PC Gameboy Console

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Background/Introduction:

This proposal details a system which enables users to not only experience an authentic playthrough of their favorite Gameboy games without needing an actual Gameboy, but also allows users to program old cartridges with game files found online. This console will consist of a Gameboy cartridge reader as well as an NES controller serial plugin which you would be able to use with an existing emulator in order to play original, physical Gameboy cartridges with an NES controller (to replicate the controls available on the Gameboy) on your PC.

This is a unique system because although retro game emulators are popular, there are very few systems available that allow people to play their old cartridges on their PCs and even fewer that enable you to use a retro controller. Many MIT students are fans of Nintendo games, but finding and affording working retro consoles can be quite difficult. Therefore, building a system that would allow users to simply find Gameboy cartridges and play them through on their PCs with an NES controller and emulator would save them a lot of money and time while also enabling them to get as close as possible to authentic game play on PC.

Hardware Description:

As described above, there are two main components to this project. One is a Gameboy cartridge reader, while the other is a NES controller to USB serial communication interface. The Gameboy cartridge itself will be a peripheral with a 26-pin connection. The NES controller is a small embedded system containing an 8-bit shift register along with 8 “switches” (for 8 possible button presses) and communicates through a 7-pin port. In order to send and receive data from these two components, a Gameboy cartridge “receiving port” (labeled “Cartridge Adapter” in the block diagram below) and a 7-pin NES female port (labeled “NES Port”) will be connected to the PSoC. The PSoC will be the sole processor, and, as shown in the block diagram, the onboard micro-USB port should be sufficient to facilitate the necessary serial communications between the peripherals and the PC for use in the emulator. There will also be a bank of red and green LED lights indicating the statuses of the controller connection, the ROM read, the ROM flash, and the data communications.

Software Description:

All of the necessary programming will be done in C since the whole project will center around the PSoC. For the Gameboy cartridge reader, there will be modules for getting data from the cartridge as well as dumping the information through USB into appropriate files to be accessed from my PC (labeled “ROM Read” and “Game File Creator” in the software chart).

There will likely be multiple code files for dumping the cartridge ROM since there are multiple ROM banks within the cartridge holding game logic that I will need to access consecutively. For flashing to the cartridge ROM, the ROM banks will all need to be erased and then re-written with new file information. For the NES controller, there will be modules for interpreting the button presses on the controller and sending them through the USB port ("NES Output Grabber" and "NES to USB Serial" on the chart) via USB HID. There might need to be separate code in order to communicate between the USB port on my Macbook and the Gameboy emulator software.

Project Scope and Management:

Modest Risk Level: There is ample documentation of people being able to dump the ROMs of old Nintendo cartridges (where the actual game logic is stored) without much trouble, and the same applies to connecting old Nintendo controllers to new technology. The main goal for this level would be dumping the ROM from a Gameboy cartridge onto my PC, connecting the NES controller to my PC through USB, and having the LEDs to indicate the status of the different functionalities.

Mid Risk Level: Taking the project to the next level might involve reading from the SRAM of the Gameboy cartridge in order to keep track of the user's game data so that they can save their game progress on the emulator to the cartridge for continuation at a later date possibly on a different device.

High Risk Level: One of the biggest stretches of this project is implementing a flash capability for the Gameboy cartridge reader (have it also function as a writer). This system would not only allow the user to play the Gameboy cartridge data on an emulator, but also allow them to flash online Gameboy game files onto blank or bootleg cartridges. They would then be able to play this file on the PC emulator system or on an actual Nintendo Gameboy console.

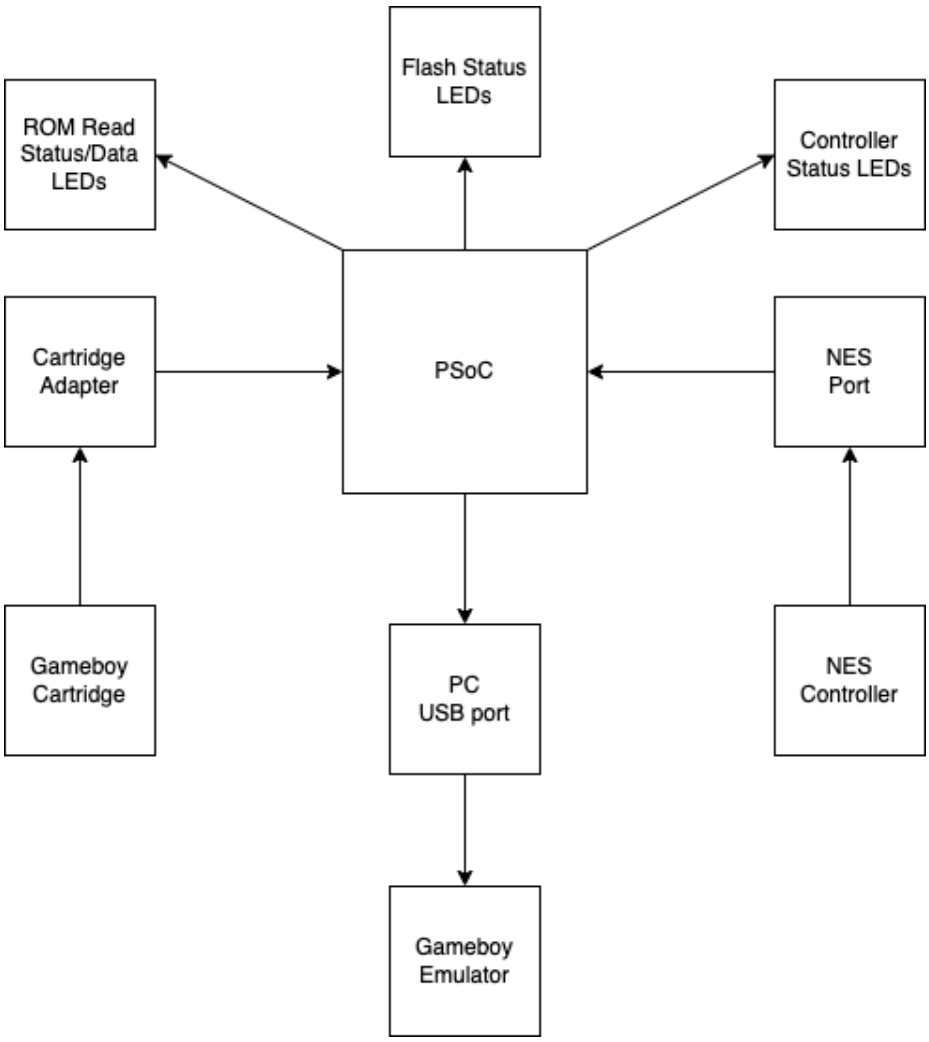
Special Component Needs:

- NES 7-pin port - eBay.com
- Gameboy Cartridge Adapter - Walmart.com

Timetable:

- *April 17* - I will set up the hardware connection between the PSoC and the Gameboy cartridge. I will also get the modules working to dump the cartridge ROM to my PC.
- *April 24* - I will set up the hardware connection between the PSoC and the NES controller. I will also get the modules working to register the controller on my PC.
- *May 1* - I will begin implementing ROM flashing modules and add the LED indicators.
- *May 8* - I will continue working on the ROM flashing given that it will likely be more than a week's worth of work.
- *May 15* - If time permits, I will implement SRAM reading and writing capabilities to save game data.

Hardware Block Diagram:



Software Outline Diagram: