

Term Project Proposal
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Our group has decided to create a 8-bit 6502 emulator that is designed to be easily extended into an NES emulator for our term project. We plan to have our emulator possess 2 kilobytes of 16-bit addressable memory to meet the design requirements. Since this CPU emulator is designed to be extended to an NES emulator, we plan to make the instruction calls clock cycle accurate. This is essential because the emulation of NES games are heavily reliant on the variations of cycles each instruction takes. Since the processing of each instruction on the native hardware will be much quicker than the actual 6502, we will use the documented number of clock cycles each instruction takes to run to make the emulation of the CPU stay true to the original hardware. By adjusting the time that each instruction takes to execute, this will allow the games to run with the same cadence as they did on the original hardware.

The 6502 includes 56 different instructions. A good portion of these instructions will be trivial to implement, such as certain arithmetic or bitwise operations. Our goal for this project is to have at least a partially implemented 6502 instruction set that is capable of running simple demo programs. Some possibilities for demos could be prime number generation, factorial calculator, palindrome detector, etc. Alongside the 56 instructions, we may implement some debugging instructions for our programs to use stdin or stdout, or map memory to a visual input/output system to add interactivity with the emulator.

If we implement all of the 6502 instruction set, then we will proceed with our stretch goals that proceed to implement the entirety of the NES emulator. Our first stretch goal will be to implement the NES PPU. The PPU is a non-interactive chipset that reads memory and outputs a video signal. In order to achieve this, we will use the SDL2 graphics library for C. SDL2 provides a simple API for creating windows and drawing graphics onto the screen. Our next stretch goal will be to implement memory mappers, which are the game specific hardware that mapped certain parts of the 2 kilobytes of the NES's memory. The default mapper maps the games' read only memory onto part of the NES's memory. With this implemented we could then emulate early NES titles such as Donkey Kong or Balloon Fight. With the implementation of other mappers, we can allow for more complex technology, such as the horizontal scrolling mapper, used in later NES titles found in Mario Bros. Another popular mapper is the PPU hardware interrupt mapper, allowing for more complex drawings onto the screen.

Some final stretch goals to complete the implementation of the NES emulator would be controller support, which is easily supplied by SDL2 and would have to be connected with the NES hardware emulation. Another stretch goal would be to add audio output to our emulator using the NES APU.