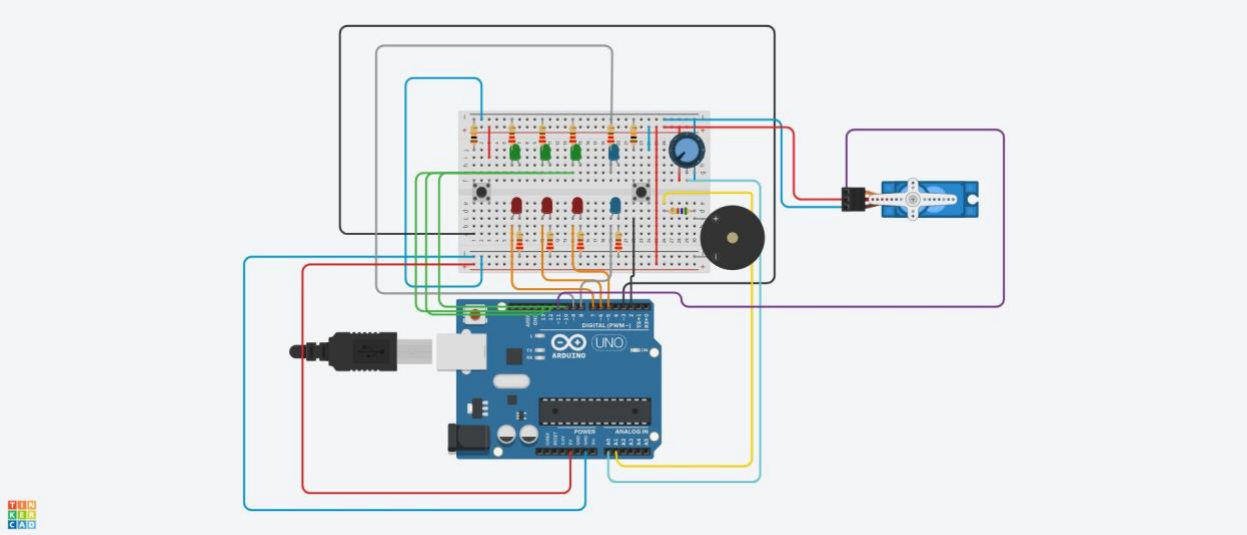
For this coursework, we aimed to develop a gaming system based on Arduino technology. The game can be controlled by players who press buttons to achieve scores, and also features additional electronic components that increase interactivity and ease of use for the participants.

We used for the scheme:

An Arduino microcontroller, 24 wires, LEDs (3 green, 3 red, 2 blue), buttons (2), resistors (8x 220 Ω, 2x 10,000 Ω, 1x 560 Ω), a potentiometer, a piezo element, and a positional microservo actuator.

This is a schematic of our project made on Tinkercad.



Buttons:

Buttons were monitored using a digitalRead() function to keep track of the state of the keys. A pull-up resistor setup was incorporated to ensure stable readings. Whenever a button is pressed, the corresponding input pin is grounded, leading to a change in state.

Pros	Cons
Efficient use of digital pins. Simple and straightforward implementation.	Requires periodic debouncing to eliminate false readings.

Green and Red LEDs:

Red and green LEDs (corresponding to two players) blink in a random sequence with a delay between turning on and off to signal players when to press a button. In the code, there is a loop for the buttons: if one of the LEDs is in a "HIGH" state and the player presses the button, they earn a point. However, if a player presses the button when none of the LEDs is on, they lose a point.

Blue LEDs:

If a player successfully presses the button and earns a point, a blue LED on their side will illuminate for a short period as an indicator of their successful action.

Piezo Element:

If a player loses a point, the piezo buzzer will emit a sound to notify the user of the penalty.

Positional Microservo Actuator:

This component indicates which player is in the lead according to the current scores by rotating between 135 and 45 degrees. When the score is tied, it returns to a neutral position of 90 degrees.

Potentiometer:

By adjusting this component, players can change the difficulty level of the game. It changes the amount of time an LED is on (the higher the difficulty, the shorter this period of time) based on the formula in which the potentiometer measurement is divided by 1023 (max possible value), and the resulting quotient is used as a multiplier for the delay time. When the potentiometer reading is at 0, the difficulty level is set to 1.

Issues encountered:

1. Initially, the Positional Microservo Actuator was connected to a VIN pin, resulting in faulty operation. This pin typically has unregulated voltage, and drawing high current through it can cause voltage drops, resulting in unstable operation. To resolve this, we connected the servo to a regulated 5V output, similar to the other components.

2. To resolve the problem of players gaining multiple points from a single button press, a debounce routine was implemented and the delay time for the LED blinking was increased. This enabled us to ensure that only one clear signal was received from the button and the pause between the LEDs blinking provided more time for the code to wait for another clear signal from the button.