**A GENERAL PURPOSE REAL-TIME SoC BASED MATRIX MANIPULATOR**

**Project**

**ECE 5730 –Embedded System Design Using FPGAs**

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**Abstract**

Matrix manipulation includes operations such as addition, subtraction, multiplication, inverse, and transpose etc., on the array of data stored as rows and columns. It is an essential process used in diverse fields of science and commerce including but not limited to Computer technology, Optics, Geology, Cryptography, Network Theory, Robotics and Animations, and Finance. Real-time matrix operations include a large number of computations, required for process control, and data & signal processing, which directly impacts the system performance. Real-time matrix calculation becomes a bottleneck for performance of fast system applications as it requires large computation power, memory and time.

In this project, we present a design which can perform matrix manipulation using Intel DE1-SoC development board. Additionally, LCD module will be interfaced with the board. It is achieved by using NIOS II soft-core processor implemented on DE1-SoC board, the inputs are fed from a host computer onto FPGA board via UART serial port, a USB to TTL convertor module will be used to establish serial communication. The final computational results are displayed on the LCD.