

## WE-GIRLS Summer Camp (June 19-22 2017)

### Project 1 – Arduino introduction. Blink LED

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#### 1. Objective

The objective is to introduce the Arduino development board by working on several projects that use light emitting diodes (LEDs).

#### 2. Introduction

Arduino is a small microcontroller board with a USB plug to connect to your computer and a number of connection sockets that can be wired up to external electronics, such as motors, relays, light sensors, laser diodes, loudspeakers, microphones, etc. They can either be powered through the USB connection from the computer or from a 9V battery.

An Arduino board (see Figure 1) consists of an 8-bit Atmel AVR microcontroller with complementary components to facilitate programming and incorporation into other circuits.



Figure 1: Arduino Uno board.

The software consists of a standard programming language compiler and the boot loader that runs on the board. Arduino hardware is programmed using a Wiring-based language (syntax and libraries), similar to C/C++ with some slight simplifications and modifications, and a Processing-based integrated development environment.

Usually, each new project requires: 1) to construct electronics circuit on protoboard and connect it to the Arduino board, 2) to write a *sketch* (i.e., a program or code), 3) verify and compile the sketch, and 4) upload the compiled sketch to the board and observe operation.

### 3. Project 1: Flashing or blinking LED

In this project we control a simple light emitting diode (LED) to make it blink on and off.

The *schematic diagram* of this project is shown in Figure 2.

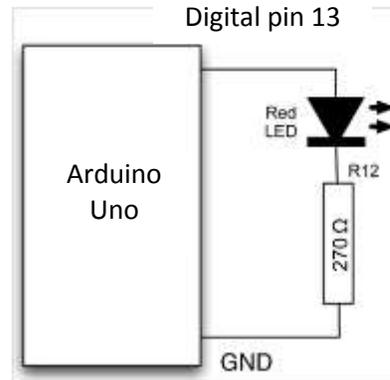


Figure 2: Schematic diagram.

The *protoboard or breadboard layout* is shown in Figure 3.

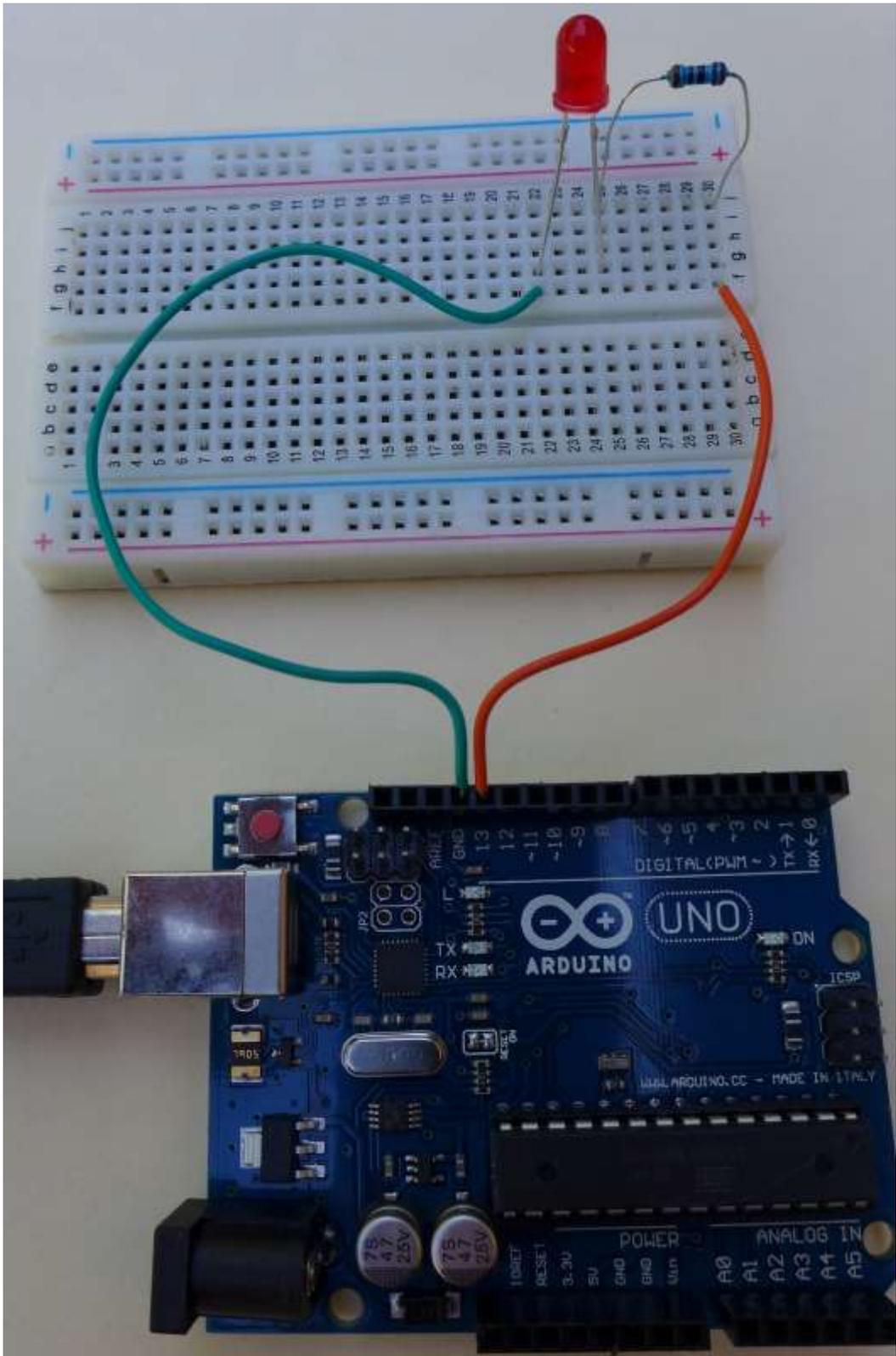


Figure 3: Protoboard layout.

The *sketch* (or program or code) for this project is shown below:

```
// Project 1: Blink LED
// Turns on an LED on for one second, then off for one second, repeatedly

void setup() {
  // we will connect an LED to Pin 13, which we want to operate as an output
  // therefore, we initialize the digital Pin 13 as an output
  pinMode(13, OUTPUT);
}

void loop() {
  digitalWrite(13, HIGH); // set the LED on
  delay(1000);           // wait for a second
  digitalWrite(13, LOW); // set the LED off
  delay(1000);           // wait for a second
}
```

Launch Arduino software (follow professor's instructions) and type-in or open the existing file with the above sketch. Once you have the sketch loaded press the "Verify" button. Once the sketch is verified, press the "Upload" button. Observe the operation and comment on it.

#### 4. Assignment

Modify the sketch to make the LED blink faster and to use Pin 12 as an output pin instead of Pin 13. Compile and load to the board. Investigate.