

Project 3 – Seven segment LED die

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1. Objective

To learn about 7-segment LED displays. We implement a simple die, which is “tossed” by pressing a button and the random number “displayed” on a 7-segment LED.

2. Project 3: 7 segment LED die

In this project we design a simple die. To toss the die we utilize a push-button. This translates into the generation by the microcontroller of a random number between 1 and 6, which is then displayed on a single 7-segment LED display (see Figure 1).

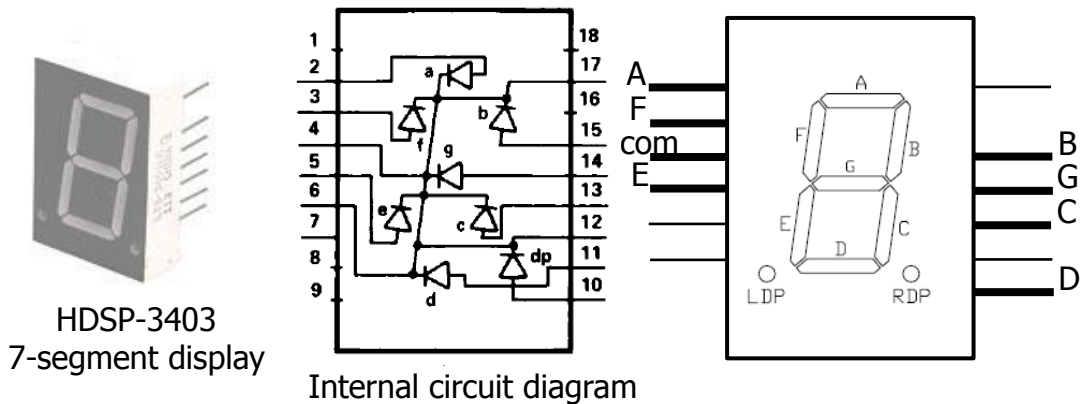


Figure 1: Example of 7-segment LED display.

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

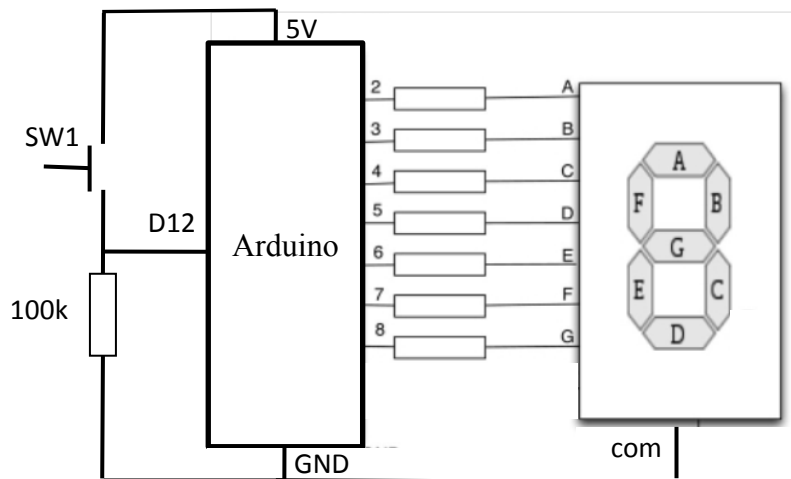


Figure 2: Schematic diagram

The protoboard layout is shown in Figure 3.

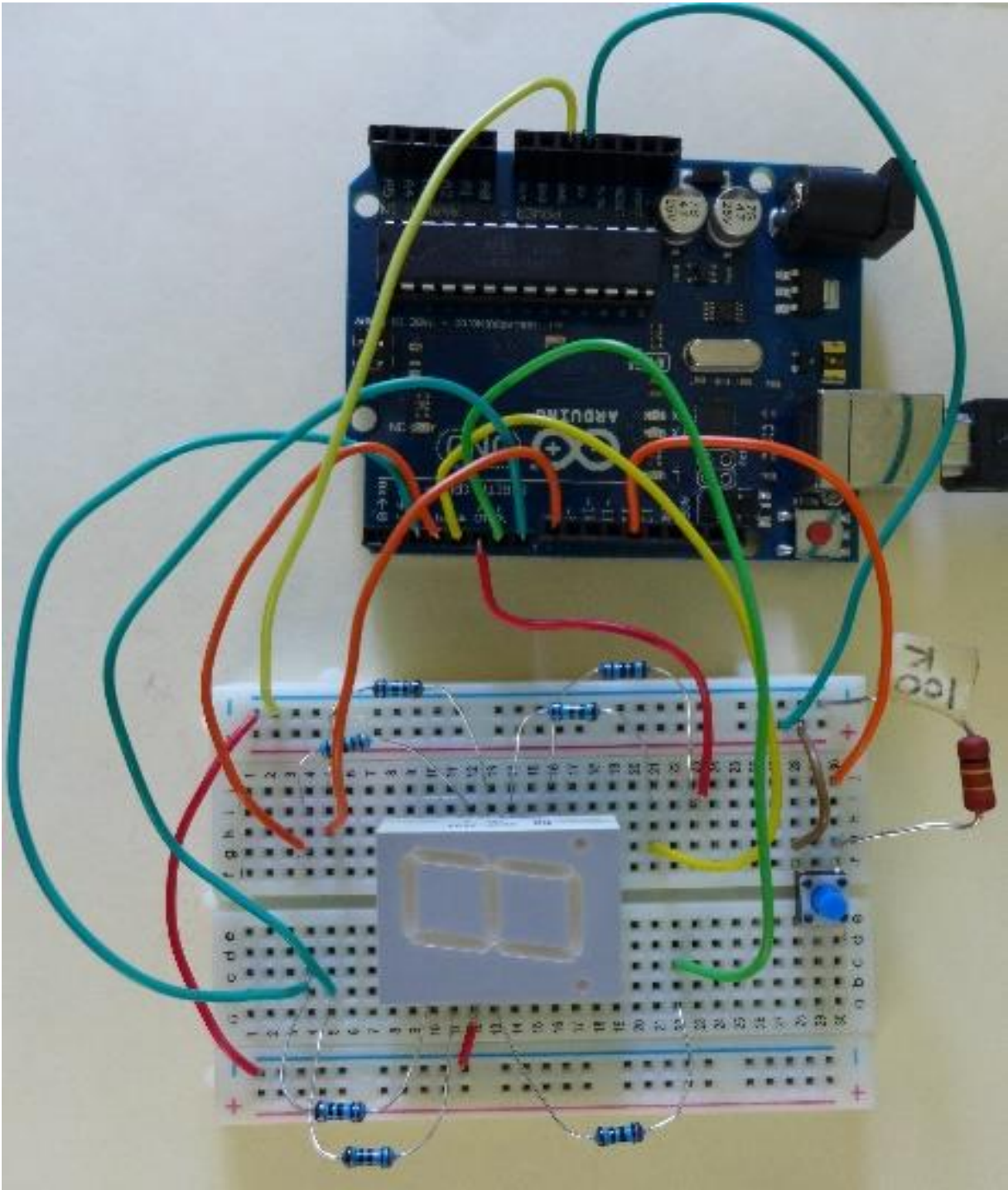


Figure 3: Protoboard layout.

The *sketch* for this project is shown below:

```
// Project 3 - Single die displayed on 7-segment LED;

// the microcontroller pins which control the individual segments
// of the 7-segment LED
int segmentPins[] = {2, 3, 4, 5, 6, 7, 8};
// the pin connected to the push button
int buttonPin = 12;

// a 2D array (a matrix) to store hard coded control signals
// for the 7-segment LED; these codes make for the 7-segment LED
// to display the desired number;
byte digits[10][7] = {
  // a b c d e f g .
  { 1, 1, 1, 1, 1, 1, 0 }, // 0
  { 0, 1, 1, 0, 0, 0, 0 }, // 1
  { 1, 1, 0, 1, 1, 0, 1 }, // 2
  { 1, 1, 1, 1, 0, 0, 1 }, // 3
  { 0, 1, 1, 0, 0, 1, 1 }, // 4
  { 1, 0, 1, 1, 0, 1, 1 }, // 5
  { 1, 0, 1, 1, 1, 1, 1 }, // 6
  { 1, 1, 1, 0, 0, 0, 0 }, // 7
  { 1, 1, 1, 1, 1, 1, 1 }, // 8
  { 1, 1, 1, 1, 0, 1, 1 } // 9
};

void setup()
{
  // set microcontroller's pins to output mode; use a for loop;
  for (int i=0; i < 7; i++)
  {
    pinMode(segmentPins[i], OUTPUT);
  }
  pinMode(buttonPin, INPUT);
}

void loop()
{
  // declare a variable, which will store the randomly generated
  // value of the tossed die;
  static int die_value;
  if (digitalRead(buttonPin)) // "toss" die each time button is pushed;
  {
    die_value = random(1,7);
  }
  // call function setSegments() to set the value of each of the
  // output pins that drive the 7-segment LED accordingly, so that
  // the generated number is actually displayed;
  setSegments(die_value);
}
```

```
void setSegments(int n)
{
  for (int i=0; i < 7; i++)
  {
    digitalWrite(segmentPins[i], digits[n][i]);
  }
}
```

Launch Arduino software 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.

3. Assignment

Modify the sketch to generate a random number between 1 and 9 instead of a random number between 1 and 6.

Modify the sketch to display randomly one of the following letters {A, C, E, F, L, U} instead of a random number between 1 and 6.