Surface acoustic wave (SAW) devices are a solution for today's ever-growing need for passive wireless sensors. Orthogonal frequency coding (OFC) together with time division multiplexing (TDM) provides a large number of codes and coding algorithms producing devices that have excellent collision properties. Novel SAW noise-like reflector (NLR) structures with pulse position modulation (PPM) are shown to exhibit good auto- and cross-correlation, and anti-collision properties.

Multi-track, multi-transducer approaches yield devices with adjustable input impedances and enhanced collision properties of OFC TDM SAW sensor devices. Each track-transducer is designed for optimum performance for loss, coding, and chip reflectivity. Experimental results and theoretical predictions confirm a constant Q for SAW transducers for a given operational bandwidth, independent of transducer and device configuration.

Results on these new NLR SAW structures and devices along with a new novel 915 MHz transceiver based on a software radio approach was designed, built, and analyzed. Passive wireless SAW temperature sensors were interrogated and demodulated in a spread spectrum correlator system using a new adaptive filter. The first-ever SAW OFC four-sensor operation was demonstrated at a distance of 1 meter and a single sensor was shown to operate up to 3 meters. Comments on future work and directions are also presented.

Major: Electrical Engineering

Educational Career:
Bachelor's of Computer Engineering, BS, 2004, University of Central Florida
Master's of Electrical Engineering, MS, 2006, University of Central Florida

Committee in Charge:
Arthur Weeks, Chair, EE
Ronald DeMara, CpE
Samuel Richie, EE
Xun Gong, EE

Approved for distribution by Arthur Weeks, Committee Chair, on February 3, 2011.

The public is welcome to attend.