

## CSEE4840 Embedded Systems: Final Project Proposal

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### Proposal:

To write a CHIP-8 hardware emulator and companion software interface.

### Summary:

CHIP-8 is a super simple interpreted programming language that, when executed in software, runs in a virtual machine. Many toy programs and games have already been written in this language, which supports a low-resolution display, a hexadecimal numberpad, and a rudimentary sound output. Nowadays, CHIP-8 is regarded as an easy first project for people getting into software emulation.

As far as programming languages go, CHIP-8 bytecode can be interpreted like Assembly (containing 35 opcodes total), making it an excellent candidate for hardware emulation. Interaction with peripherals like the computer keyboard and sound, however, can be handled in software. Additionally, our software will have the job of choosing and loading games into the hardware emulator, as well as other non-simulation tasks. Note that the interaction between the virtual machine and the display will be handled in hardware, however.

### Rationale:

While writing a CHIP-8 emulator in software is considered the “hello world” of emulating, writing even a simple single-cycle computer simulator in SystemVerilog seems far more difficult. This makes it a worthy candidate for a final project for this class.

Additionally, choosing the software-hardware partition at the “virtual machine” level makes this a very parallelizable project labor-wise. Since software emulators of CHIP-8 already exist, it will be possible to split our group into two pairs, with one pair focusing on designing the interface and writing the software while the other pair focuses on implementing the virtual machine. The existing software implementation of CHIP-8 will enable the pair focusing on the software to “mock” the hardware-software interface.

### Timeline:

- March 24: The hardware implementation is completed.
- March 31: The design document is completed.
- April 8: The software implementation and interface is completed.
- April 9-April 15: Integration Hell
- April 16: Completion of the project.

### Further reading:

Comprehensive specifications for CHIP-8 are widely available, though this website is a particularly good repository: <https://chip-8.github.io/links/>

