Foundations of Computing

Circuits & Controllers

Dr Robert Blair

r.blair@uea.ac.uk

Introduction to basic analogue electronics

Outline

1. Recap: Basic circuits
2. Micro Controller
3. Building circuits
4. Schematic circuit diagrams
5. 'Pull Down' resistor
6. 'Pull Up' resistor
7. State comparison
8. Input Comparison
9. Examples

Learning outcomes

- You will be able to define a basic circuit

- You will be able to explain the concept of a programmable controller

- You will be able to define Pull-Up and Pull-Down resistors and their use

- You will be able to write code to create 'Toggle' switch effect

- You will be able to write code which uses input comparison

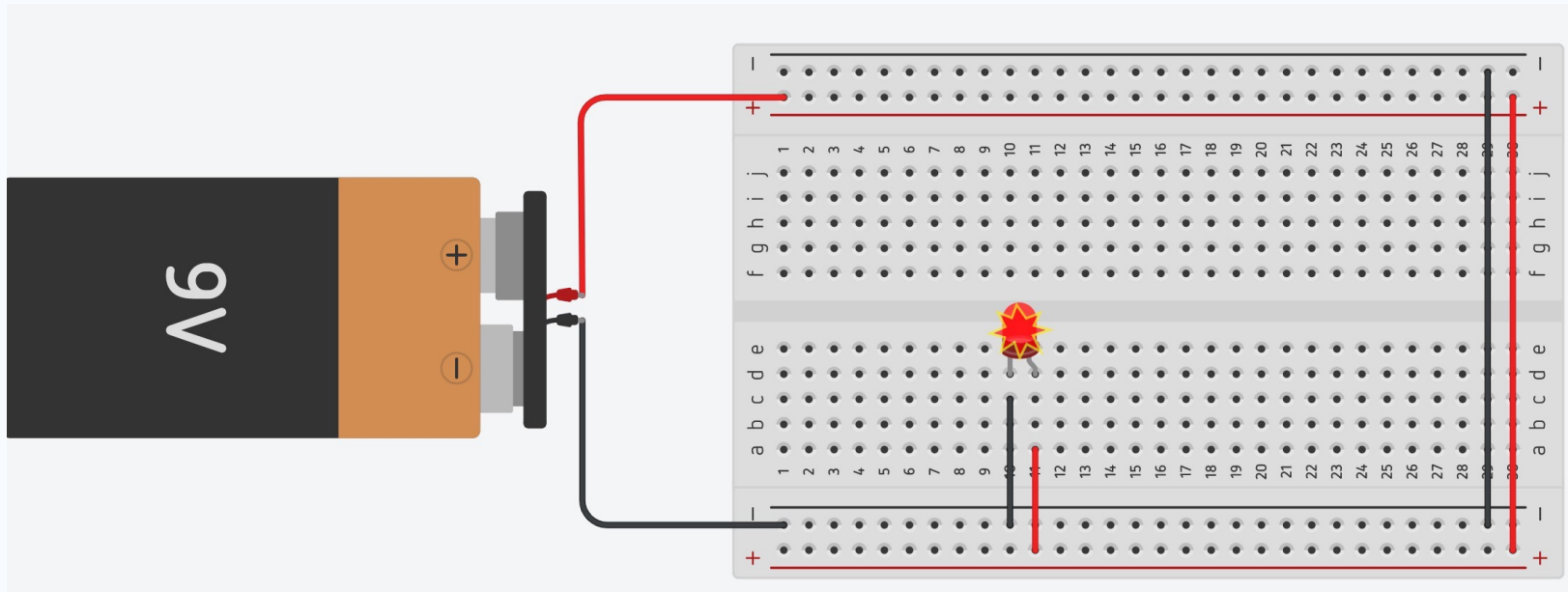University of East Anglia
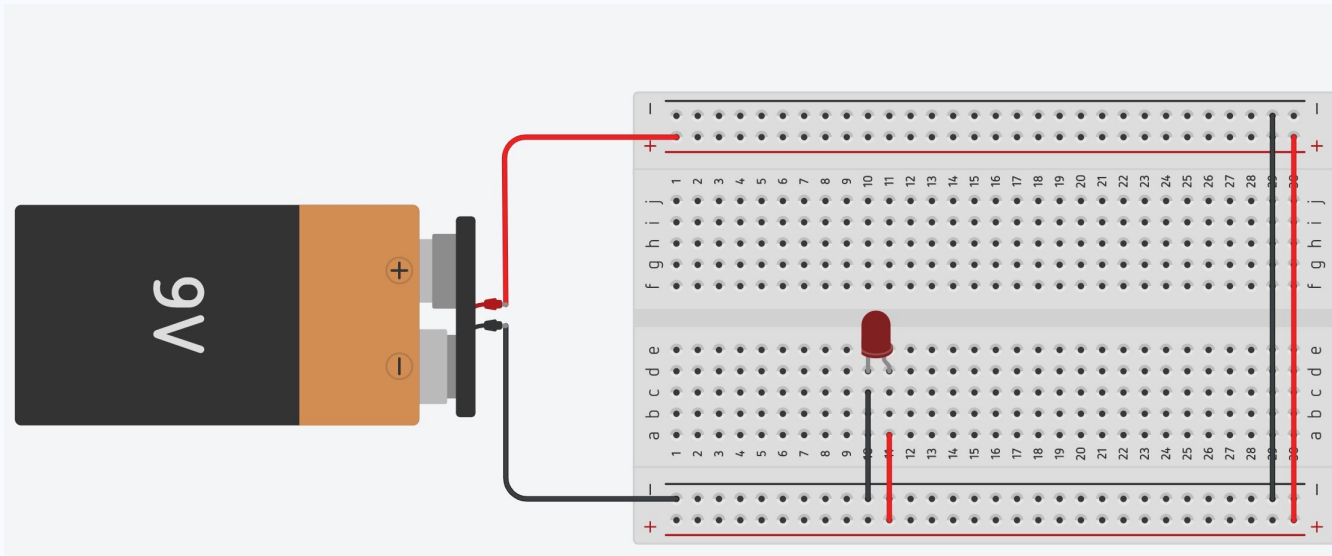
Basic Circuits

Circuit view
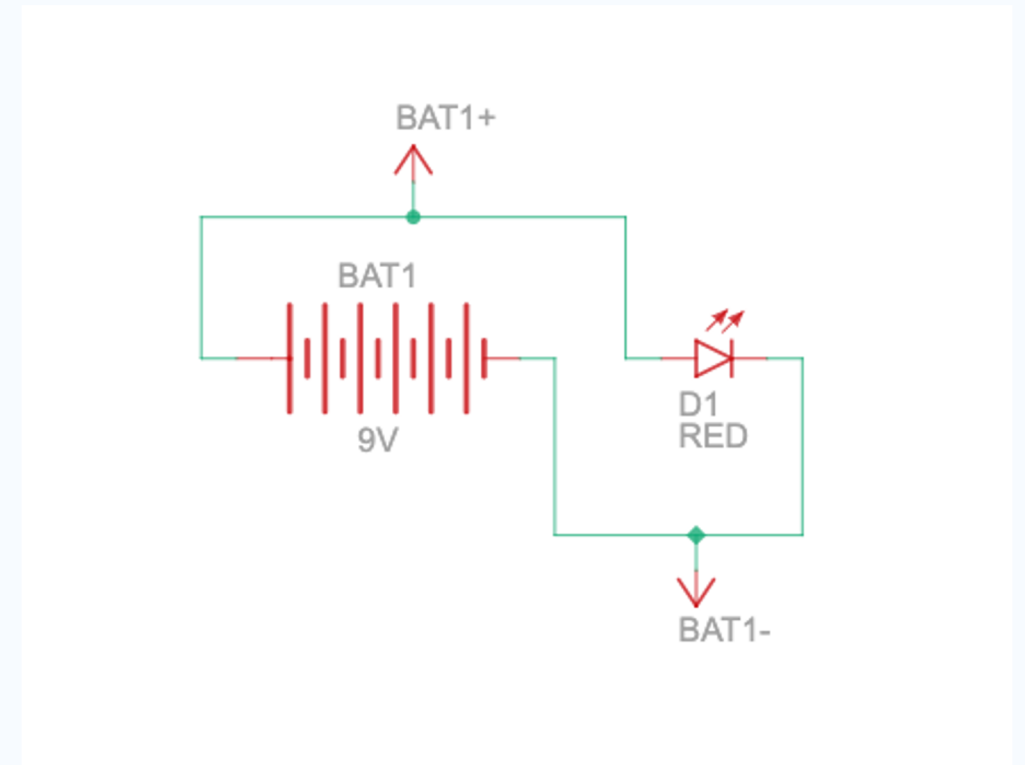
Schematic view

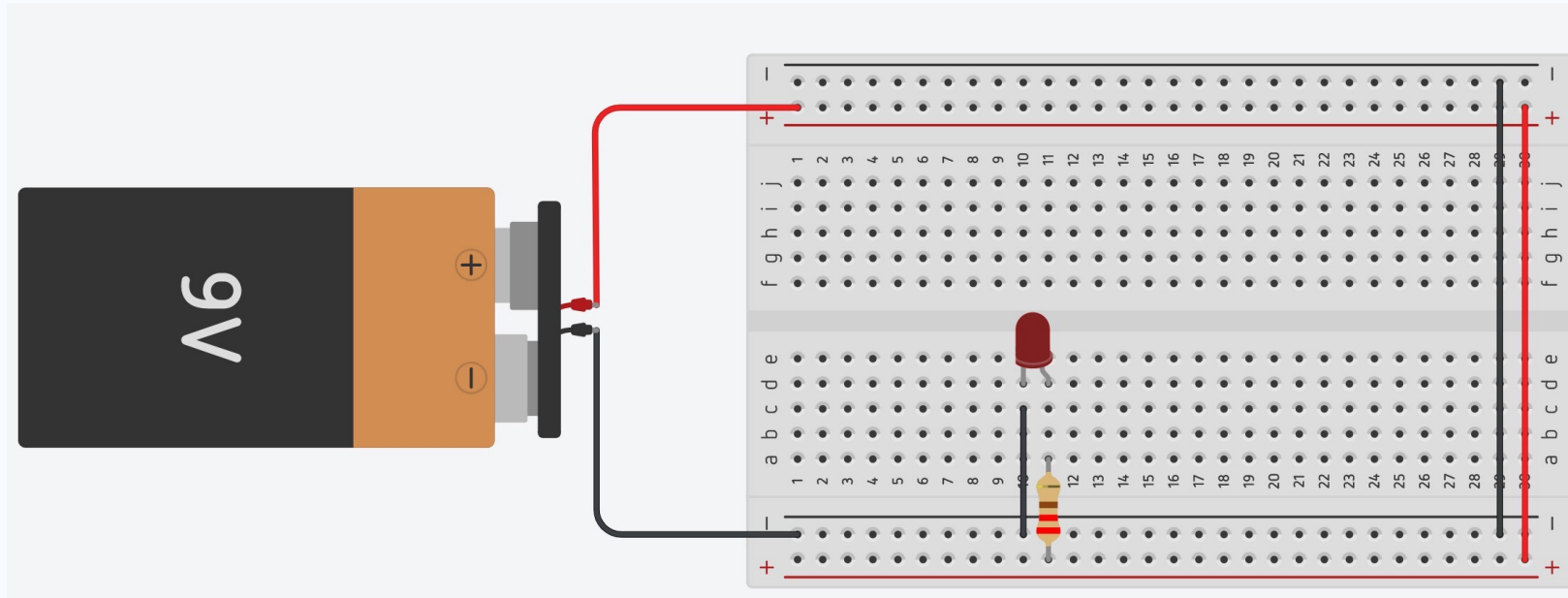Power source, connectors, breadboard, LED

Basic Circuits – oops!

Circuit view
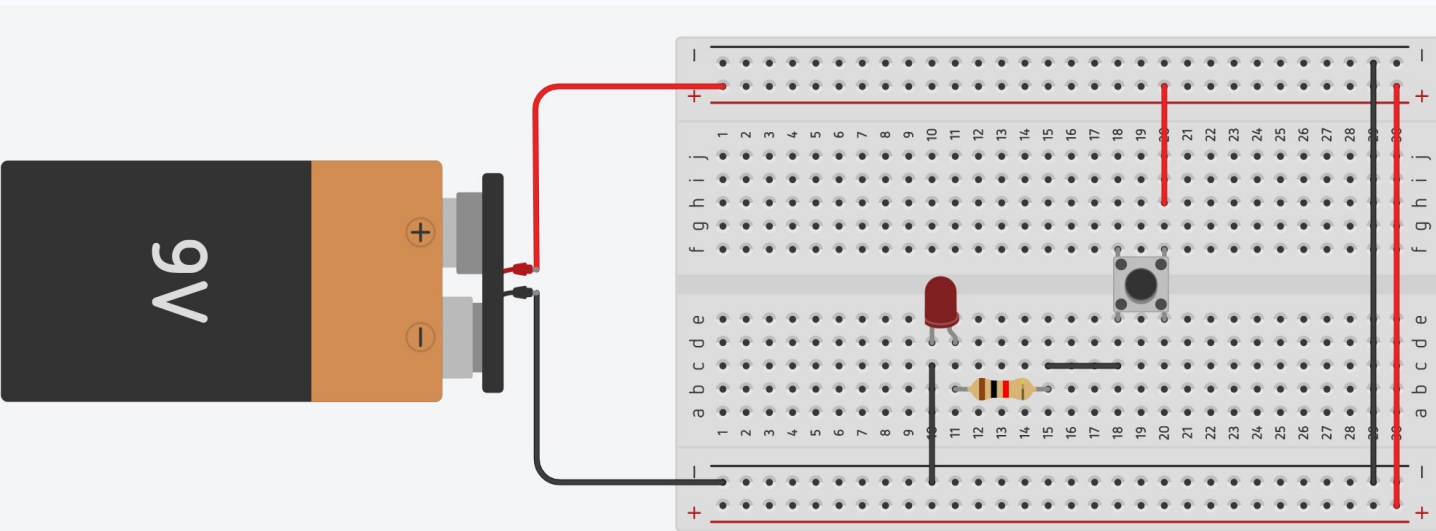
Power source, connectors, breadboard, LED
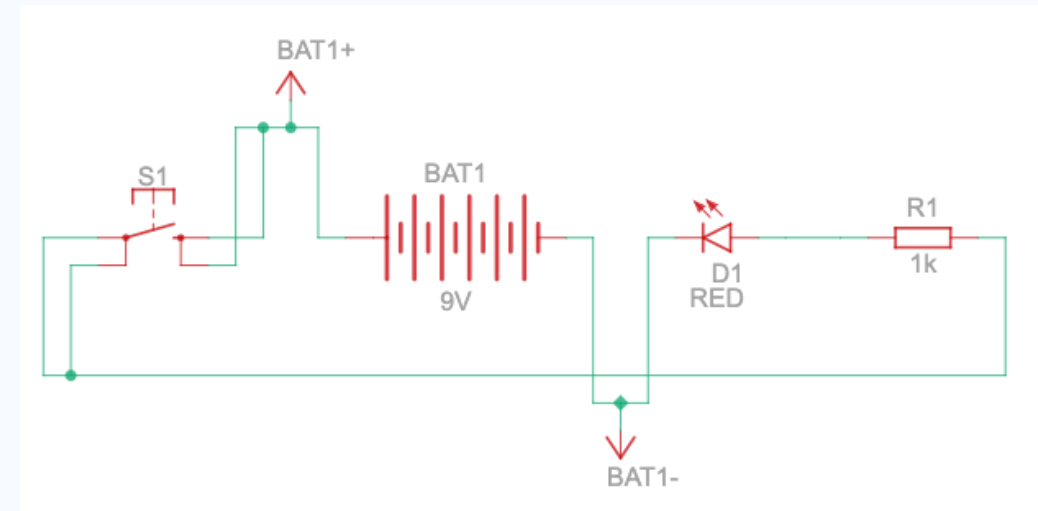
Basic Circuits – that's better.

Circuit view

Power source, connectors, breadboard, LED, resistor
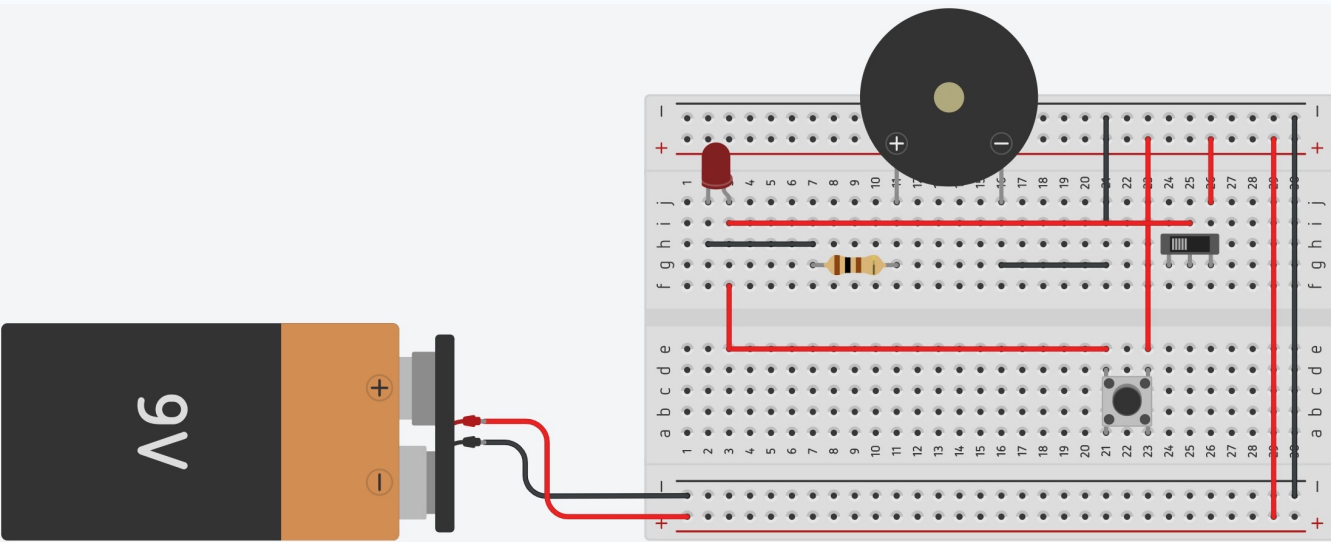
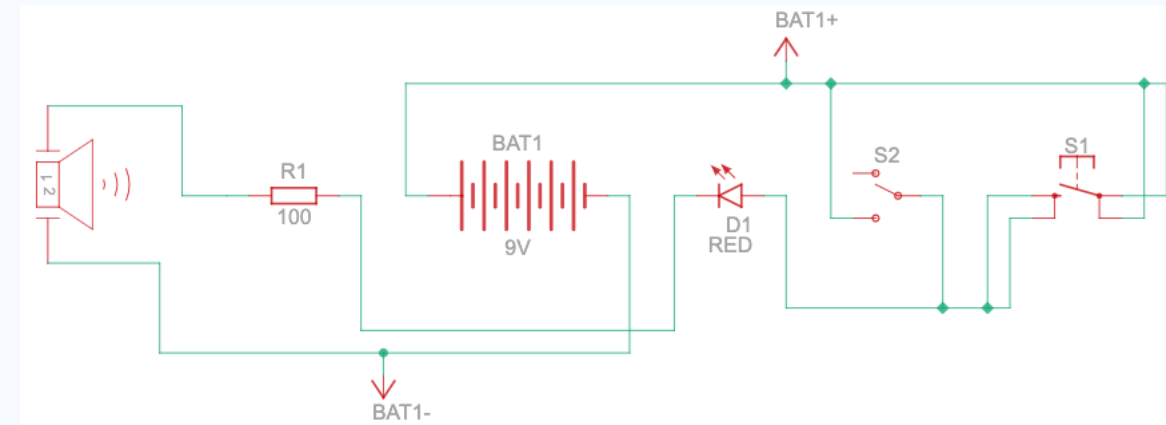# Basic Circuits – control

Circuit view

Schematic view

Power source, connectors, breadboard, LED

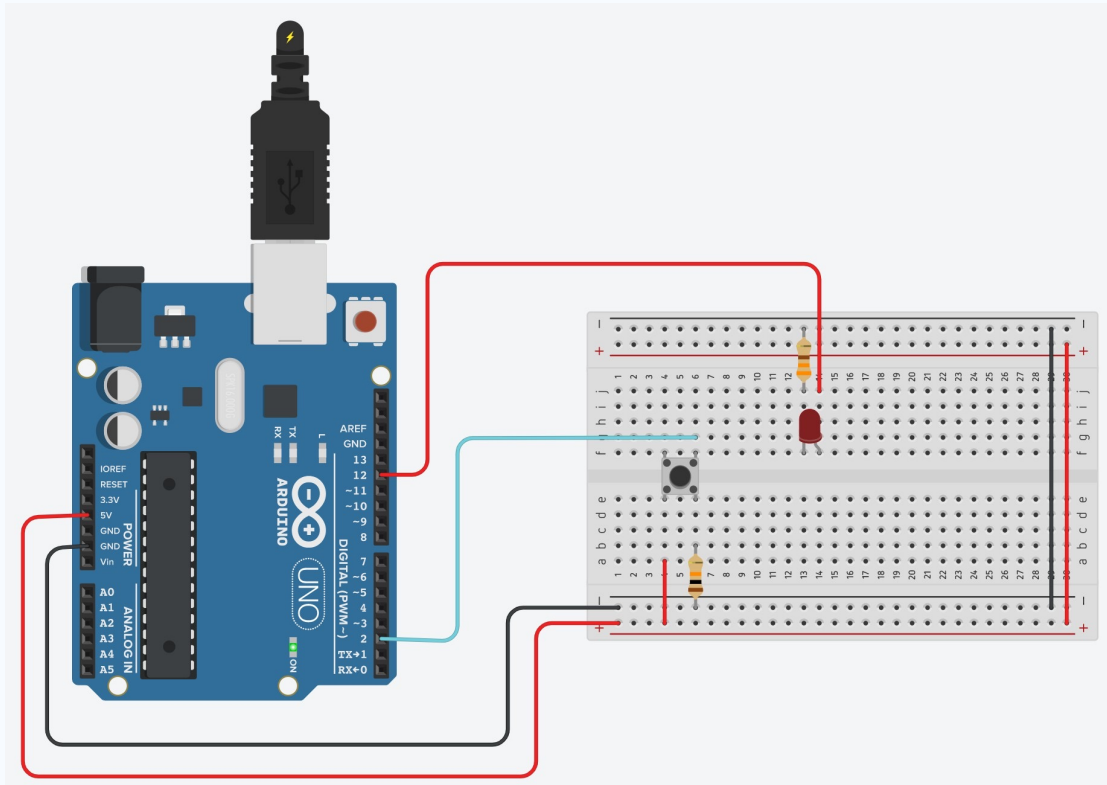# Basic Circuits – components
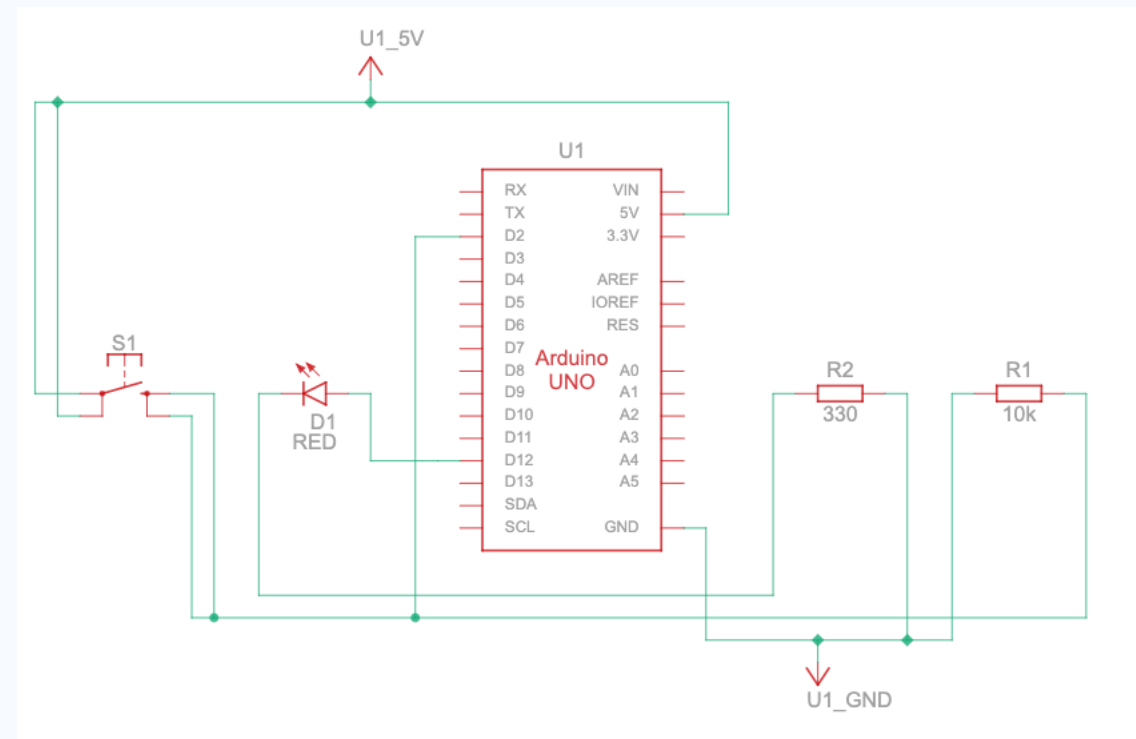
Circuit view

Schematic view

Power source, connectors, breadboard, LED

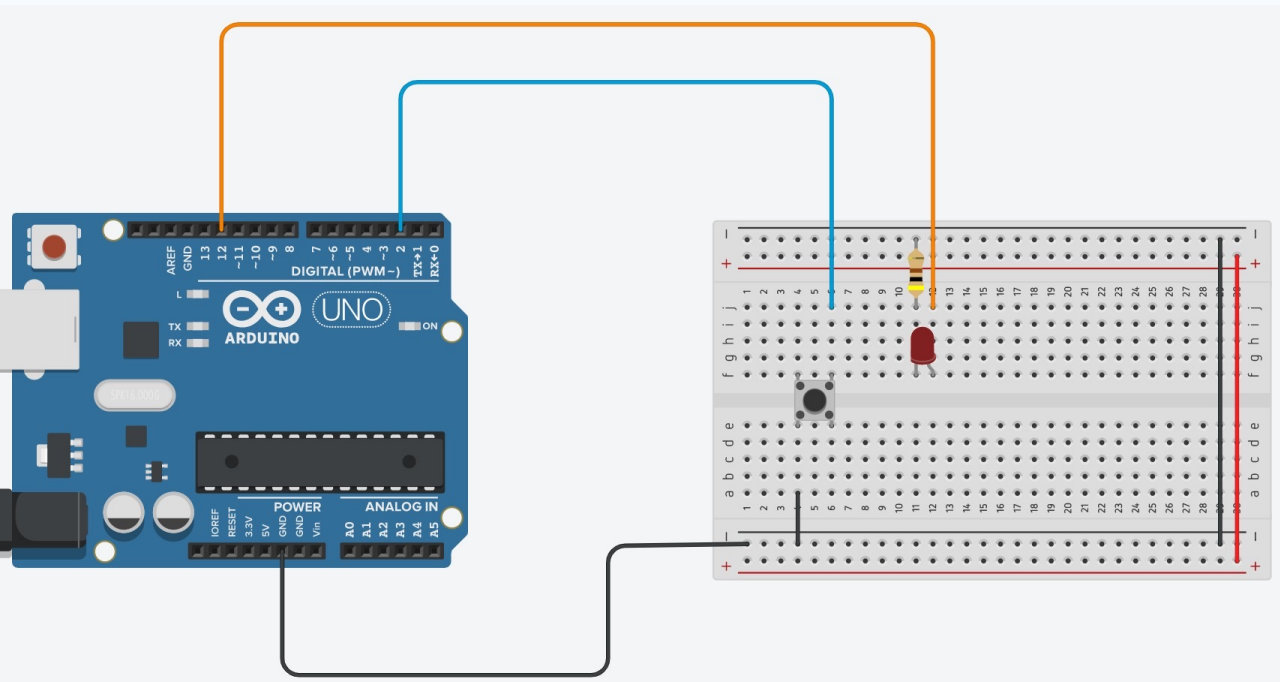# 1. Circuits – No Toggle, External resistor

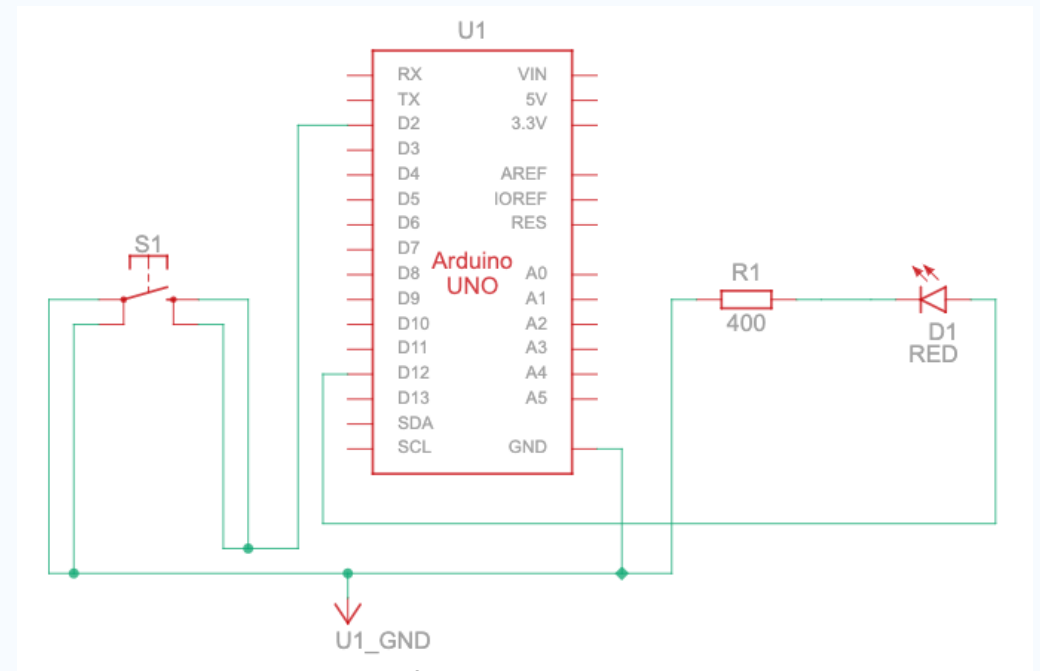Circuit view – Pull Up Resistor (external)

Schematic view

ON/OFF: controller, pins, connectors, breadboard, resistors (to stop 'bounce'), press switch, LED (N.B. 'HIGH', 'LOW')
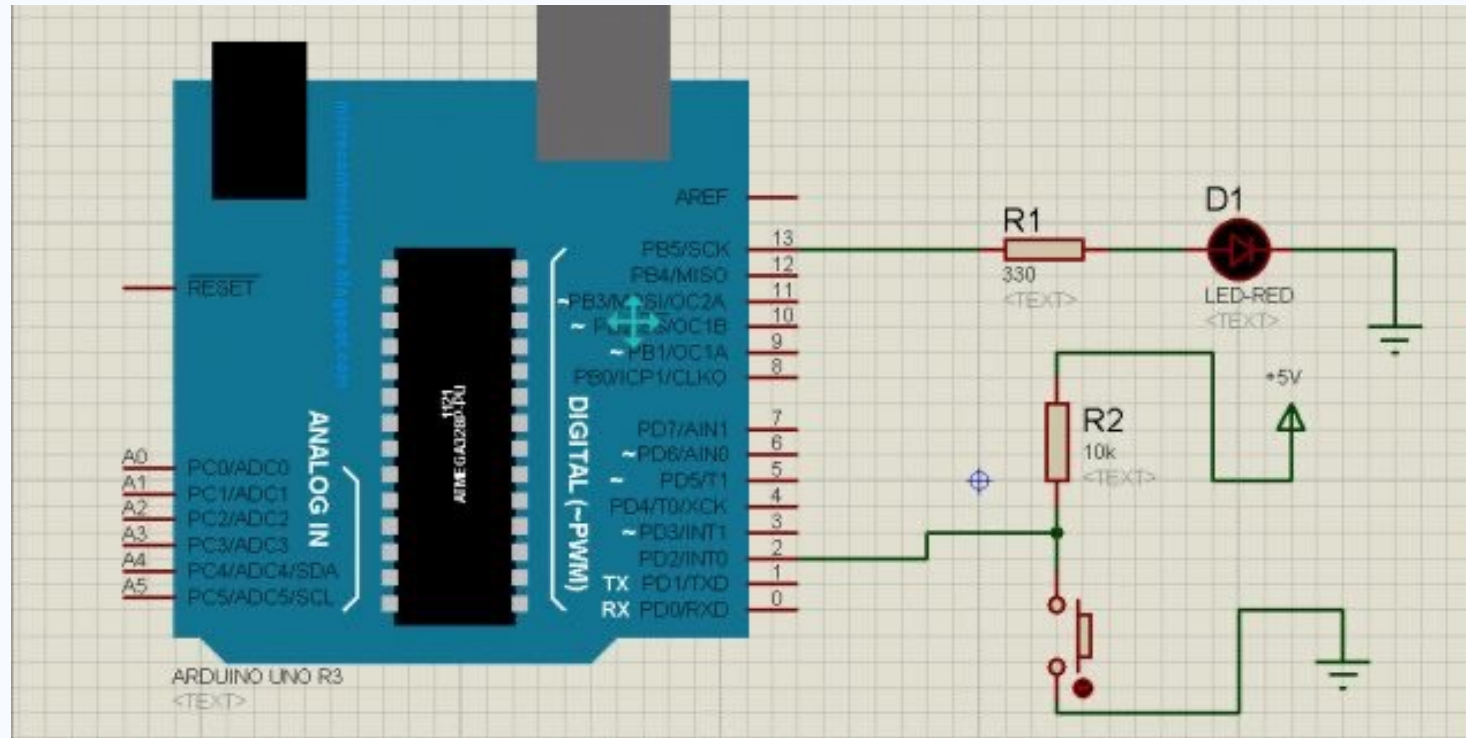
2. Circuits – No Toggle, LED

Circuit view – Pull Up Resistor in built

Schematic view

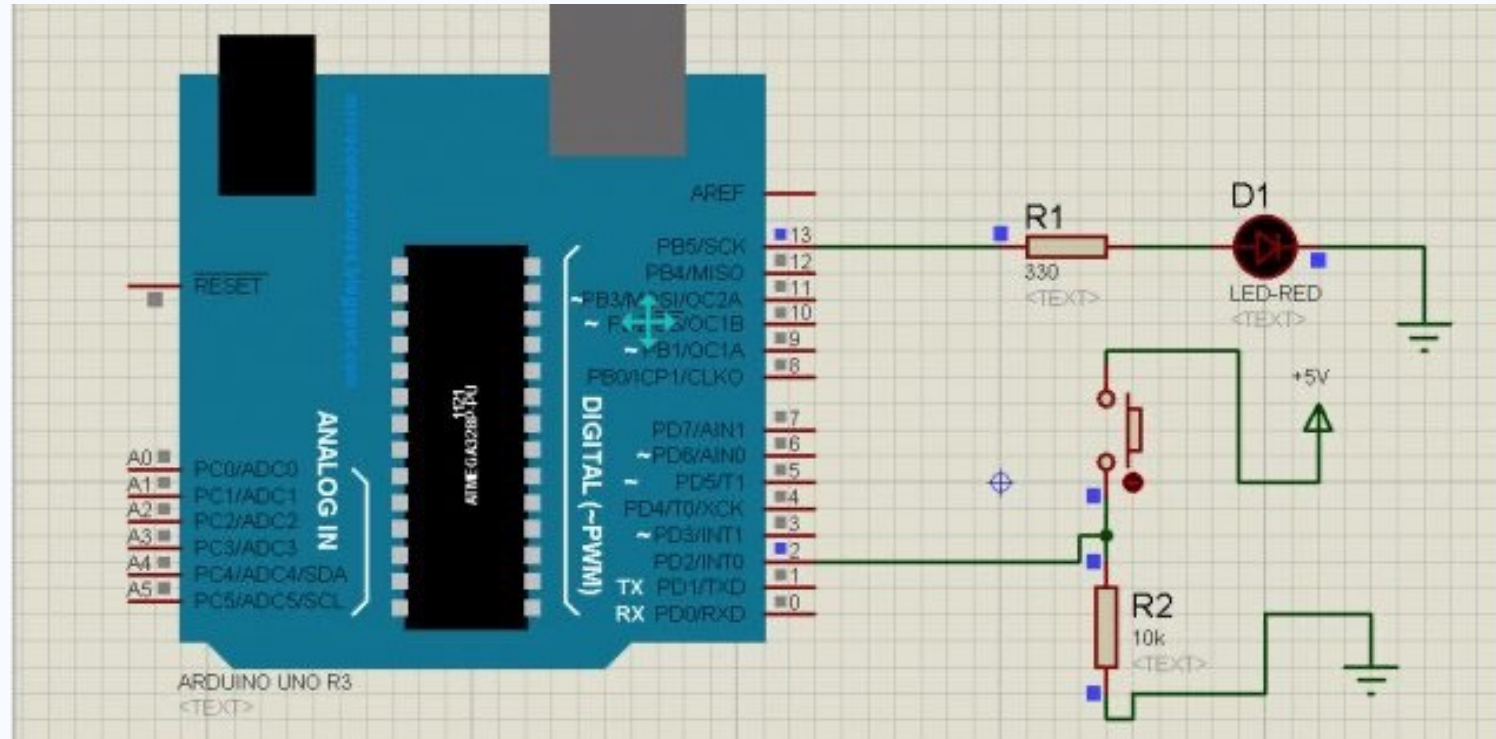Power source, connectors, breadboard, LED

University of East Anglia

Basic Circuits – Switch (pull up resistor)

Schematic view – 'pinMode(PUSH_BUTTON,INPUT_PULLUP);'

The PULLUP resistor configuration is the opposite of the PULLDOWN resistor configuration. In normal condition 5 volts are connected with the Arduino's pin and when the Push Button is press then ground is connected with the Arduino's pin.
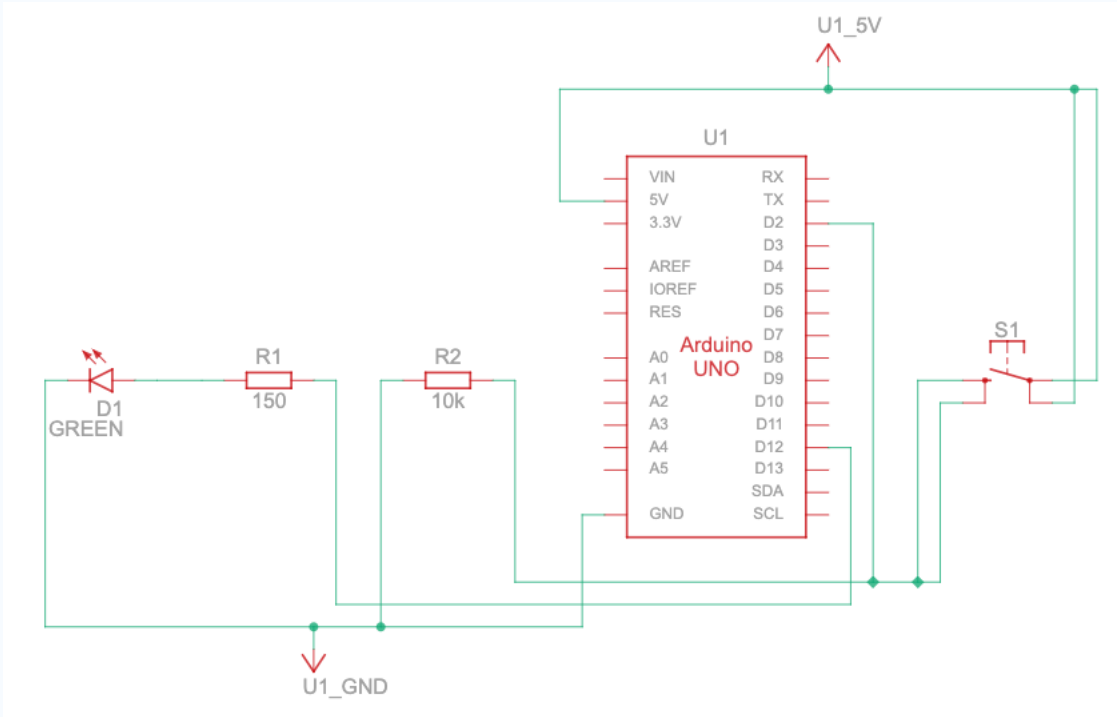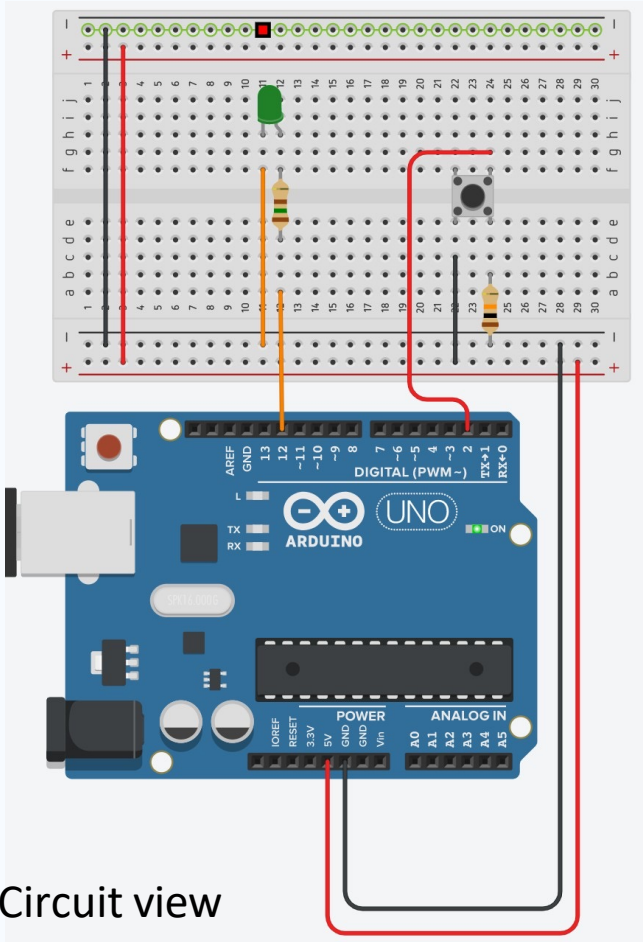
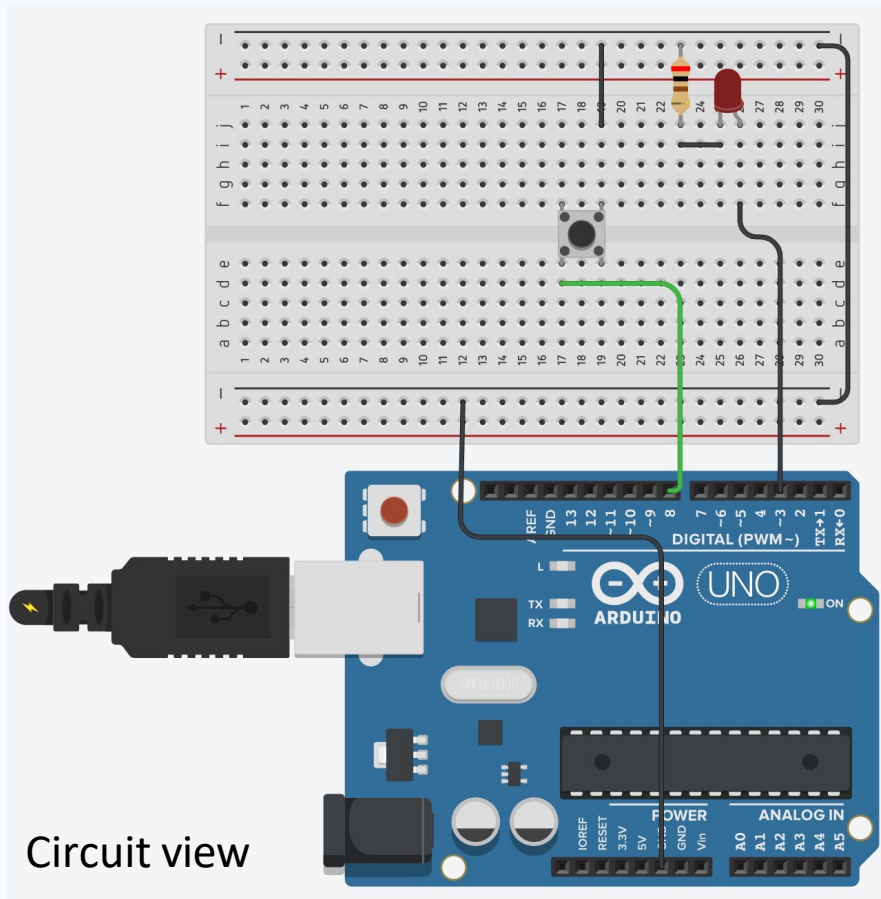# Basic Circuits – Switch (pull down resistor)

Schematic view

When you press the button it gives 5 volts to the Arduino pin and when you release the button it gives ground to the Arduino's pin.
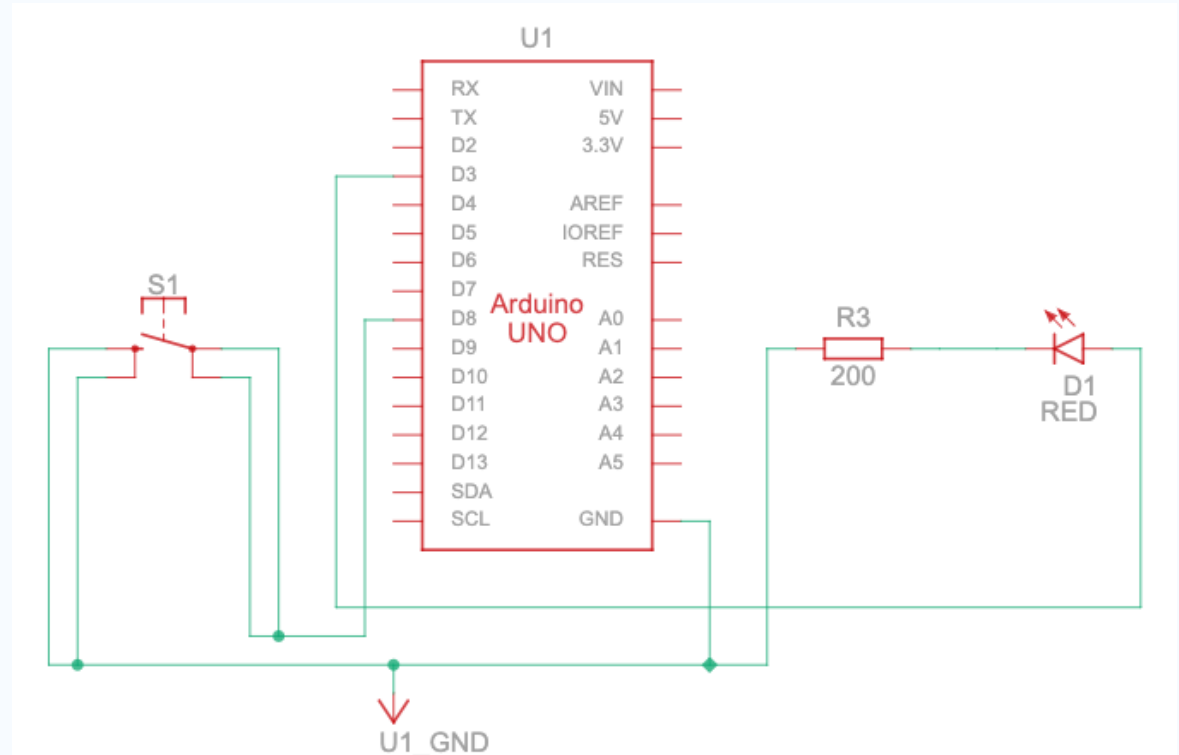
3. Circuits – Toggle, LED, State

Circuit view

Schematic view

Power source, connectors, breadboard, LED

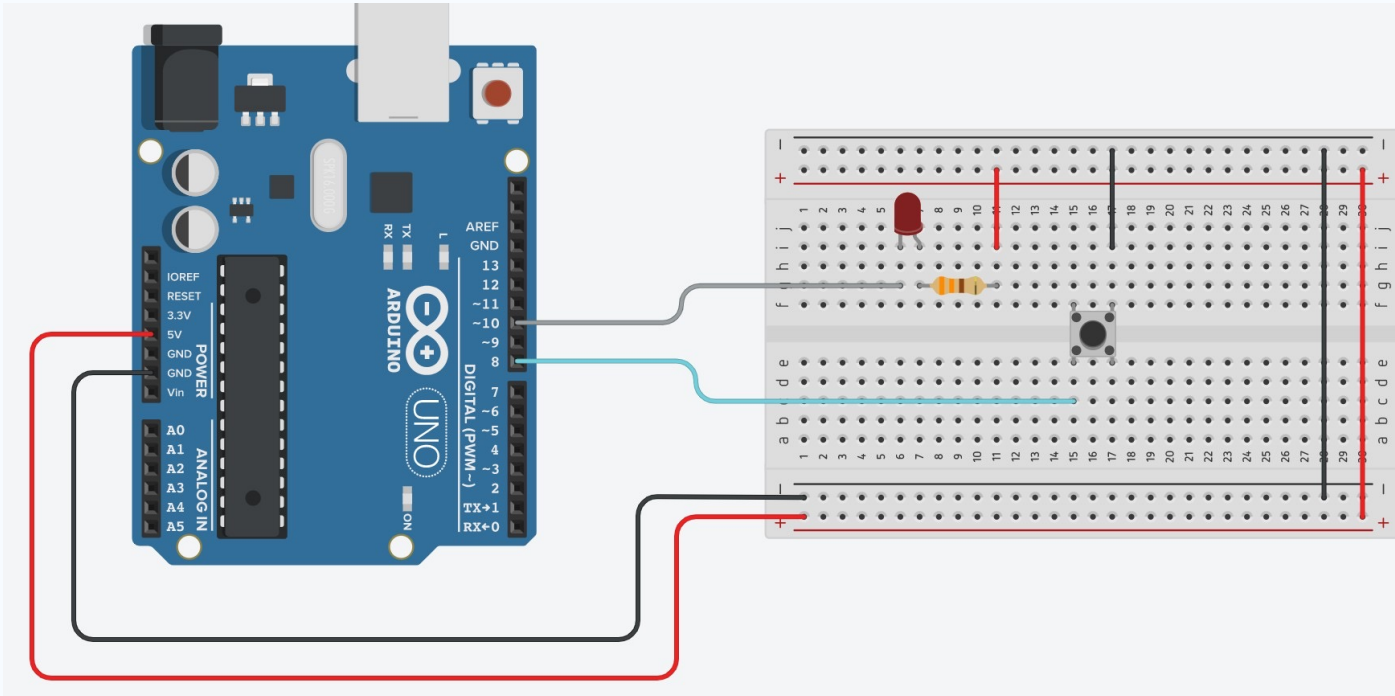# 4. Circuits – Toggle, LED
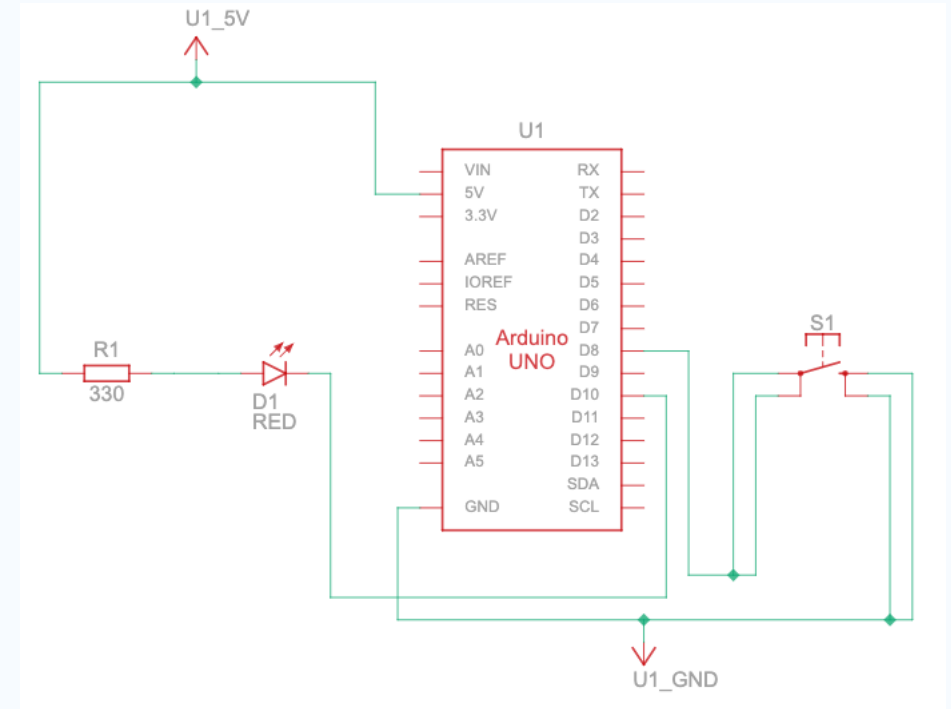

Circuit view

Schematic view

Power source, connectors, breadboard, LED
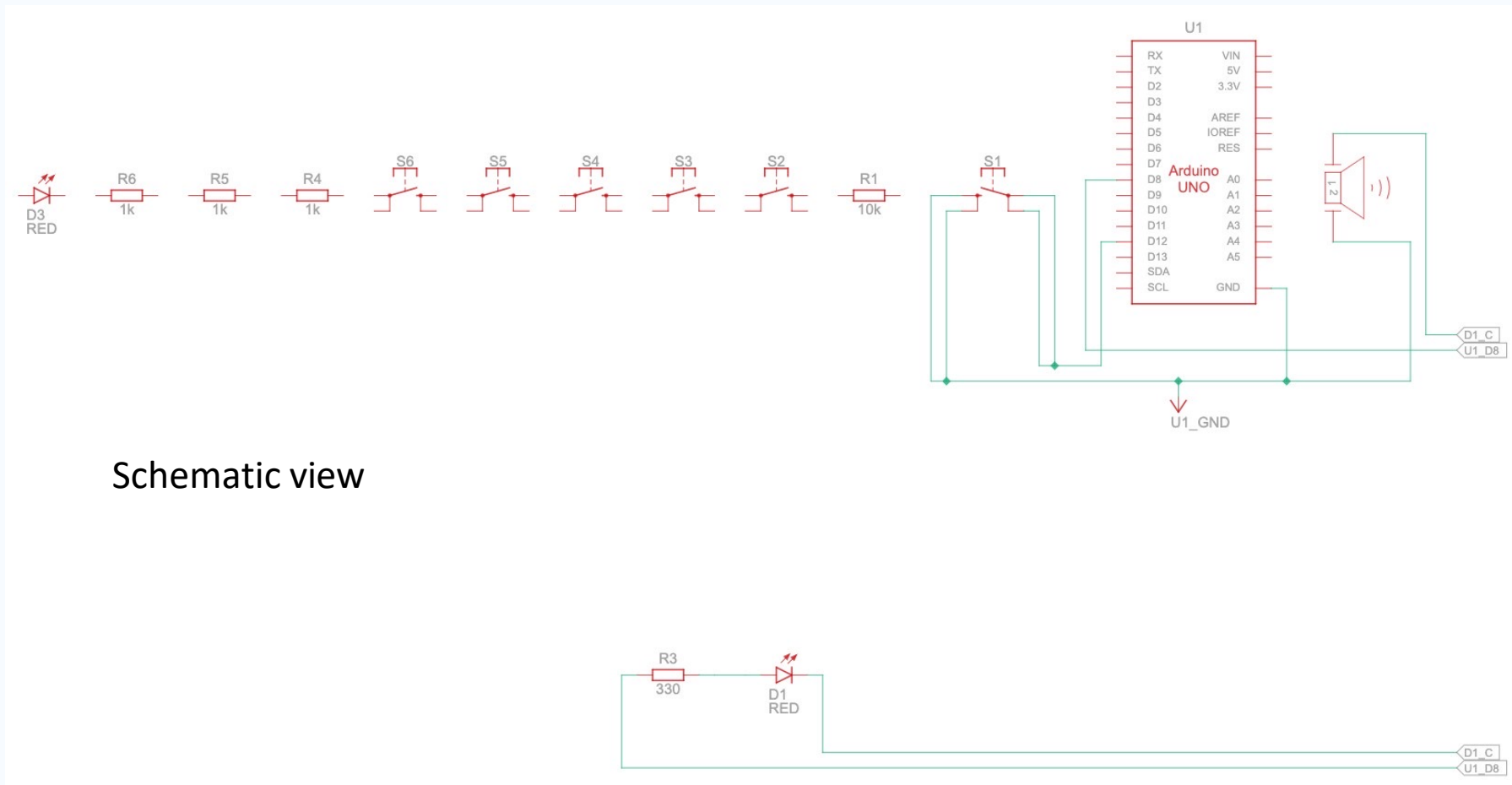
5. Circuits – Toggle, LED

Circuit view

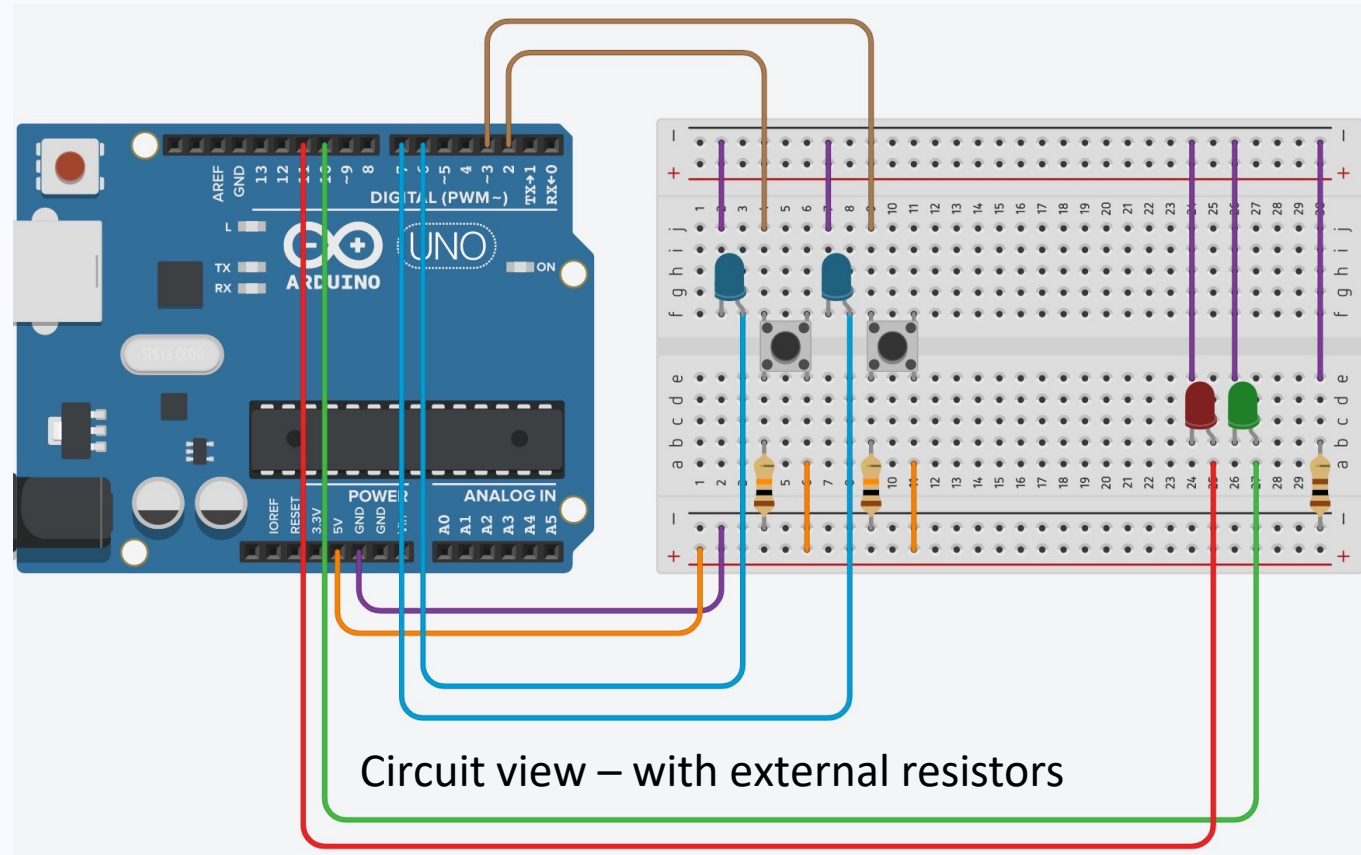Schematic view

Power source, connectors, breadboard, LED

6. Circuits – Multiple Components

Circuit view
Power source, connectors, breadboard, LED
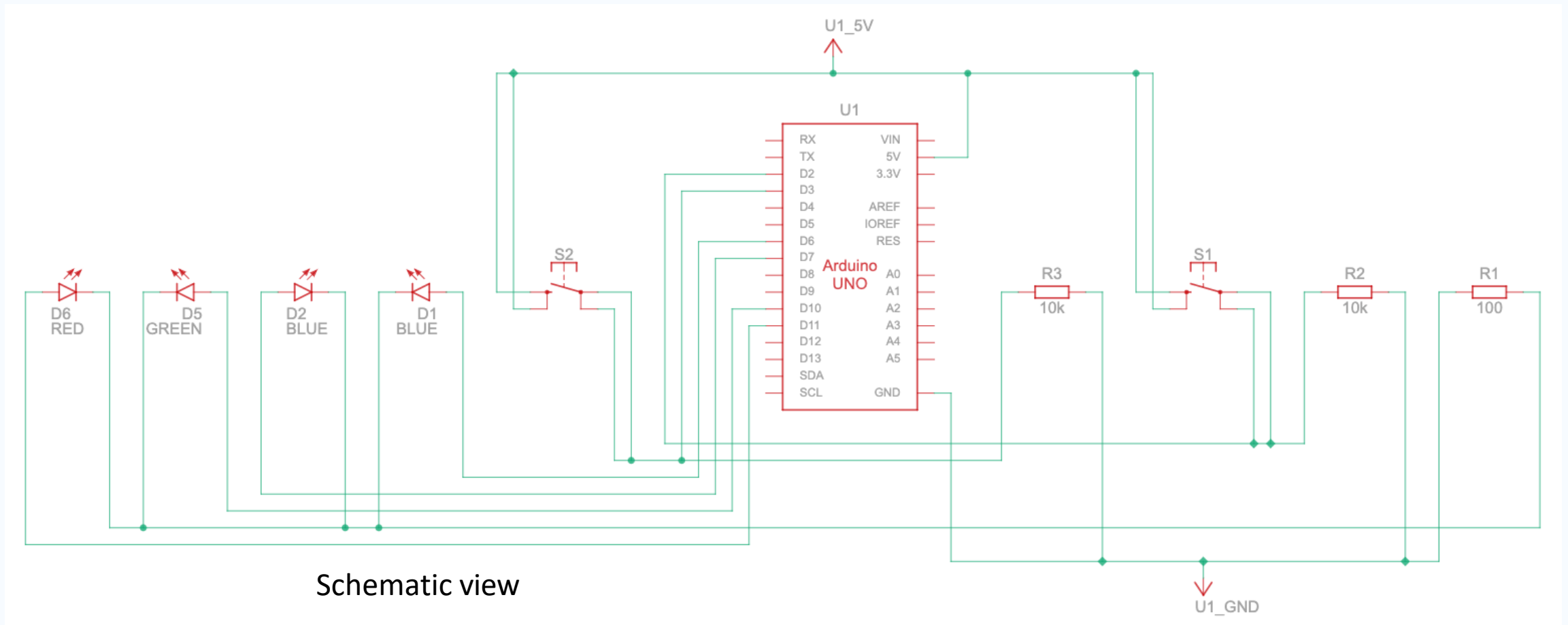
Circuits – Multiple Components

Schematic view

Power source, connectors, breadboard, LED
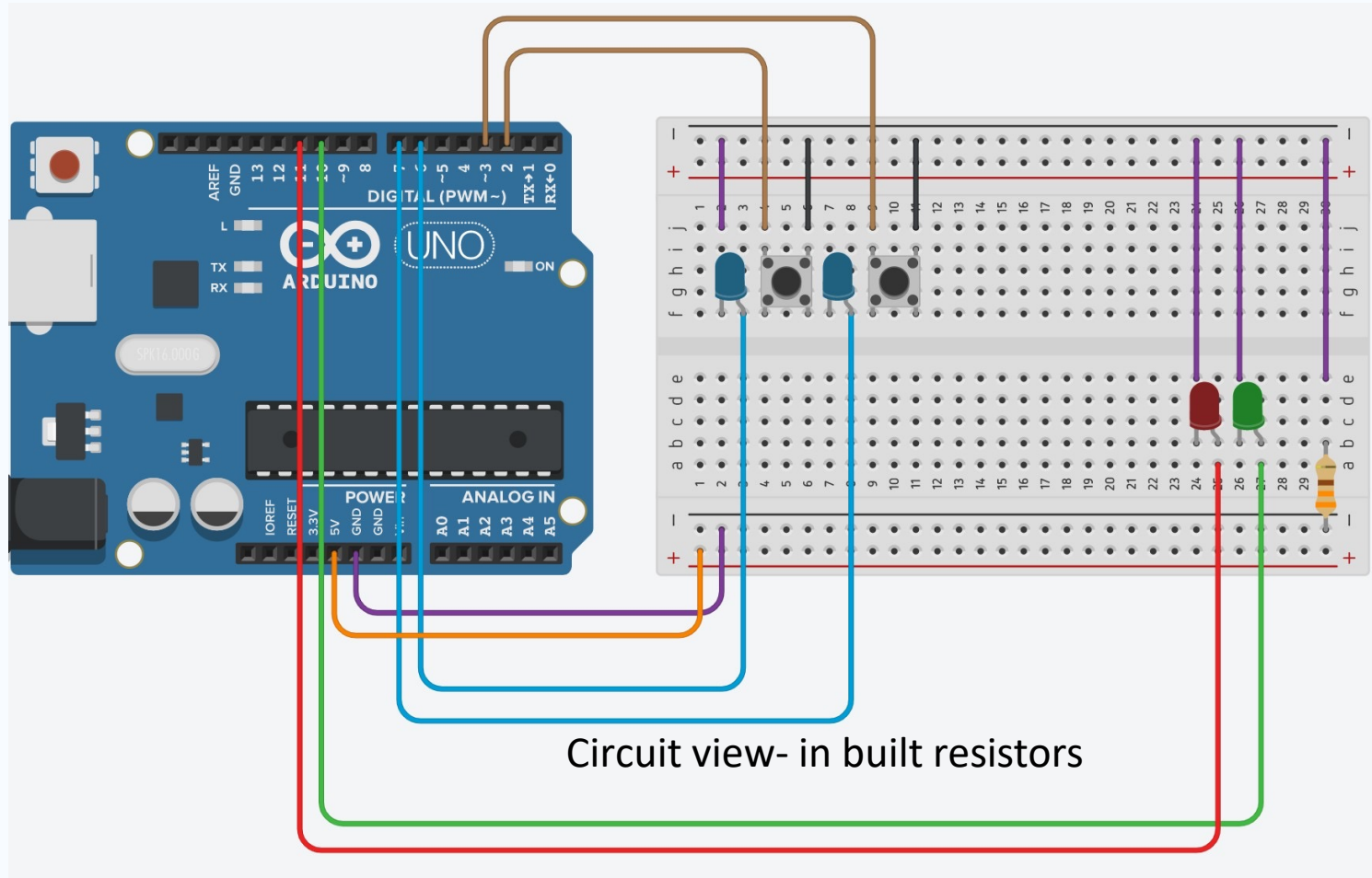
7. Circuits – No Toggle, Code Comparison

Circuit view – with external resistors

Power source, connectors, breadboard, LED

Circuits – No Toggle, Code Comparison

Schematic view

Power source, connectors, breadboard, LED

8. Circuits – Toggle, 'jumping' LEDs

Circuit view- in built resistors

Power source, connectors, breadboard, LED

University of East Anglia

Circuits – Toggle, 'jumping' LEDs

Schematic view

Power source, connectors, breadboard, LED

University of East Anglia

9. Circuits – Toggle, LED, expansion

Circuit view

Power source, connectors, breadboard, LED

Circuits – Toggle, LED, expansion

Schematic view
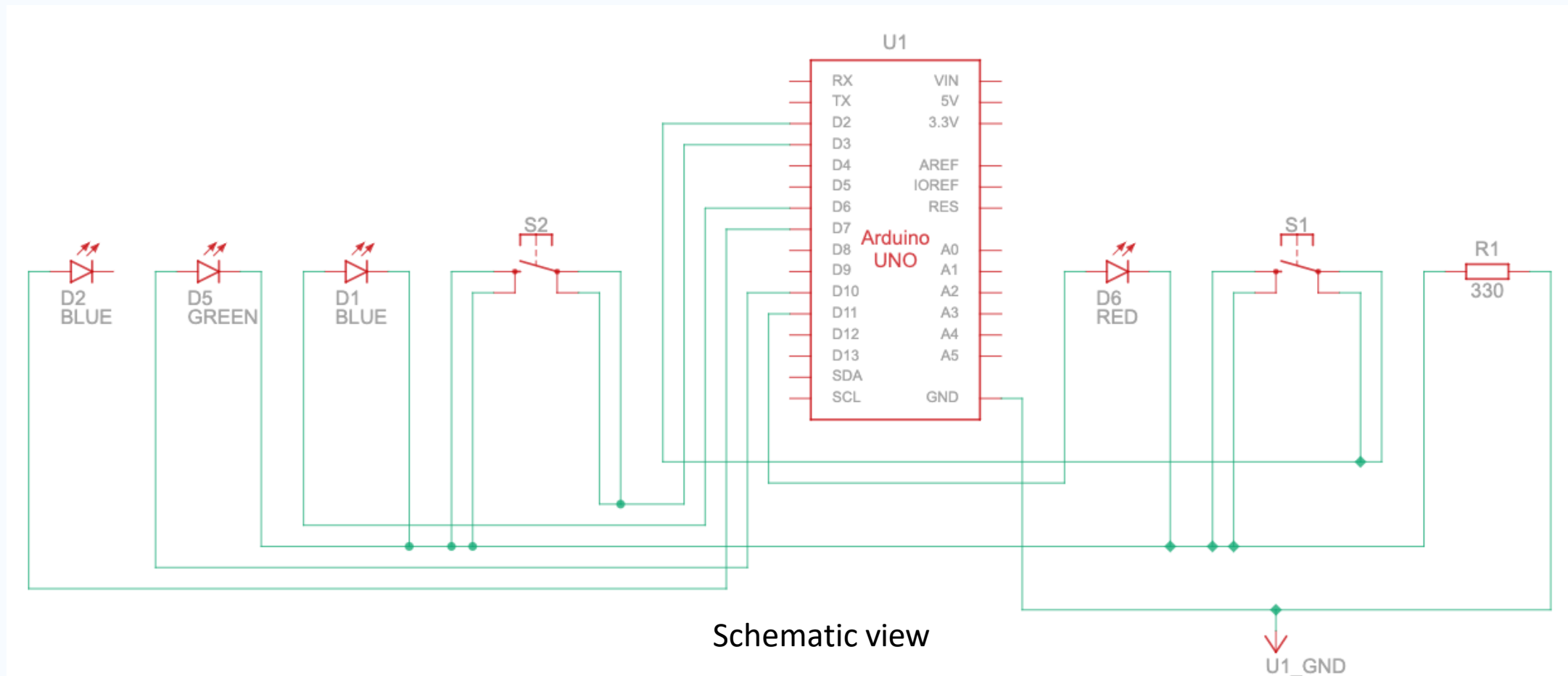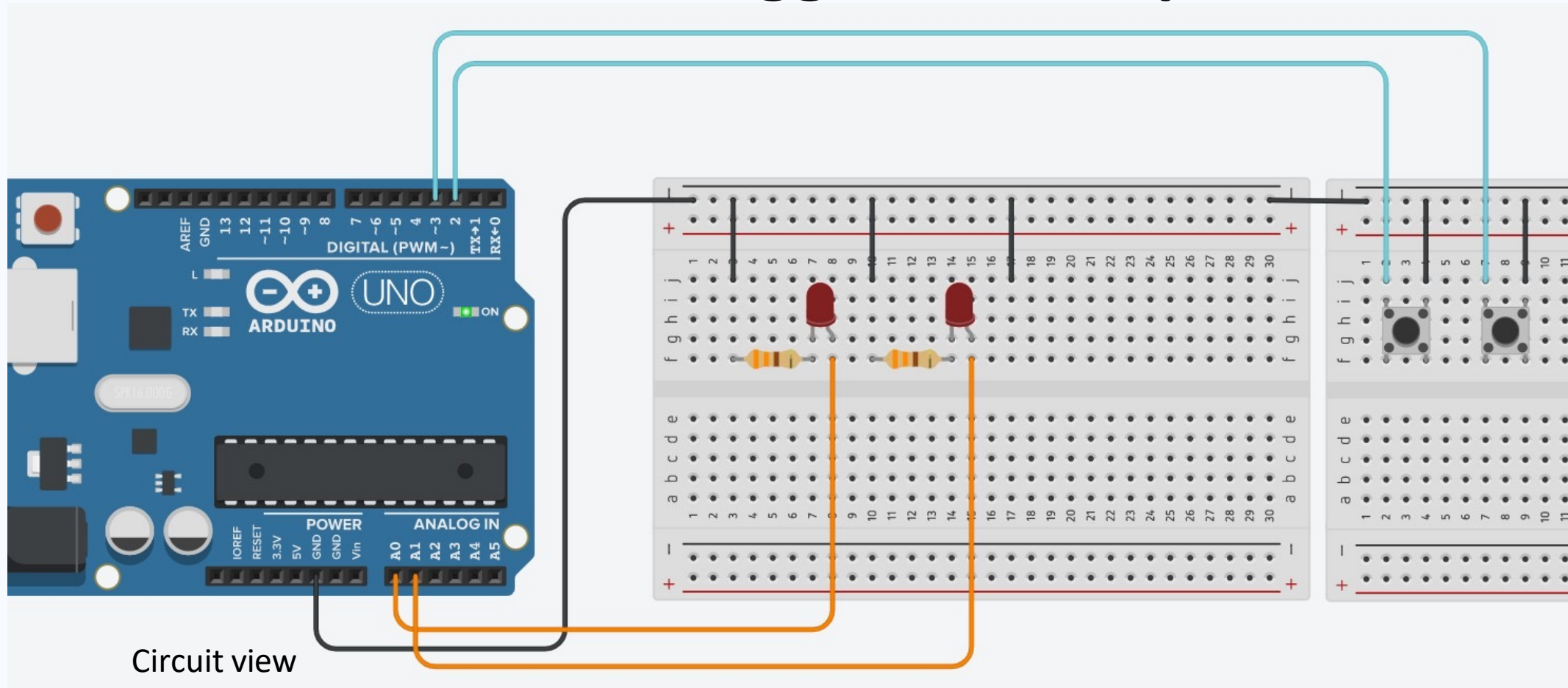
Power source, connectors, breadboard, LED

10. Circuits – Toggle, LED, expansion

Circuit view

Power source, connectors, breadboard, LED

Circuits – Toggle, LED, expansion

Schematic view

Power source, connectors, breadboard, LED

11. Circuits – Toggle, LED, Switch
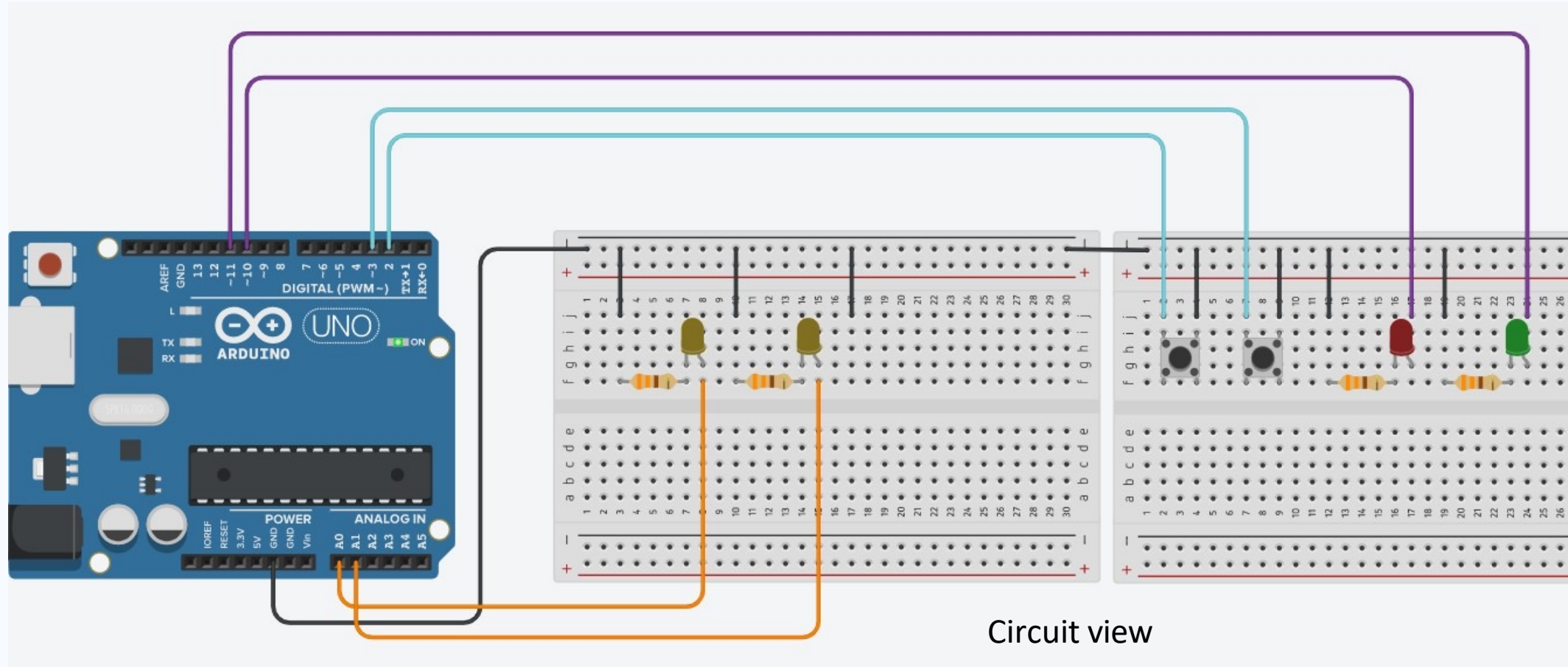
Circuit view

Power source, connectors, breadboard, LED
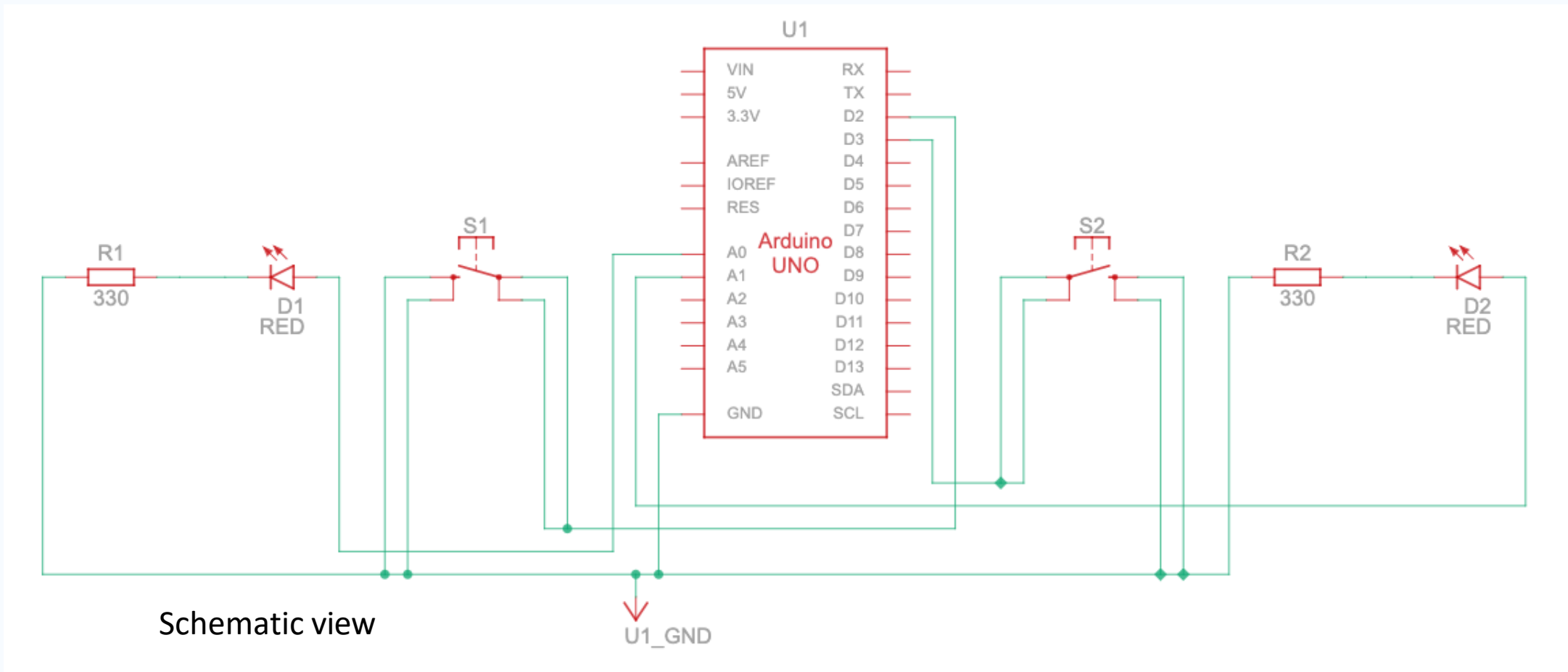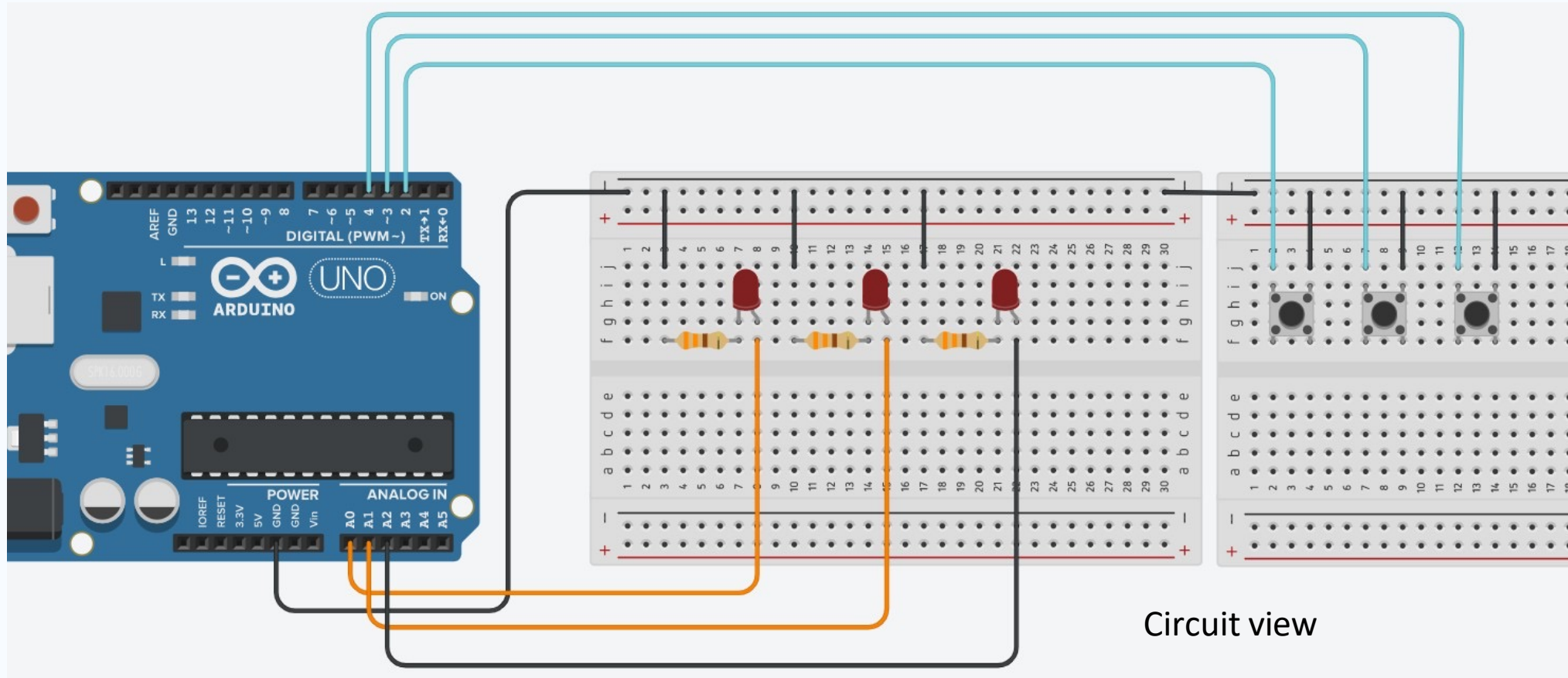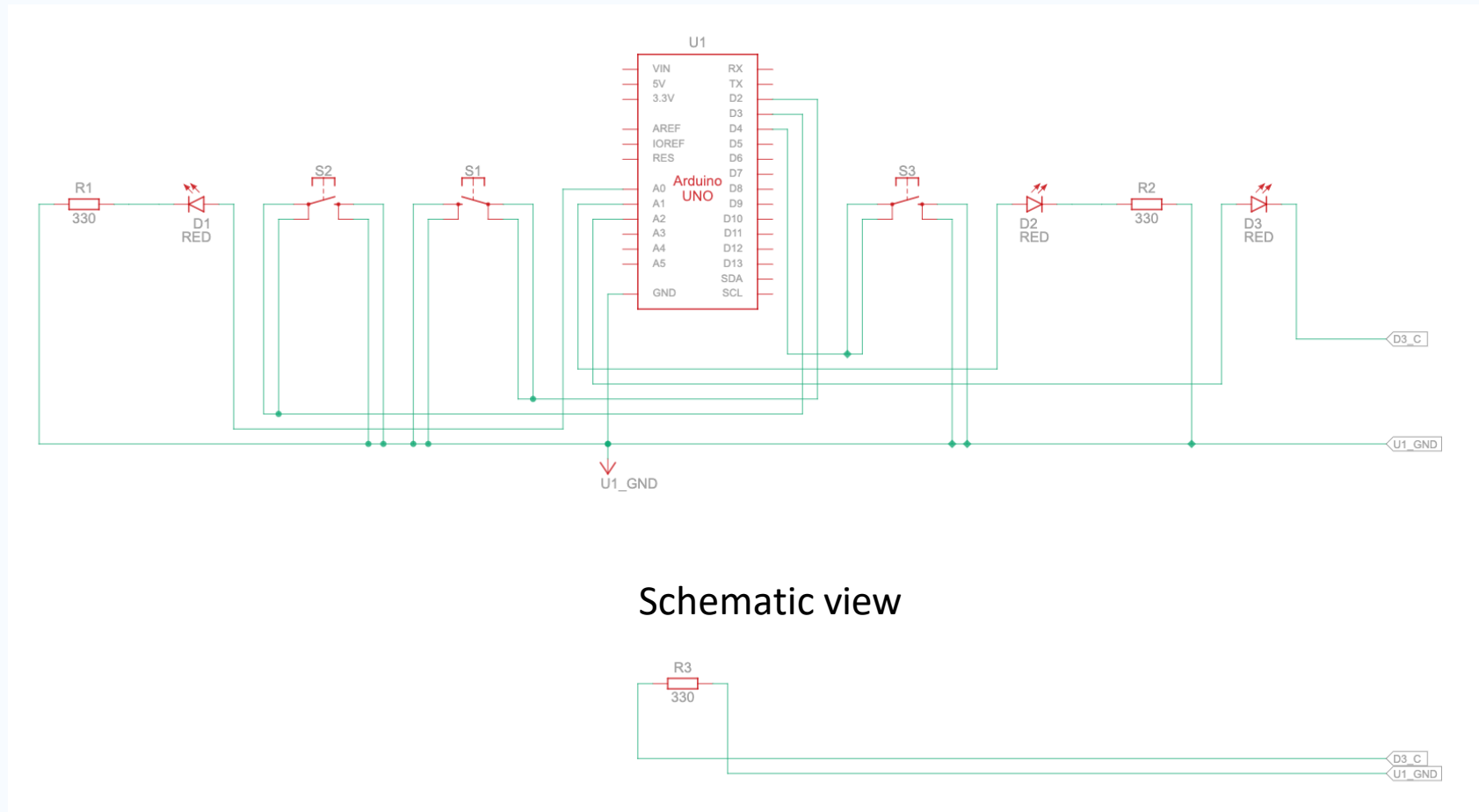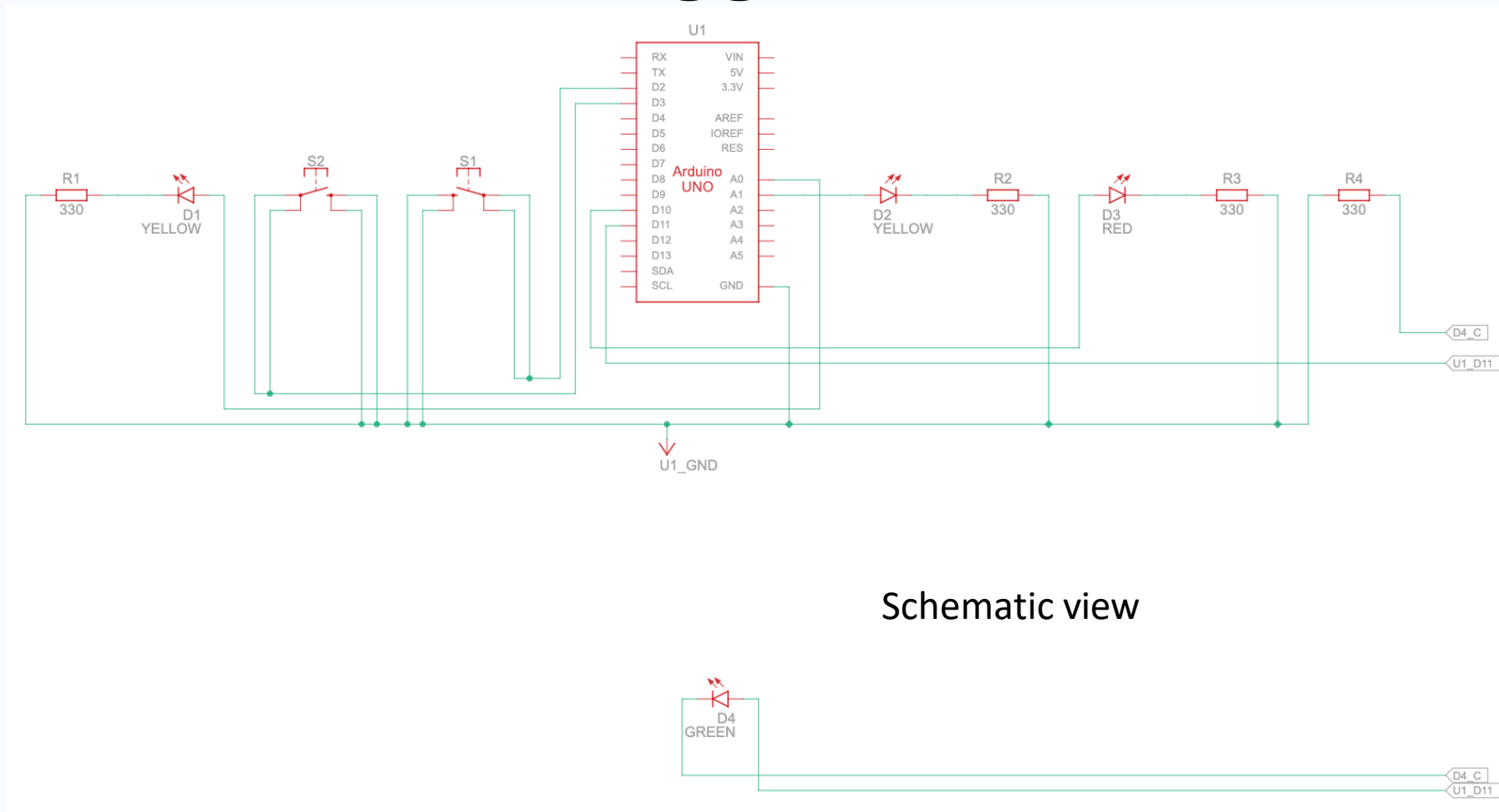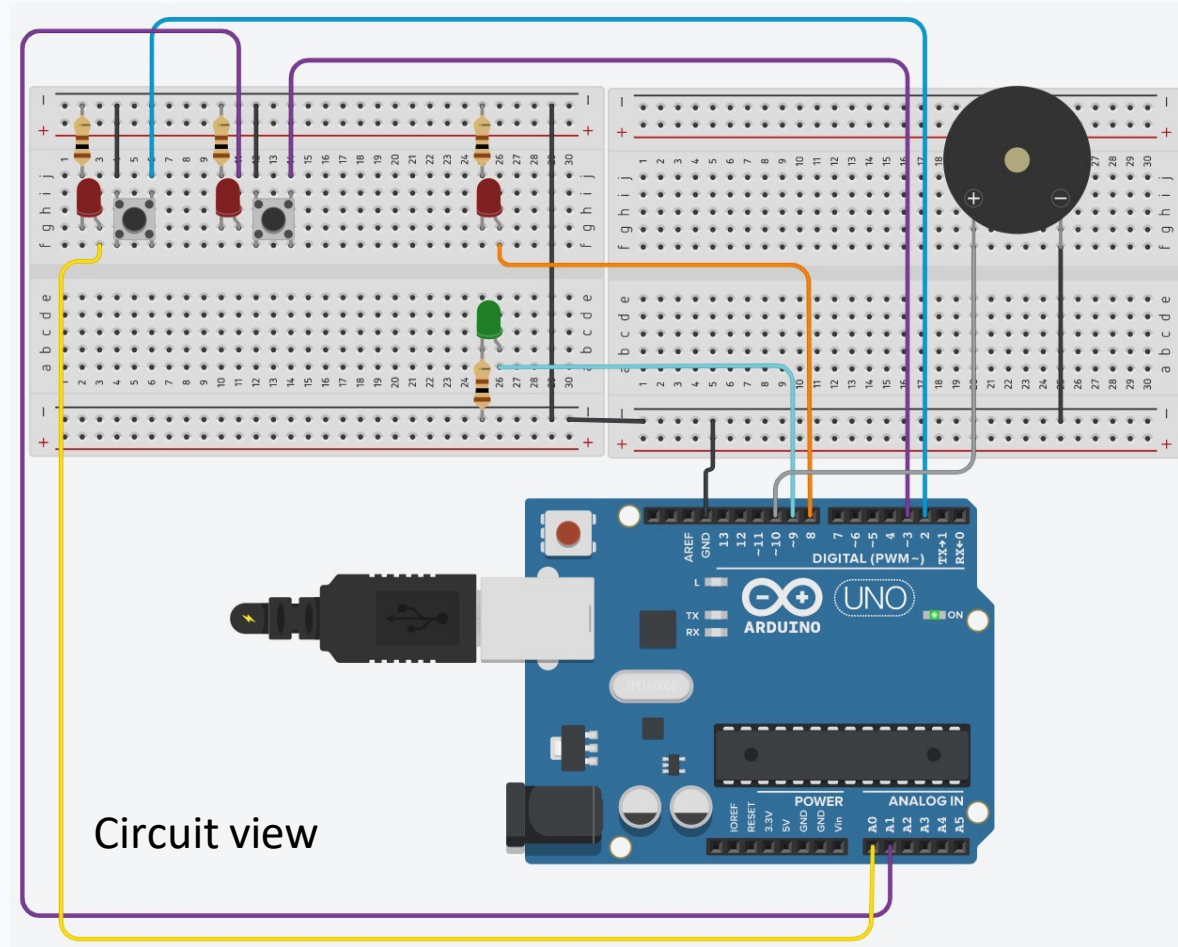
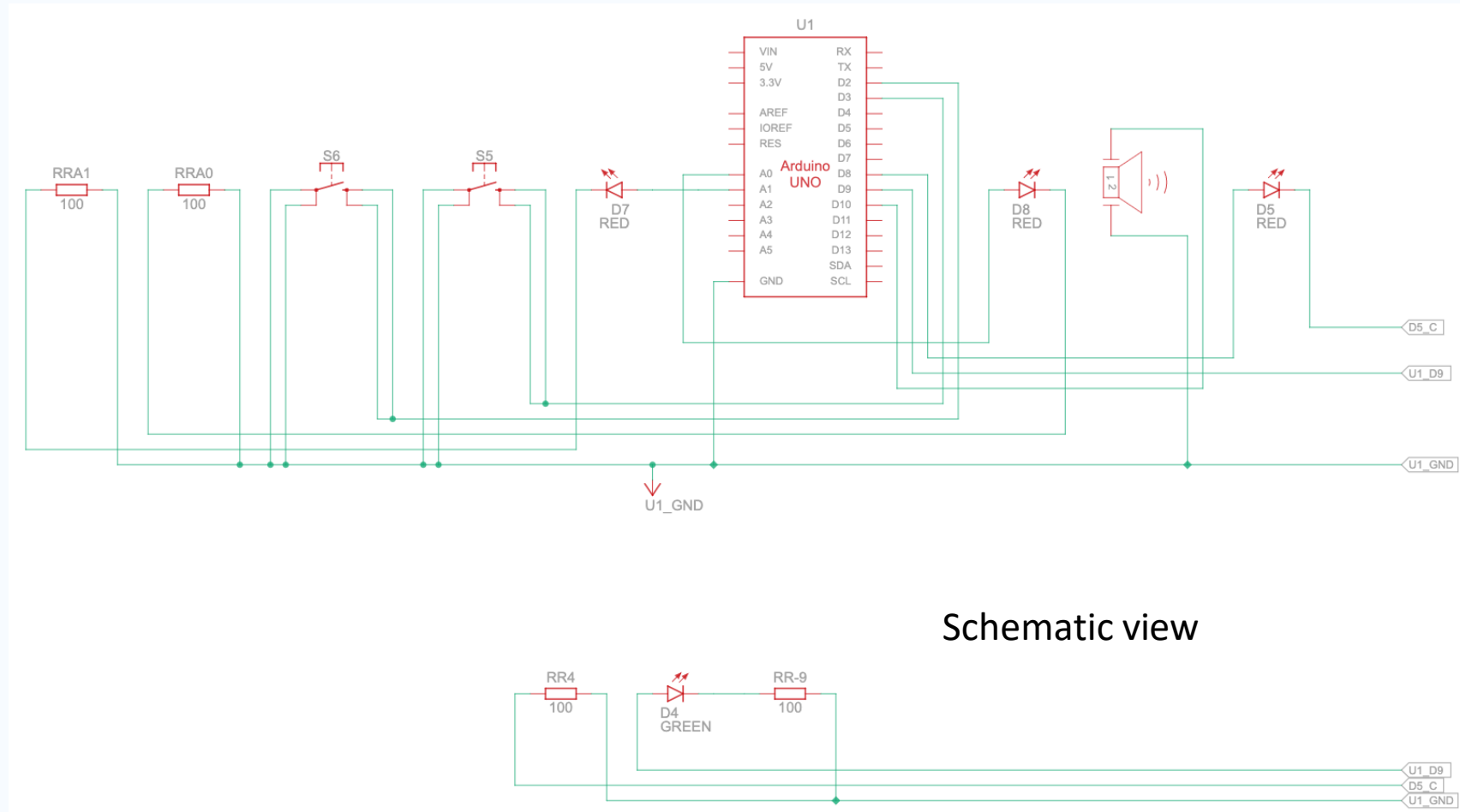# Circuits – Toggle, LED, Switch

Schematic view

Power source, connectors, breadboard, LED

12. Circuits – Toggle, LED, Buzzer, Input Comparison

Circuit view

Power source, connectors, breadboard, LED

Circuits – Toggle, LED, Buzzer, Input Comparison

Schematic view

Power source, connectors, breadboard, LED

Summary

- You can define a basic circuit

- You can explain the concept of a programmable controller

- You can define Pull-Up and Pull-Down resistors and their use

- You can write code to create 'Toggle' switch effect

- You canwrite code which uses input comparison

Foundations of Computing

Circuits & Controllers - end

Dr Robert Blair

r.blair@uea.ac.uk