You will learn the following in this lab:

- How to handle I/O devices
- Developing hardware controllers (i.e., device drivers in hardware) for the I/O devices you choose, e.g., keyboard, mouse, keypad, joystick, accelerometer, audio amplifier, etc.

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**Add I/O devices to your MIPS computer**

Choose your I/O devices as per the needs of your demo app.

**Output Devices:**

- Every student must use a VGA monitor as an output device; you have already integrated that with your CPU.
- You are welcome to have additional output devices, e.g., audio output, 7-segment display, various LEDs (including tricolor) on the board, etc. Please refer to the Nexys 4 board manual for pin connections to control the various LEDs. You have already implemented an 8-digit 7-segment display. The website has Verilog for a sound module, which is basically a tone generator, suitable for a piano/MIDI player.
- You are to integrate any output devices that you wish to use into your computer via the memory-mapped IO unit (memIO). Simply assign an address to each (e.g., 0x6000, 0x6001, 0x6002, etc.), and access them for output using sw instructions in MIPS assembly.

**Input Devices:**

- For input devices, choose one of: keyboard, mouse, keypad, joystick, or accelerometer.
- **Keyboard:** Verilog files are provided on the course website.
- **Mouse:** Ask me for help in modifying the keyboard module to make it work with USB mice.
- **Joystick/Keypad:** I have a very limited number of these add-on devices, which plug into your boards. The keypad functions like switches, so you don’t need to develop a Verilog module for it. The joystick will need some Verilog development, but I can help with that. In either case, you will need to understand the operation and the pin connections from the data sheet and the Nexys 4 manual.
- **Accelerometer:** Your boards have a built-in accelerometer. Verilog files and a simple demo will be available on the course website.
- Integrate these input devices into your MIPS computer via memory-mapping (memIO). Assign an address to each in the 0x600X range.

**Due Date:** You do not have to submit any files for this assignment. Simply show the instructor or TAs all the functional input-output devices you intend to use. To stay on track with the demo schedule, please try your best to have the I/O completed by 11/21.