Microcontroller based Industrial Applications.

Title: Industrial Fire Safety System.

Problem Statement:

In many industrial environments, fire and smoke incidents can lead to severe property damage, operational downtime, and life-threatening situations if not detected early. Traditional safety systems often lack real-time responsiveness or affordability for small-to-medium setups. This project aims to develop a low-cost, Arduino-based Industrial Fire Safety System using flame and smoke sensors to detect hazards and trigger immediate alerts through a buzzer and LED indicator, ensuring timely awareness and response to potential fire risks.

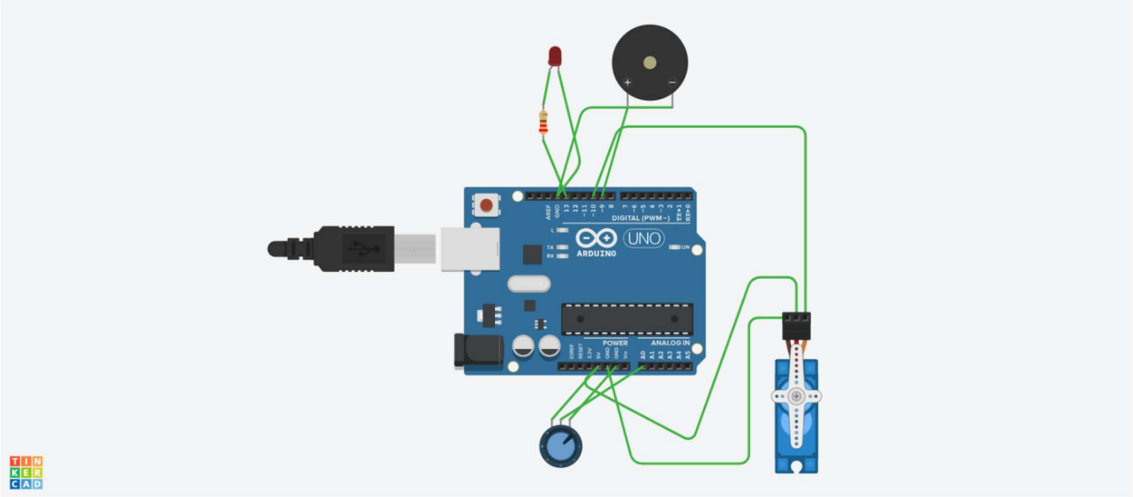
Scope of Solution:

The **Industrial Fire Safety System** is a compact and low-cost prototype designed to demonstrate the feasibility of real-time hazard detection using microcontrollers and sensors. The project focuses on detecting **flame and smoke presence** in an environment and providing **immediate audible and visual alerts** to ensure early warning.

Solution Approach:

This was done in 2 methods, via both hardware and software. For software simulation, TinkerCAD was used. For hardware execution, Arduino IDE was used.

Simulated Circuit:



Drive with video demonstration:
https://drive.google.com/drive/folders/1X17y9yHO8hkKJQuCGsqg_aahPxO9cKol?usp=drive_link

Code:

```
const int flameSensorPin = 2;
const int smokeSensorPin = A0;
const int buzzerPin = 9;
const int ledPin = 13;

void setup() {
  pinMode(flameSensorPin, INPUT);
  pinMode(buzzerPin, OUTPUT);
  pinMode(ledPin, OUTPUT);
  Serial.begin(9600);
}

void loop() {
  int flameStatus = digitalRead(flameSensorPin);
  int smokeValue = analogRead(smokeSensorPin);

  Serial.print("Flame: ");
  Serial.print(flameStatus == 0 ? "DETECTED" : "SAFE");
  Serial.print(" | Smoke: ");
  Serial.println(smokeValue);

  if (flameStatus == 0 || smokeValue > 300) {
    digitalWrite(buzzerPin, HIGH);
    digitalWrite(ledPin, HIGH);
```

```
  } else {
    digitalWrite(buzzerPin, LOW);
    digitalWrite(ledPin, LOW);
  }

  delay(500);
}
```