Arduino Project

Electronic Die

Difficulty: Intermediate

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Introduction
The uOttawa Makerspace is home to the latest in microcontroller technology with Arduino Uno and Intel Galileo microcontroller boards. This guide shows students of the Makerspace the appropriate methods to use the Arduino microcontroller boards by the creation of a simple electronics project that uses the programming capacity of the Arduino board. The electronic project selected is a randomly generated electronic die represented by six LEDs.

Resources
The items to be used for the project are:

- Arduino UNO microcontroller board
- Six LEDs of any color
- One 560 Ω (ohm) resistor
- Connecting wires
- Medium-sized breadboard
- Laptop with USB compatibility
- USB Type A male to Type B male cable
- Arduino IDE software

Additional material for the project is:

- Electronic_Die - Circuit image file
- Electronic_Die source code (sketch)

Procedure

Prepare the Circuit

- Connect each of the positive anode of the LEDs (the longer lead) to the output pins (8 to 13) on the Arduino
- Join the negative end of all the LEDs and connect it to the resistor
- Ground the cathode of the resistor using the GND pin on the Arduino
- Ensure the circuit is connected as the provided in the circuit schematic given in Figure 1

Note: The breadboard can be used to layout the circuit with numbers for the die side. Make sure to ground the circuit otherwise the circuit will not function.
Upload Code

- Start the Arduino IDE for the software side of the project
- Copy and paste the Electronic_Die sketch source code (provided as Supporting Materials) in the IDE window
- **Optional:** Browse through the code to understand the functionality of the software
- Click in the Verify button to make sure there are no compile time errors in the code
- Ensure the Arduino is connected via the USB port to the computer
- Click on the Upload button on the IDE to upload the code to the Arduino
- **Optional:** If there is an error message look over the connectivity of the board
- The upload takes some time as it electronically rewrites the Arduino microcontroller

**Note:** The source code must be verified before the code can be uploaded to the Arduino board.
Using the Circuit

- Once the code has been uploaded to the board the circuit will function as a six-sided die
- Switching on the Arduino will light up one randomly selected LED of the six in the circuit
- The electronic die is re-cast using the reset button on the Arduino board
- Congratulations! You have successfully completed the guide to Arduino Project, now go ahead and create marvellous circuits!
Supporting Materials

Arduino sketch (source code) for Electronic_Die

// Project 15 - Creating an Electronic Die
void setup()
{
    randomSeed(analogRead(0)); // seed the random number generator
    for ( int z = 8 ; z < 14 ; z++ ) // LEDs on pins 8-13 are output
    {
        pinMode(z, OUTPUT);
    }
}

void randomLED(int del)
{
    int r;
    r = random(8, 14); // get a random number from 8 to 13
    digitalWrite(r, HIGH); // output to the matching LED on digital pin 1-6
    if (del > 0)
    {
        delay(del); // hold the LED on for the delay received
    }
    else if (del == 0)
    {
        do // the delay entered was zero, hold the LED on forever
        {} while (1);
    }
    digitalWrite(r, LOW); // turn off the LED
}

void loop()
{
    int a;
    // cycle the LEDs around for effect
    for ( a = 0 ; a < 100 ; a++ )
    {
        randomLED(50);
    }
    // slow down
    for ( a = 1 ; a <= 10 ; a++ )
    {
        randomLED(a * 100);
    }
    // and stop at the final random number and LED
    randomLED(0);
}