E155 Final Project Proposal: μMudd Mark V Debugging and Lab 6 Revision

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1 Project Goal

The μMudd Mark V design, integrating an Altera Cyclone IV and Atmel SAM4S, is currently nonfunctional. There is a known bug in JTAG wiring to the MCU, but it it unknown whether this is the only existing bug. This project will involve identifying and correcting bugs in the μMudd Mark V, and reworking Lab 6 to fit the new board.

2 Project Deliverables

The following tasks will be completed in this project:

1. Identifying blocking bugs in the μMudd which completely prevent MCU programming and operation
2. Determining and implementing a solution to the above bugs. This solution may take several forms, as described below
3. Reworking Lab 6 with instructor guidance to fit the new μMudd MCU

2.1 Revised μMudd

We cannot yet explicitly state deliverables for the functional μMudd PCB as they depend on unknown bugs in the design. Below are several potential deliverables, at least one of which will be provided at the end of the project:

1. A modified version of the physical, pre-existing, μMudd Mark V PCB that provides full MCU functionality
2. Modified PCB design files that provide full MCU functionality
3. A completed respin of the μMudd with full MCU functionality
4. A new JTAG cable that provides full MCU functionality

2.2 Reworked Lab 6 Requirements

To maintain the IoT theme of the current lab 6, our reworked lab will include:

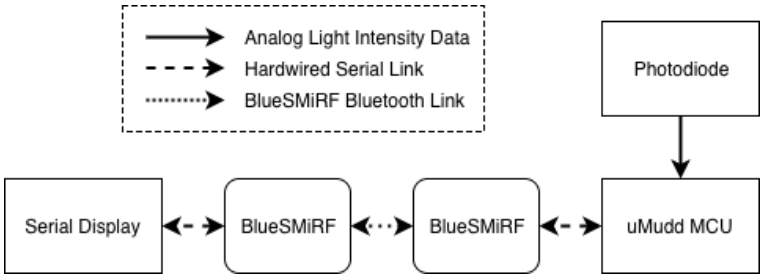
1. Wireless connectivity (Bluetooth, WiFi, etc)

2. Serial communication (I^2C, SPI, UART, etc) between the MCU and another device
3. C programming for the MCU
4. A practical use-case for the completed lab

While lab specifics will be determined after meeting with the instructor, we suggest the following:

2.3 Reworked Lab 6 Proposal

The reworked lab 6 will provide a wireless light sensor. Students will interface the μMudd Mark V MCU with a photodiode and BlueSMiRF to relay temperature data over a bluetooth connection hosting a transparent serial link. This serial link will connect the MCU to a character or graphics LCD display through another BlueSMiRF. This introduces students to two new pieces of hardware: the BlueSMiRF and the serial display. A point of extra credit is available for adding more sensors, such as a thermistor, or for adding a novel feature to the project. The following block diagram illustrates the completed lab:



3 Project Budget

The project budget is also ill-defined at this stage, as it depends on unknown bugs in the current design. I estimate the project will require a reference board for the SAM4S MCU, a respin of the current board, and an unknown set of new equipment and components, which may include a JTAG adapter and/or a replacement MCU. Also included are new components for the proposed lab 6. A preliminary budget is described below, with costs estimated from previous board development purchase orders or online vendors.

Item Name	Item Description	Vendor	Item Cost
SAM3-P256	SAM3S Development Board	Olimex	$31.09
ARM-USB-TINY-H	USB-JTAG Adapter	Olimex	$47.86
PCB Fabrication		Advanced Circuits	$264.00
ATSAM4S4BA-AU	SAM4S MCU	Digikey	$3.93
2x BlueSMiRF Silver	Bluetooth Transceiver	Sparkfun	$55.90
16x2 SerLCD	Serial Character LCD	Sparkfun	$19.95
Total Budget			$422.19