Student Name: Charuta Kulkarni

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Advisor Name: Dr. A. A. Ilumoka Number of Credits: 6

ABSTRACT
A key component in computer based data acquisition systems are analog to digital converters (ADCs). With the advent of high-speed and high-precision signal processing systems, there is a constant demand for high-accuracy ADC systems. The accuracy of these converters increases when the sampling rate and the resolution increases. However, the difficulty in achieving both, high resolution and high speed, analog-to-digital conversion continues to be a challenge due to the effect of timing errors and parasitic capacitance. This project investigates innovative approaches for A to D conversion by Artificial Intelligence (AI) techniques. A novel method to implement a high precision, high accuracy ADC using Artificial Neural Networks (ANNs) is proposed. Using MATLAB, noisy analog signals and their equivalent digital representations were generated. Neural networks including backpropagation (BP), learning vector quantization (LVQ) and modular (MANN) created in two independent industry-standard tools MATLAB and Professional II Plus were successfully trained, tested and deployed as standalone applications. Additionally, real-time analog signals generated in the lab were applied to the input of a Texas Instrument ADC0804 - a CMOS 8-bit successive approximation A/D converter (fig 1). Both the ADC0804 input and output were simultaneously recorded in an EXCEL spreadsheet via the NI USB 6009/Labview interface (fig 2). This data was used to train and test a variety of neural paradigms - BP, LVQ and MANN. Experimental results confirm that this approach to data conversion is viable being both fast, reliable and economic.

Figure 1 Real time Data Acquisition with ADC 0804

Figure 2 Database Generation Using Labview