Arduino Project #2: Digital to Analog Signal Conversion
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Required equipment:

1. Arduino Uno
2. USB cable
3. 470Ω resistor
4. 10kΩ resistor
5. 100kΩ resistor
6. 1µF polarized capacitor

Welcome to your second Arduino project! In this project, you will automate a voltage tracking system based on analog input data from a simple circuit built on your breadboard. Additionally, you will learn how to convert a digital signal to an analog signal by adjusting the Arduino’s digital output duty cycle, the percent of time the digital signal is on.

Preliminary Step
Conduct a YouTube search for “Arduino Tutorial 4” and watch the video entitled “Tutorial 4 for Arduino: Analog Inputs” by Jeremy Blum. This video demonstrates how to read an analog input and store the data in a variable to be used in your program. While Jeremy Blum’s project involves a circuit different from the one you will build, the principle essential to successfully completing your project is identical. With this in mind, you should make an effort to understand the function of a command rather than its specific application in Jeremy’s project.

Objective #1
Use a 470Ω resistor and LED to build an LED circuit powered by an Arduino digital output (navigate to http://www.youtube.com/watch?v=gwcVr5VfXwA to view a tutorial on building breadboard circuits). Create a sketch that varies the brightness of the LED by holding the digital output in the ON position longer than in the OFF position, i.e., by adjusting the ON delay period from 1ms to 3ms, then 5ms.
**Objective #2**
Using a similar method, create a sketch that produces 3.0V from pin seven of the Arduino. Use a voltmeter to confirm that your program is functioning properly.

**Objective #3**
Use a 10kΩ resistor, a 100kΩ resistor, and a 0.1µF capacitor to build the specified circuit on your breadboard, then read the voltage across the capacitor as an analog input. Use A0 as the input pin.

Note: Remember that the readings displayed in the serial monitor are not in volts. They are based on a ten bit system, resulting in a scale from 0 to 1023 where 0 and 1023 in the serial monitor correspond to 0V and 5V, respectively.

**Objective #4**
Create a sketch that sets a target voltage to be applied across the capacitor (e.g., 4.0V), reads the actual voltage across the capacitor, and makes the appropriate adjustments to the delay period in the ON position so that the actual voltage approximates the target voltage. Test your voltage tracking system for 3.0V, 3.5V, 4.0V, and 4.5V.