RetroPie Gaming Project

Micah McKittrick

Central Washington University Electronics Engineering Technology

Abstract

The purpose of this project is to build a gaming emulator using a Raspberry Pi Model B to emulate the video game systems Nintendo, Super Nintendo, Sega, and Atari 2600. In order to interact with the emulators the following peripherals have been wired in: One 8-Way directional arcade style joystick, ten concave arcade style buttons with microswitches, two USB powered speakers, one 15.6 inch HDTV and one USB powered hub. The buttons and joystick will be wired to the Raspberry Pi's GPIO pins. Code will be obtained from an outside source then modified in order to work with the gaming emulators. All parts of this project are housed inside a custom acrylic glass case. The USB hub is installed on the front panel to allow users to plug in alternative controllers or keyboards for troubleshooting. The final product will be user friendly and require minimal upkeep.

Introduction

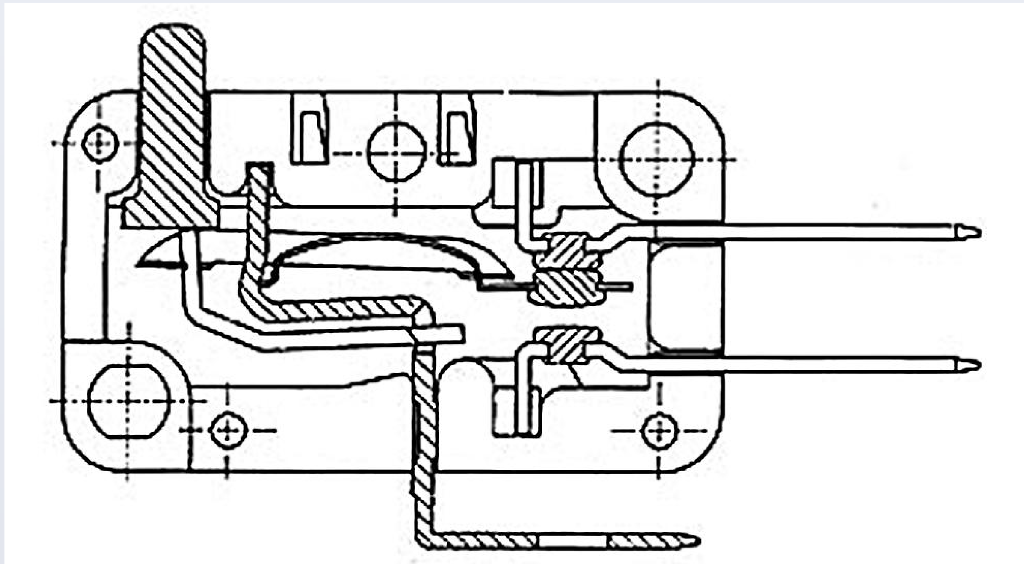
Once the RetroPie console is plugged into the wall everything will turn on and automatically boot into the system that runs all the gaming emulators called Emulationstation.

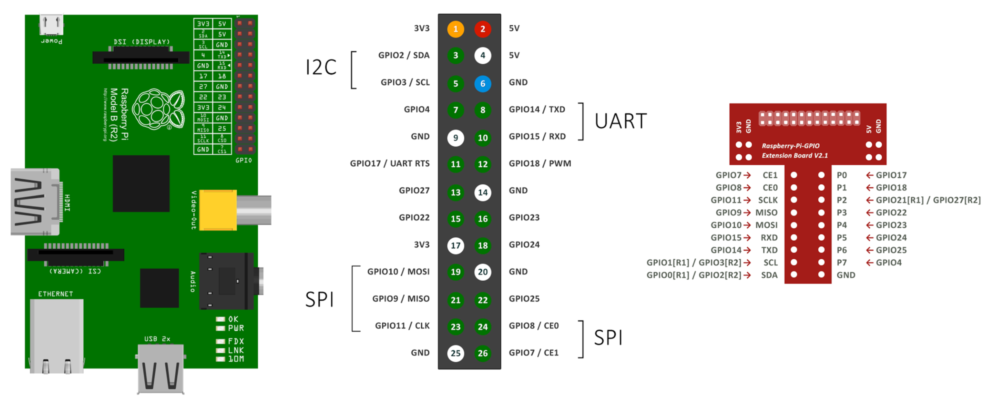
When Emulationstation boots up the user is able to interact with the emulators via the 8-way directional joystick and the arcade style buttons. The user has the ability to move left and right and choose from 4 different emulators: Atari, NES, SNES and Sega.

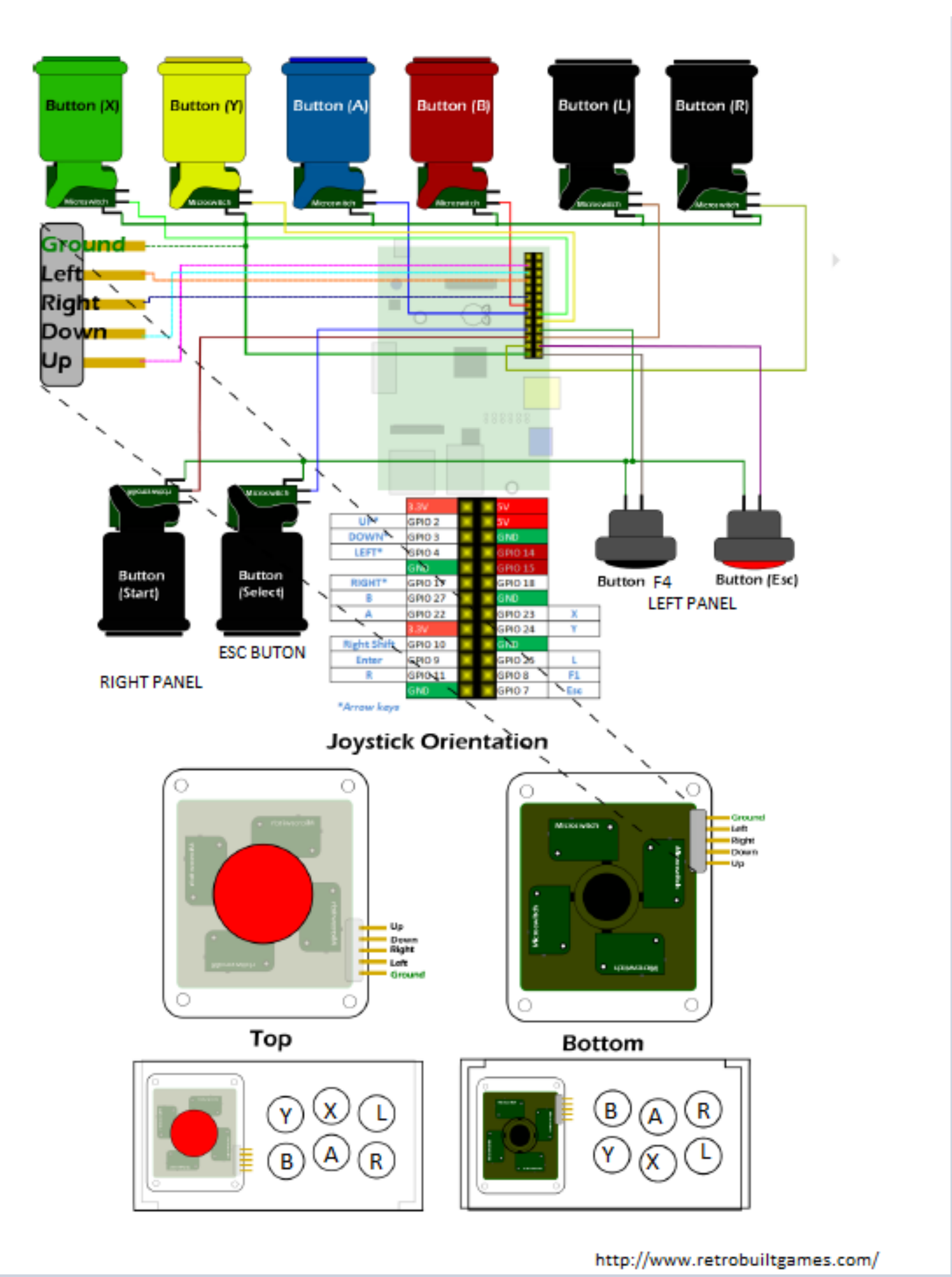
The user then selects which emulator they wish to use and a list of games will be produced. Again, the user will use the joystick to choose the game they wish to play. Once a game is selected using the A button Emulationstation boots up that game and allows the user to interact with it just as the original gaming system would allow them to do.

Design/ Implementation

The Raspberry PI GPIO pins are ACTIVE LOW which means when the Pi receives a LOW signal it registers that signal as a key press. Using this idea each button is wired directly to the corresponding GPIO pin and is held HIGH at 3.3V. The ground pins are then daisy chained together and tied to ground. When a button is pressed the circuit is grounded and a LOW signal is produced. When that LOW has been established the Pi recognizes that the button has been pressed and thus performs whatever action that GPIO is assigned to.







Results

Image 1) This image shows the response time of the Joystick when a direction is initiated. The signal is held HIGH at 3.3V until the connection is made and circuit goes LOW. The Pi in turn registers that specified response as a specific key press. The signal will be held LOW until the Joystick is returned to its neutral state.

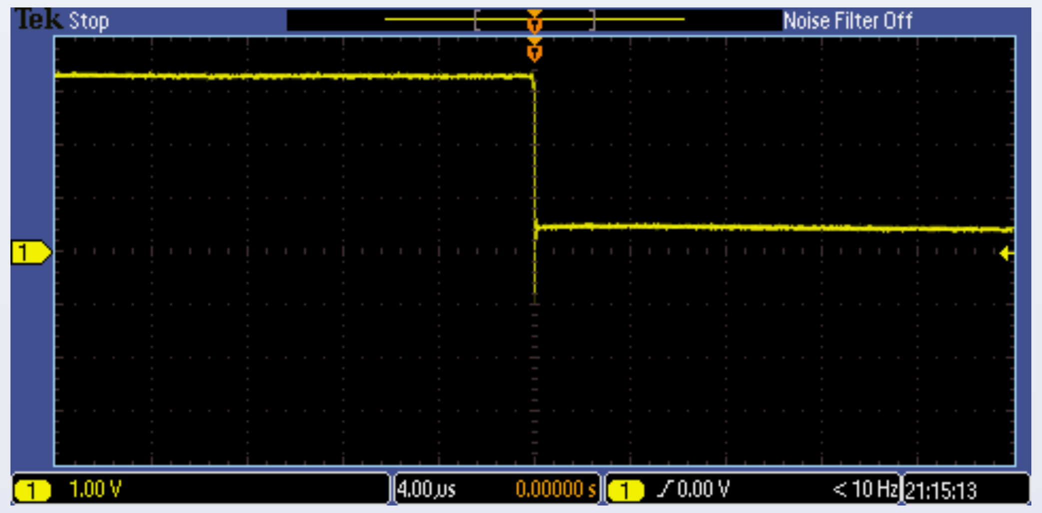


Image 2) This image shows the response time of the Buttons when they are pressed. The signal is held HIGH at 3.3V until the connection is made and circuit goes LOW. The Pi in turn registers that specified response as a specific key press. The signal will be held LOW for about 12µ seconds. It will then return to 3.3V regardless of if the button is continually held down.

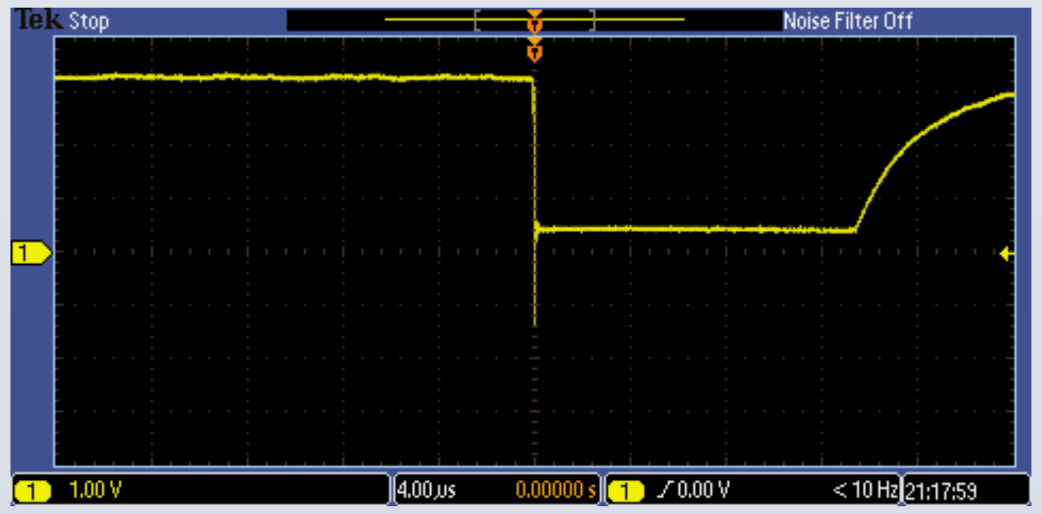
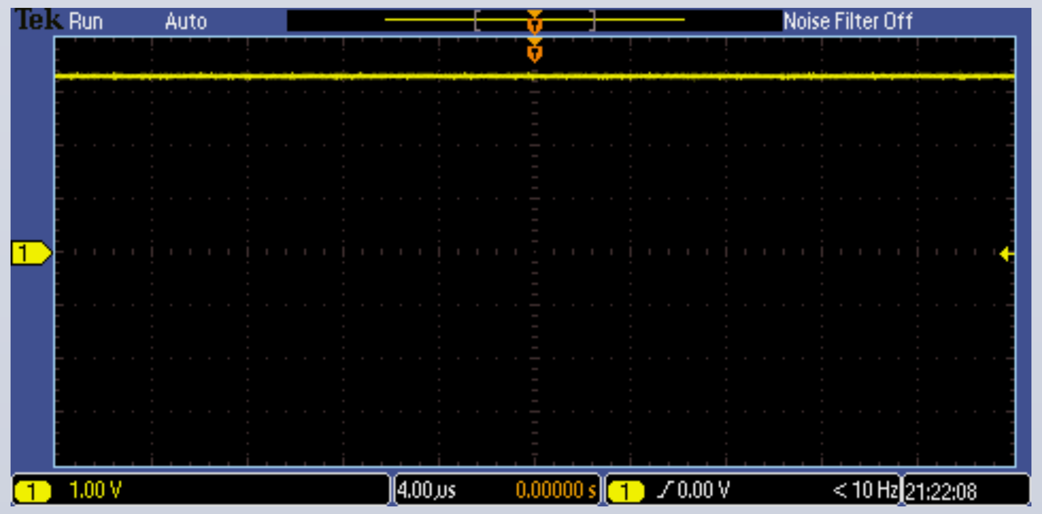
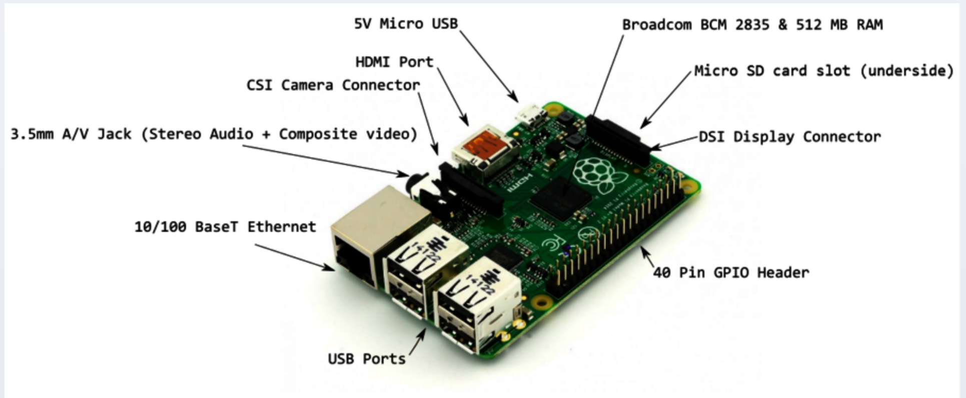


Image 3) This image shows the voltage level that the Raspberry Pi outputs through each of the GPIO pins. The Pi outputs a consistent 3.3V which corresponds to the other two images above.



Conclusion

This project is designed to inspire people of all ages to branch out of their comfort zones and dive into the world of electronics. With it's low cost and versatility the Raspberry Pi enables people to learn the basics of electronics and programming.



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