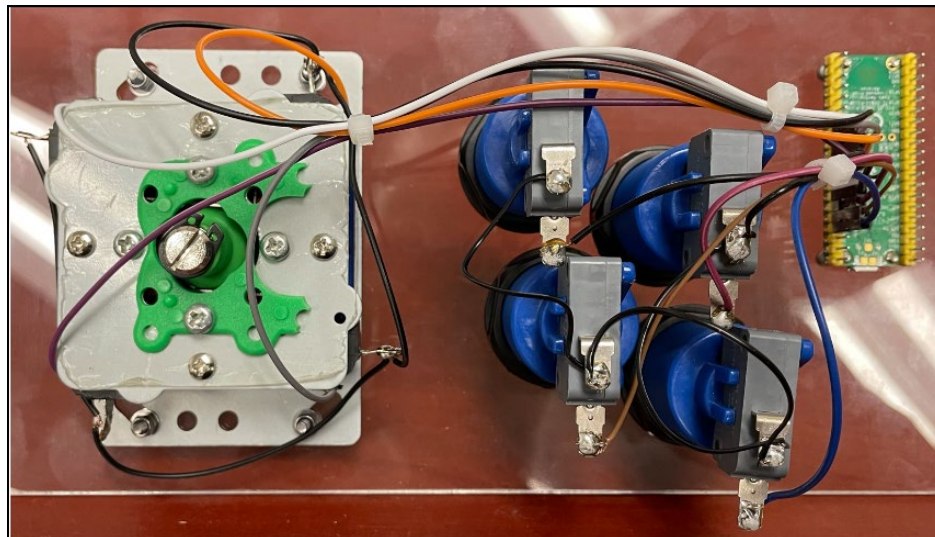


## Designing an Arcade Control Bar

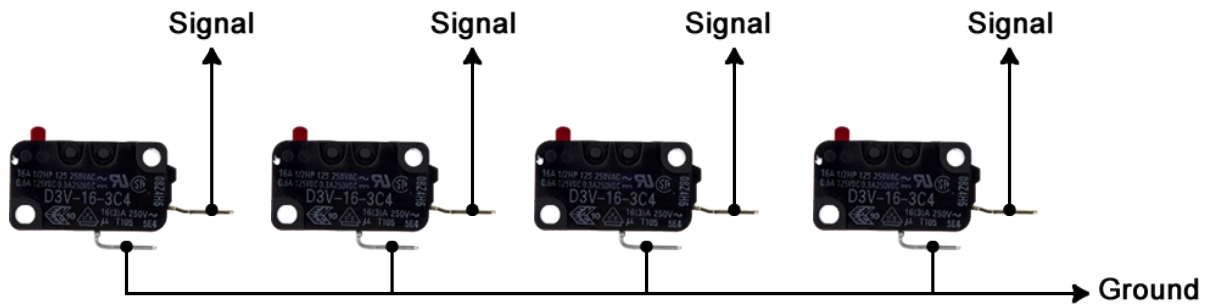
An arcade control bar enables use of arcade buttons and joysticks to control a video game. The arcade control bar described in this example was developed for retro games such as PacMan and Frogger created in the educational programming language Snap! The control bar in the illustration below consists of a red joystick (left), blue arcade buttons (center), and a microcontroller – a Raspberry Pi Pico (right). The joystick and arcade buttons are connected to inputs on the microcontroller. A USB cable connects the microcontroller to a computer.



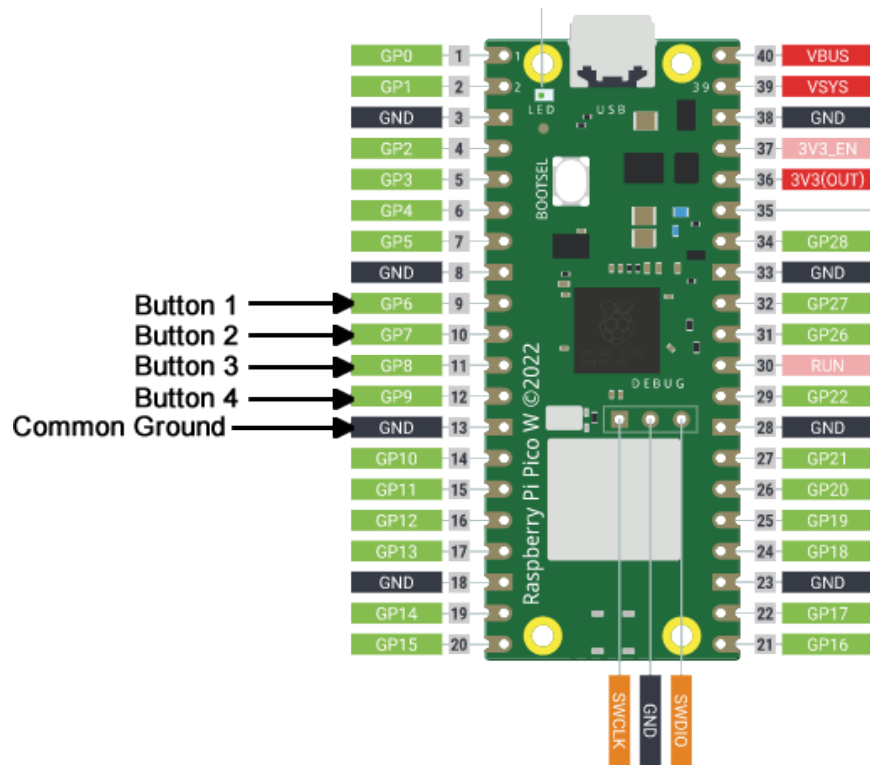
Designing your arcade controller gives you the flexibility to determine the number of arcade controls and their layout. This example has one joystick and four arcade buttons. However, you may want a layout with two joysticks so that you can compete with a friend, or a layout with six arcade buttons to enable more control options in the games that you design. The design choices are up to you. If we flip the control bar over, we can see that the arcade buttons activate a microswitch when each button is pressed. Although it is less evident in this view, the joystick also activates a series of four microswitches as it is moved up, down, left, and right. The outputs of the microswitches are connected to corresponding inputs on the microcontroller.



The following diagram illustrates how the switches in the arcade buttons are connected. Each switch has a signal and a ground connection. The ground connections for all four switches are wired together. The common output is connected to a ground input on the microcontroller. The four signal connections are connected to four digital input pins on the microcontroller.

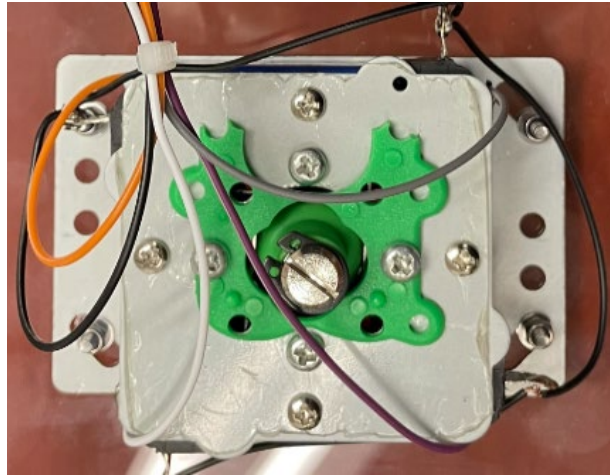


The four microswitches in the joystick are wired together in a similar fashion. In this example, the signal connections for the four buttons are connected to digital input pins 9, 10, 11, and 12 on the microcontroller. However, as the designer, you can choose any available input pins. You will just need to match the numbering of the physical pins on the microcontroller to the corresponding references in the computer that monitors these inputs. The four ground connections of the switches are connected to a common ground input on the microcontroller.



The four microswitches on the joystick are connected to the input pins of the microcontroller in a similar way.

Many arcade joysticks provide a collar that restricts the range of motion of the joystick, enabling the joystick to travel in four directions, eight directions, or any infinite number of directions (i.e., in 360 degrees of motion). In this example, the green collar shown in the illustration below has been installed so that the joystick only travels in four directions. In this way, the four directions of movement of the joystick (up, down, left, and right) can be mapped to the four arrow keys on the computer keyboard. The specific directions from the manufacturer provided with your joystick will explain the options available.



In some cases, the microswitches provided with arcade buttons are not installed when they arrive. In those cases, the microswitch must be snapped into place. The two connections (signal and ground) should be installed so that they are on the bottom of the installed switch, as shown in the illustration below.

