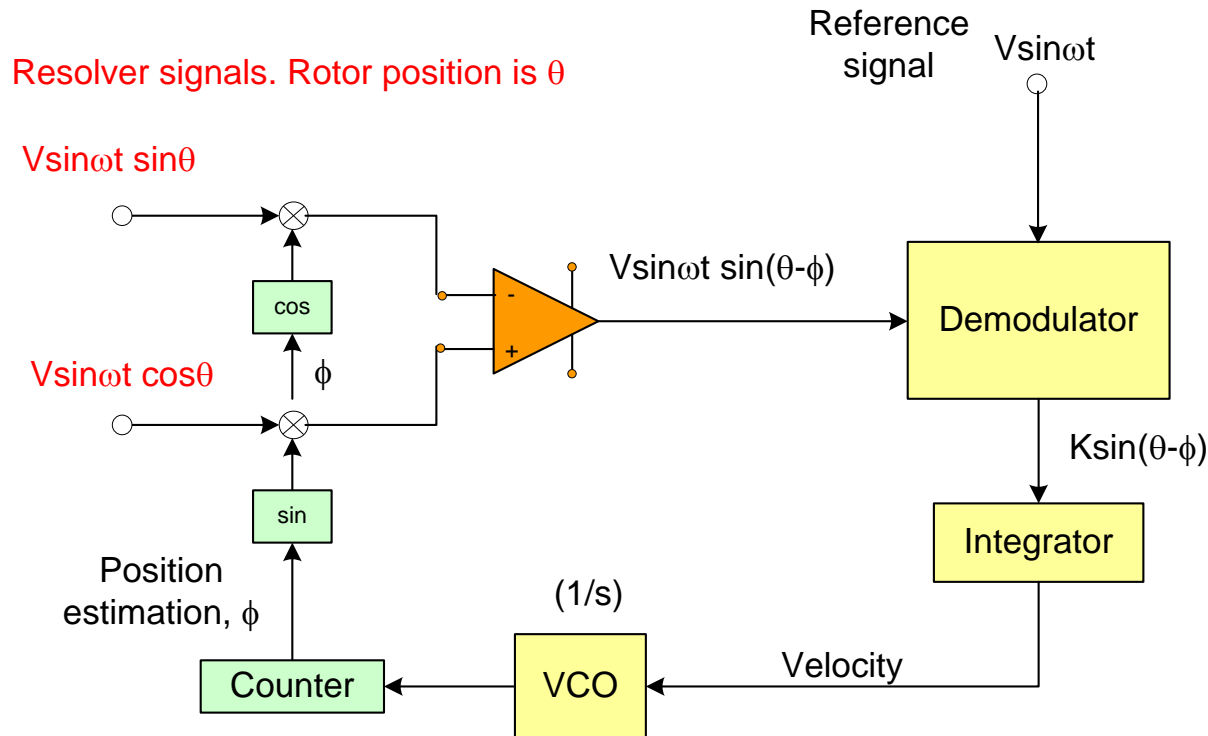
# Technical Detail

- **Experimental Setup**



# Technical Detail

## Type II Tracking Loop with Discrete Circuitry<sup>[1]</sup>

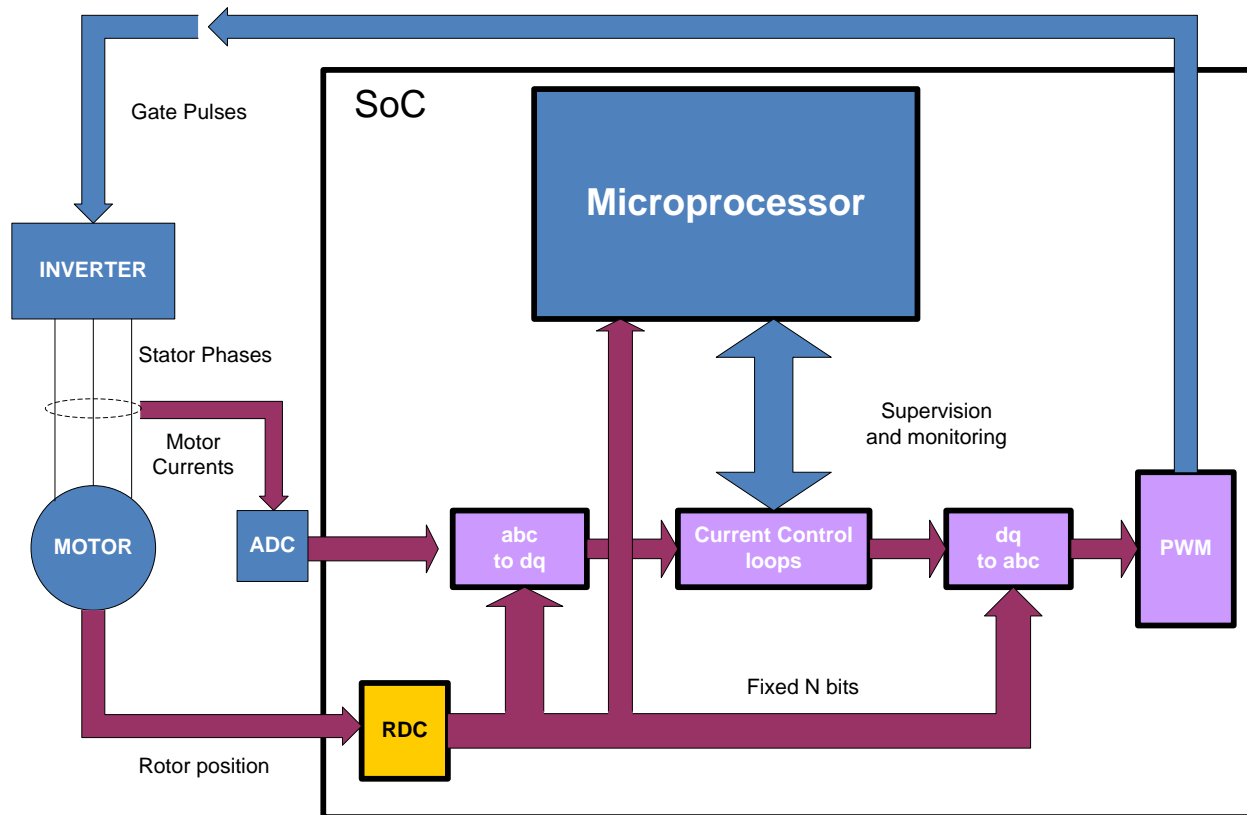


1. Walt Kester, "MT030 Tutorial: Resolver to digital converters," Analog Device, Inc.



# System Overview

- Control of motor speed or position
- Closed-loop: Motor-sensor-SoC



# Detail: The Decoupled FOC

