

IVALab Arduino Experiments: Intro

I am not sure what you are comfortable with or not, so I have devised a series of small experiment to get to know the Arduino. These experiments should get you more comfortable with the Arduino, its programming language, its input/output capabilities, and more (hopefully!). The ultimate goal is to eventually interface motor controllers, motor encoders, accelerometers, gyros, and other elements that you have gotten- or will get- to know.

Experiment 1. This is just to introduce you to the Arduino and how it operates. You should be able to find a pre-existing code that does LED blinking (the pre-existing code files are called sketches). Compile it and get it to be downloaded to the Arduino. The Arduino will automatically run it. Once programmed, the Arduino will always run the program when powered up.

Experiment 2. The next step is to find the potentiometer sketch that will read in voltages from the A/D converters. The potentiometer needs to be connected as depicted in Figure 1. You can verify as such by testing out the resistance between pin 1 and pin 2, and pin 2 and pin 3 as you turn the knob without the potentiometer being connected to a voltage supply.

Once that's verified, you can see how the potentiometer adjusts the voltage by actually connecting the V_{in} and GND pins to a power supply and measuring the output voltage V_{out} . Then connect the circuit to the Arduino by using the Arduino's 5V supply, GND, and the appropriate A/D pin. Program the Arduino so that LED blinks at a rate that varies according to the potentiometer knob position, which is regulating the voltage supplied to the A/D input pin.

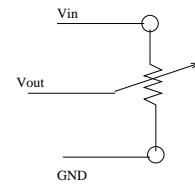


Figure 1: Potentiometer.

Experiment 3. Take the setup from Experiment 2 and get the Arduino to output the voltage as a string periodically. Verify that the voltage you measure with the Arduino is the same as the voltage measured on the multi-meter. This experiment requires you to convert the A/D measurements to actual voltages.

Experiment 4. Get an external LED to blink like in Experiment 2. To protect the Arduino and the LED, use the optoisolator as a bridge between the two components. Make sure to choose an appropriate resistor for the LED to prevent it from blowing out (don't forget that LEDs have a polarity, usually indicated by the notch and longer leads).

Experiment 5. This experiment will connect one of the IMUs to the Arduino. In particular, consider the accelerometer + gyro combination that runs off of a 5V supply. Connect the IMU to the Arduino and read in the acceleration plus gyro signals. Output the values to the serial port so that you can see what the input signal values are. Tell the A/D converter that it should use the 5V supply as the voltage reference.

Experiment 6. Repeat Experiment 5 with the following changes. Hook up the 3.3V regulator to the IMU requiring 3.3V. Also connect the 3.3V supply to the V_{ref} of the Arduino. It should now be setup to read the IMU voltages appropriately. Tell the A/D converter to use the externally supplied voltage reference during A/D conversion.

Experiment 7. Connect a switch up to one of the digital input ports, with the other part of the switch connected to the 5V supply. Make sure that the switch has some resistance and does not directly connect to the 5V. Next, on the other side of the switch, where it connects to the digital input, setup a pull-down circuit so that the digital input reads GND when the switch is in the off position. Get the internal LED to turn on when the switch is on and off when it is off.