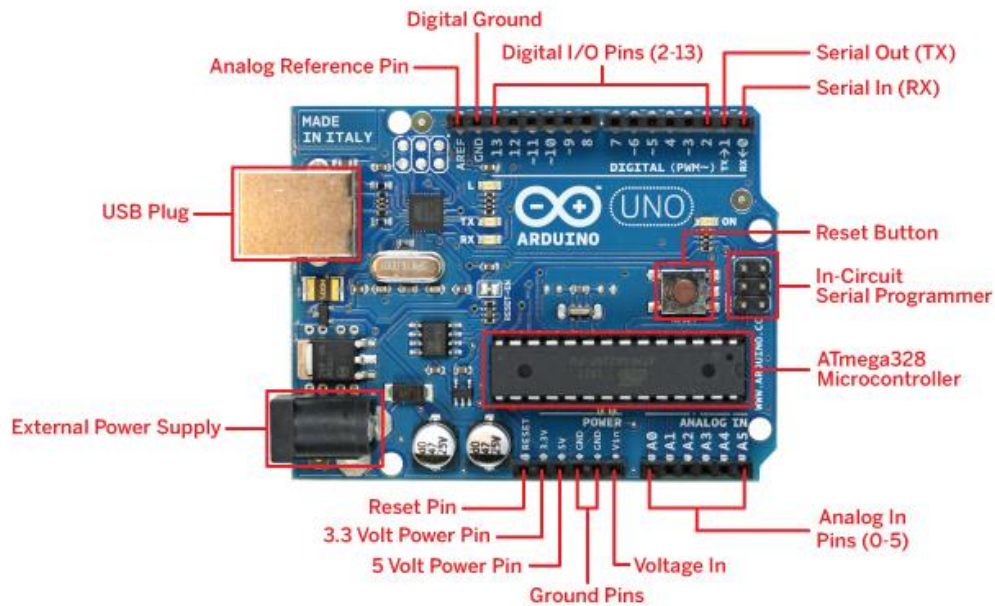# Architectural Robotics Spring, 2018: Project 1

In-Class Demonstration: Monday, January 29 (20 points)

Written Report Submitted to Canvas by: Wednesday, January 31 (20 points)

This project will help you get familiar with the hardware and software which you will use for this course.

The diagram of the Arduino board is shown below

1   Run Examples Using the Arduino (For Practice)

Introduction: Try to run the Examples in Arduino IDE, as many as possible. You can find the examples at "File->Examples". To get start with the development on the Arduino, run the following examples: **Basics**, **Digital**, **and Analog**. The examples will help you get familiar with the Arduino board and practice your C programming skill.

Hardware:

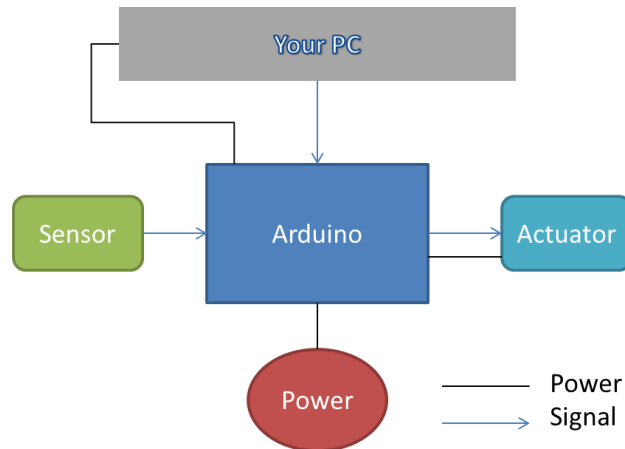| Name	Number	Others
Arduino board	1	
Breadboard	1	
10-kilohm Potentiometer	1	
Resistor	~	220 ohm, 10k ohm, ...
10-kilohm Potentiometer	1	
Momentary button or switch	1	
Connection cable	~	m-m, f-f, m-f

Open Source Software:

Arduino IDE, Arduino Driver, Processing, Max7, Fritzing

2 Sensor-Actuator System (For Credit)

In this task, you will use the Arduino to build a sensor-actuator system. You will learn how to use the input and output functionality of the Arduino which is a foundation for your future work on more complicated projects.

The model of a sensor-actuator system is shown in the diagram below:

Hardware:

Name	Number	Others
Arduino board	1	
Breadboard	1	
Hook-up wire	~	m-m, f-f, m-f
Light sensor	1	Measurement of light level
Button	1	
Motor	1	
LED	1	

Open Source Software:

Arduino IDE, Arduino Driver

2.1 Objective

Design an automatic window shade. The shade closes when it detects significant light and opens when there is low light. An LED by the window/shade turns on when the shade is in the process of opening or closing. You will use a light sensor for measurement of the ambient light level and a motor to control the shade. A button also controls the shade, toggling between opening and closing.

The requirements for this task include:

- Connect the light sensor to the analog input. This sensor will give data on the amount of light detected by the sensor.

- Test the light sensor with different levels of light. Use these data to determine thresholds for opening and closing the shade. Document your results and be prepared to support your approach. Why might you want different thresholds for opening and closing the shade?
- Use a button as a digital input toggle to the Arduino to drive the shade open or closed.
- Turn on the LED light when the shade opens and closes.
- Use the finite state machine (FSM) to control the system. NOTE: Since the project is designed for you to become familiar with the Arduino, it is not required to use an FSM in this first project. However, the FSM is a very basic and useful robot control model; you may find it makes the programming easier.

2.2 System Diagram
The diagram of the system refers to the figure below.
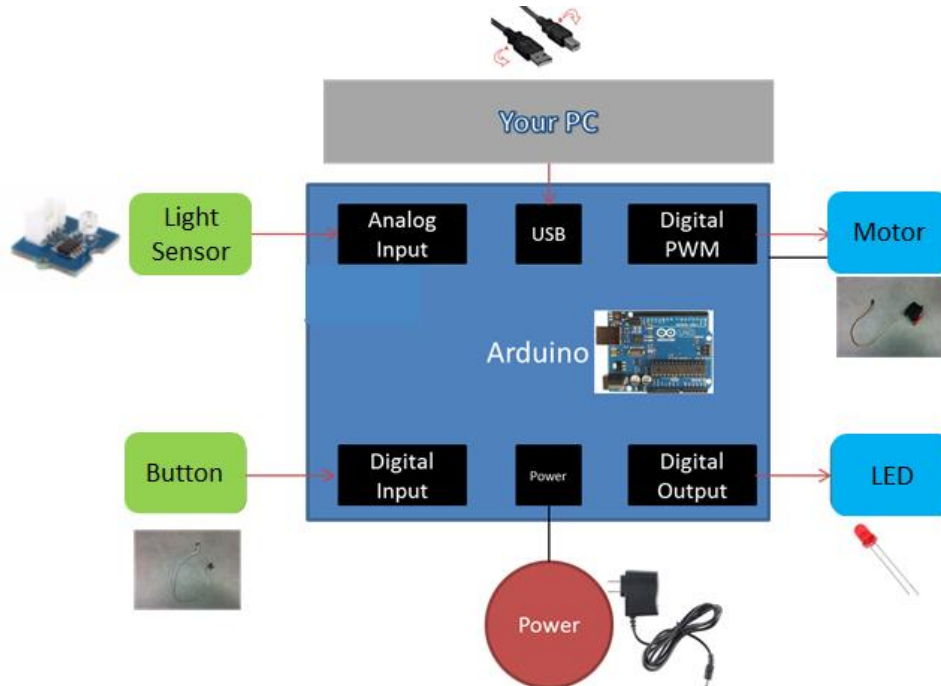
3 Written Project Report

The report should include the components below. Submit the report through the Canvas course page

- Overview with photo
- Design, including supporting documentation on the lighting thresholds
- Code logic and code
- Solutions tried and rationale for chosen solution

Reference Material:
1. Tutorial of Arduino: https://www.arduino.cc/en/Tutorial/HomePage
2. Finite State Machine: https://en.wikipedia.org/wiki/Finite-state_machine