WE-GIRLS Summer Camp (June 19-22 2017)
**Project 5 – Lie detector**
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## 1. Objective

The objective of this project is to build a simple lie detector.

## 2. Introduction

The lie detector is based on an effect known as galvanic skin response (GSR). As a person becomes nervous – for example, when telling a lie – the skin resistance decreases due to an increase in the moisture level of the skin. Our lie detector is based on measuring the resistance of the skin. We can measure this resistance using an analog input of the Arduino board and use an LED and buzzer to indicate a lie or untruth.

## 3. Project 5: Lie detector

The schematic diagram of this project is shown in Figure 1. We use a multicolor LED that will display red to indicate a lie, green to indicate a truth, and blue to show that the lie detector should be adjusted by adjusting the potentiometer.

The subject's skin resistance is measured by using the subject as one of the two resistors of a voltage divider. The lower the subject's resistance, the more A0 will be pulled towards 5V – this is the case when a lie is detected. The higher the subject's resistance, the closer to GND A0 will be pulled – this is the case when a truth is observed.
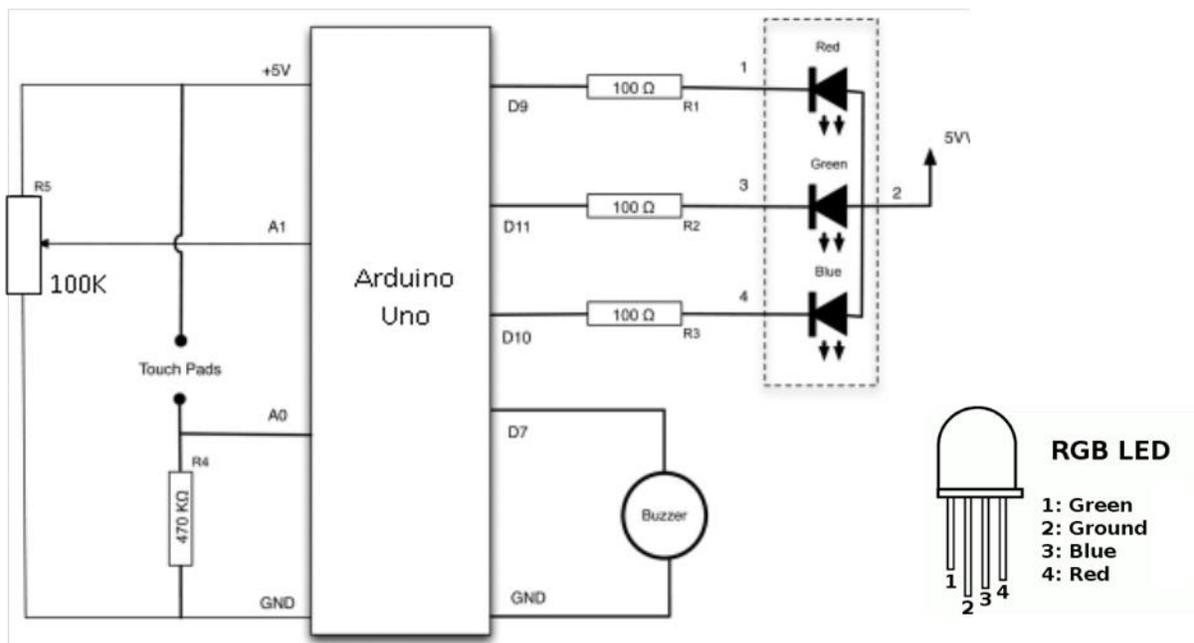


Figure 1: Schematic diagram.
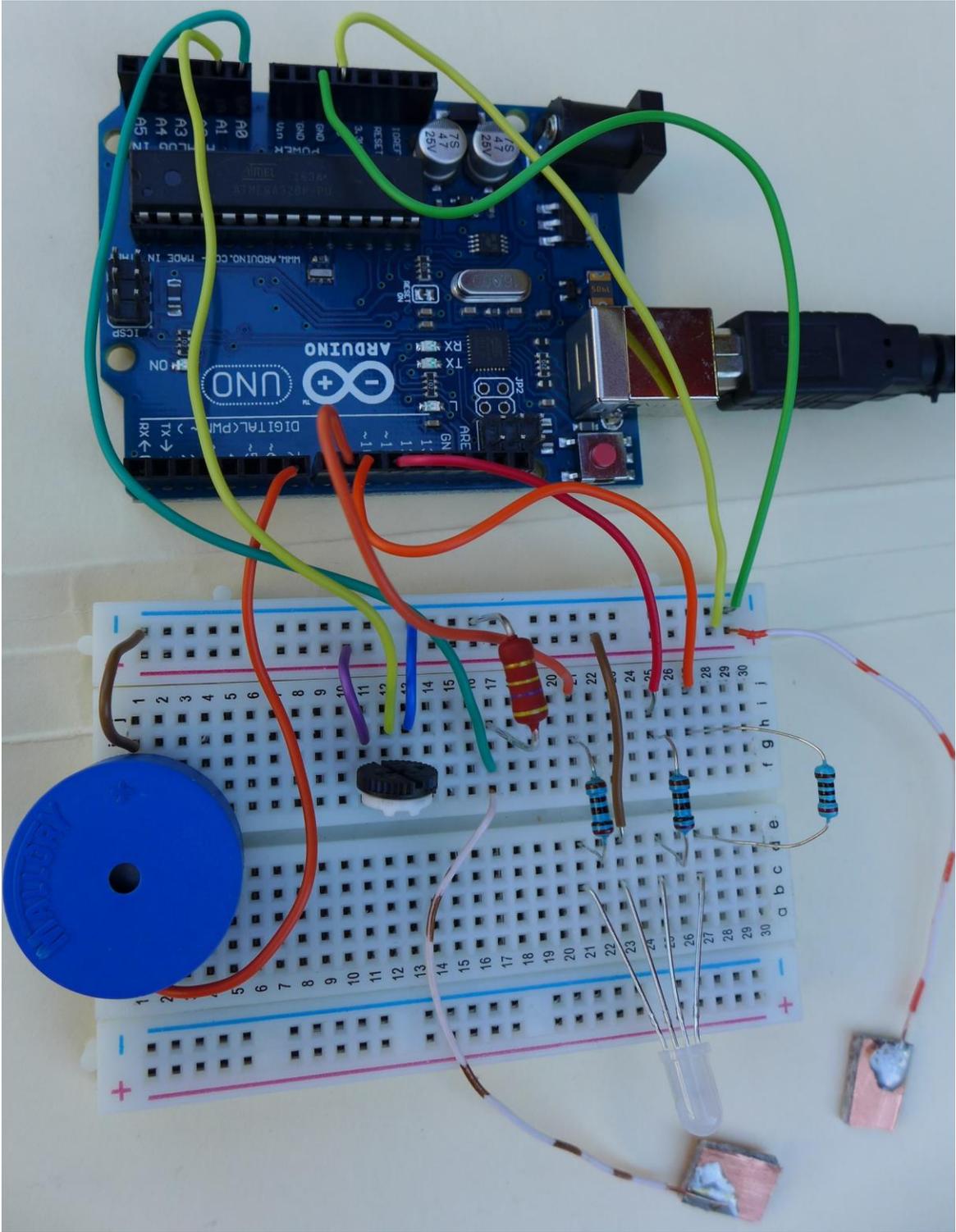
The protoboard layout is shown in Figure 2.



**Figure 2: Protoboard layout.**

The idea is to compare voltages at A0 and A1. If they are about the same, the LED will be set to green. If the voltage from the subject's finger sensor (A0) is significantly higher than A1, the variable resistor will indicate a fall in skin resistance, the LED will change to red, and the buzzer will sound. On the other hand, if A0 is significantly lower than A1, the LED will turn blue, indicating a rise in skin resistance.

The *sketch* for this project is shown below.

```
// Project 5 - Lie detector
// First, get your subject to place two adjoining
// fingers on the two metal thumbtacks. Then turn the
// knob of the potentiometer until the LED turns green.
// You may now start to interrogate your subject.
// If the LED changes to either red or blue, you should
// adjust the potentiometer until it changes to green again
// and then continue the interrogation.

int redPin = 9;
int greenPin = 10;
int bluePin = 11;
int buzzerPin = 7;

int potPin = 1;
int sensorPin = 0;

long red = 0xFF0000;
long green = 0x00FF00;
long blue = 0x000080;

int band = 10; // adjust for sensitivity

void setup()
{
  pinMode(potPin, INPUT);
  pinMode(sensorPin, INPUT);
  pinMode(redPin, OUTPUT);
  pinMode(greenPin, OUTPUT);
  pinMode(bluePin, OUTPUT);
  pinMode(buzzerPin, OUTPUT);
}

void loop()
{
  int gsr = analogRead(sensorPin);
  int pot = analogRead(potPin);
  if (gsr > pot + band)
  {
    setColor(red);
    beep();
  }
  else if (gsr < pot - band)
```

3

```
  {
    setColor(blue);
  }
  else
  {
    setColor(green);
  }
}

void setColor(long rgb)
{
  int red = rgb >> 16;
  int green = (rgb >> 8) & 0xFF;
  int blue = rgb & 0xFF;
  analogWrite(redPin, 255 - red);
  analogWrite(greenPin, 255 - green);
  analogWrite(bluePin, 255 - blue);
}

void beep()
{
  // 5 Khz for 1/5th second
  for (int i = 0; i < 1000; i++)
  {
    digitalWrite(buzzerPin, HIGH);
    delayMicroseconds(100);
    digitalWrite(buzzerPin, LOW);
    delayMicroseconds(100);
  }
}
```

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.

## 4. Assignment
Form pairs of two and test each other by asking different questions.
Comment on the sensitivity of the lie detector.