Class Report 3: Blinking LED Core

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Github Repository

https://github.com/MaddieVorhies/ELC5396_ClassReport3.git

Summary

In this project, the goal was to create a blinkig-LED core that can turn LEDs on and off at specific rates. There are a total of four discrete LEDs that will be turned on and off at different specified rates. This project is also used to demonstrate the implementation of the system timer, GPIO, and UART modules for both hardware and software of the vanilla FPro system. The FPro bus serves as the communication medium that is shared by the I/O cores of the MMIO subsystem. It allows the compute to exchange data with memory modules and I/O devices. The MMIO I/O cores act as an intermediary between the CPU and the connected hardware. Using UART, the MMIO I/O core is able to translate read and write messages from the the CPU to data that the hardware can understand. Drivers will use these cores to communicate between the operating system and the hardware to demonstrate the blinking LEDs on the device.

Implementation

To implement this project, the first step was to create an instance of the MicroBlaze MCS. Then there were a few HDL file with an MCS instance that were added to the project as well as a constraint file. This configuration of files includes the CPU, MMIO subsystem and bridge, FPro Bus, slot definitions, GPIO and timer MMIO cores, and the UART core. This finishes the hardware portion of the project.

Vitis is the program that was used for the software derivation. Within Vitis, an executable containing the logic for the four blinking LEDs was created. This executable is used to interact with the hardware and program the device.

Results

Using Vivado and SystemVerilog, a hardware platform was created to interact with the software platform created in Vitis. Vitis was used for the application of the blinking LED logic. The program reads in an integer input from the user and uses that as the rate at which one of the LEDs blink in milliseconds. The rest of the LEDs either double, triple, or quadruple that rate to show different blinking speeds of the LEDs.