Smart Motion-Activated Light And Sound Scare System

Summer Internship
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Source: https://upload.wikimedia.org/wikipedia/commons/9/97/Rhesus_Macaque_monkey_with_kid.jpg

Introduction

- Most of the cities and rural habitants have been occupied by monkeys often resides at temples and residents of personal property. They have been one of the hurdles for the humans interfering and creating nuisances in private spaces by breaching and dismantling the peace.

- To avoid and scare away the monkeys, **smart motion- activated light and sound scare system** is used without killing the monkeys and maintaining sustainability at ecology. The sole purpose is to scare away without harming the species and creating a win- win situation for both monkeys and human society.

Problem Statement

Monkeys raid farms, destroy crops, and invade properties.

Farmers and property owners face financial losses and safety concerns.

Need for humane and effective deterrent.

Concept Overview:

Smart motion-activated light and sound scare system combines lights, sounds and physical model of gorilla.

Detects monkey movement and trigger scare mechanisms.

Can be customized for different environments and monkey species.

Key components

- **Motion sensor:** PIR(Passive Infrared) sensor detector module HC-SR501.

- **Light modules:** Laser module 650NM 5V.

- **Sound emitters:** 5V active buzzer module is used. But, speakers with recordings of predator can also be used.

- **Servo motor:** TowerPro SG90 servo motor(180° rotation) for head movement of the model.

- **Power supply:** Duracell ultra alkaline battery 9V.

- **Control unit:** Arduino Uno Rev3 SMD A000073.

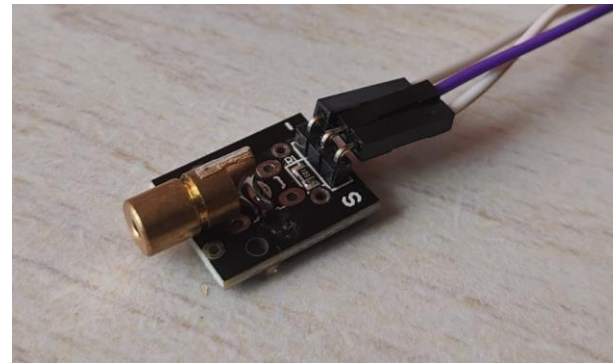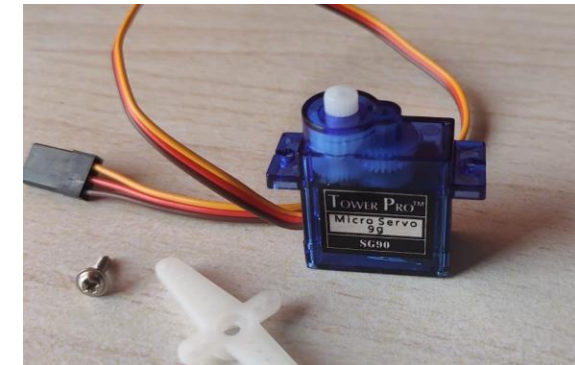- **Physical model:** Physical model of a gorilla is used.
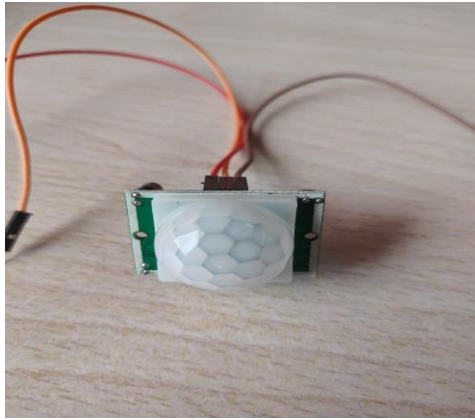
PIR Sensor

Arduino Uno

9V Battery

Buzzer

Laser light

Servo motor

Fig. 1 Materials used

How it works?

- The Smart Motion-Activated Light and Sound Scare System works by using a PIR motion sensor to detect movement. When motion is detected, it activates bright lights and loud sounds to scare away animals, such as monkeys, from the area. The system is automated, ensuring a quick response to any intrusions.

- Explanation of circuit diagram:
  - ➢ **PIR Motion sensor:**

    VCC: Connects to the 5V pin on the Arduino

    GND: Connects to the GND pin on the Arduino

    OUT: Connects to a digital pin 2 (input) on the Arduino

➢**Laser Light:**

    VCC: Connects to the 3.3V pin on the Arduino

    GND: Connects to the GND pin on the Arduino

    OUT: Connects to a digital pin 7 (output) on the Arduino

➢**Buzzer:**

    VCC: Connects to the 6V external power source

    GND: Connects to the GND pin on the Arduino

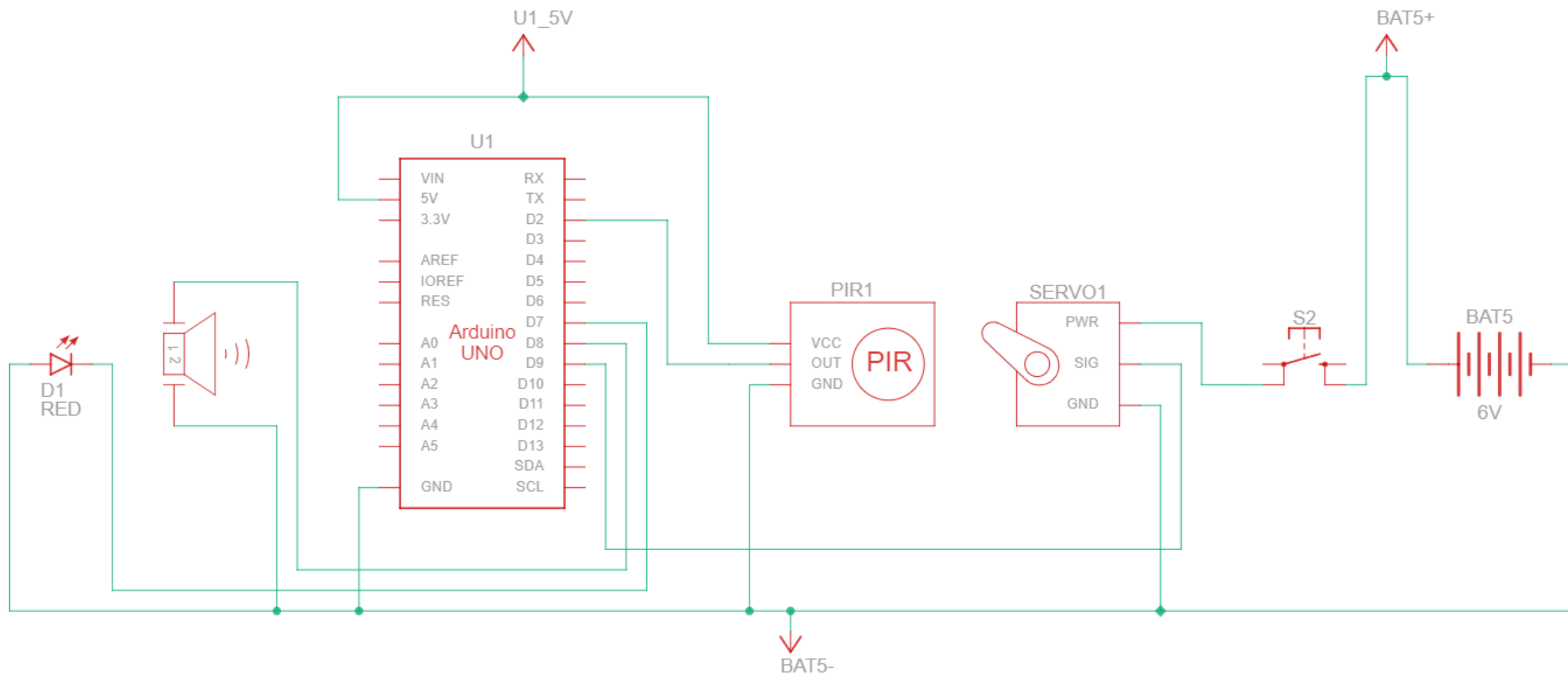   OUT: Connects to a digital pin 8 (output) on the Arduino

➢**Servo motor:**

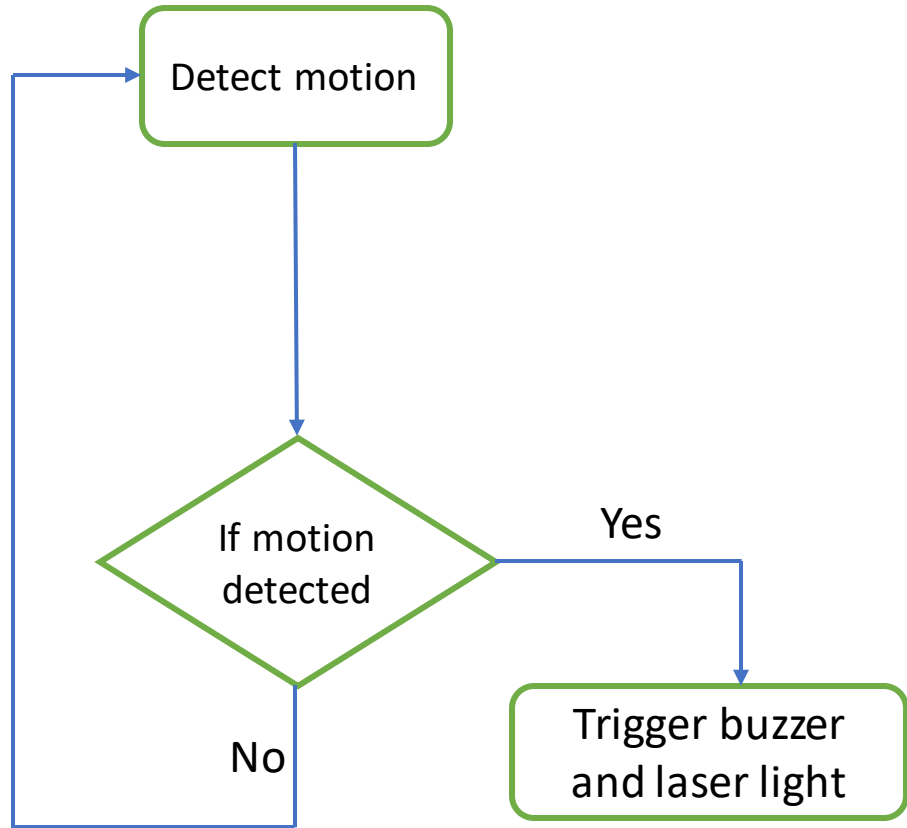   VCC: Connects to the 6V external power source

    GND: Connects to the GND pin on the Arduino

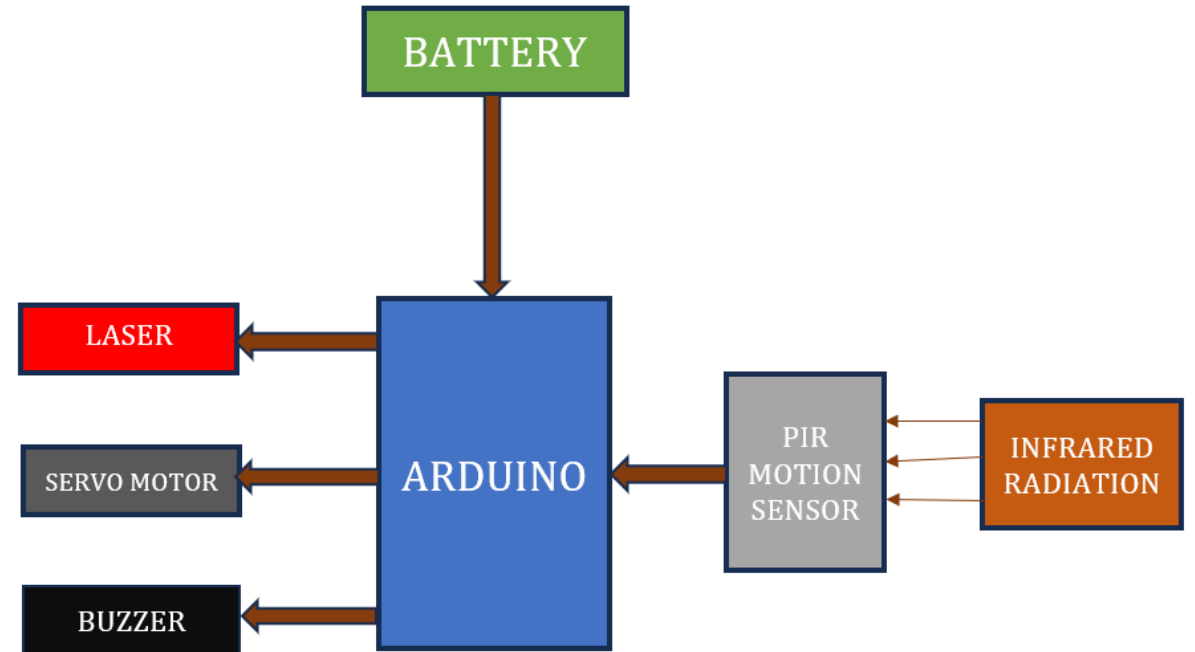   OUT: Connects to a digital pin 9 (output) on the Arduino

Note: The ground wire of the power source and the ground of the Arduino are interconnected.

Fig. 2 Circuit diagram of the model

Fig. 3 Working flow diagram of the model

Fig. 4 Block diagram of the model

- Here is the simple Arduino code for a Smart Motion-Activated Light and Sound Scare System:

```
sketch2.ino
1   #include <Servo.h>
2
3   // Define pins
4   const int pirPin = 2;
5   const int laserPin = 7;
6   const int buzzerPin = 8;
7   const int servoPin = 9;
8
9   // Create a Servo object
10  Servo myServo;
11
12  // Variable to store PIR state
13  int pirState = LOW;
14
15  void setup() {
16    // Initialize serial communication
17    Serial.begin(9600);
18
19    // Set pin modes
20    pinMode(pirPin, INPUT);
21    pinMode(laserPin, OUTPUT);
22    pinMode(buzzerPin, OUTPUT);
23
24    // Attach servo to the pin
25    myServo.attach(servoPin);
26    // Set initial positions and states
27    myServo.write(60);  // Set servo to initial position
28    digitalWrite(laserPin, LOW);
29    digitalWrite(buzzerPin, LOW);
30  }
31
32  void loop() {
33    // Read PIR sensor state
34    pirState = digitalRead(pirPin);
35
36    if (pirState == HIGH) {
37      // Motion detected
38      Serial.println("Motion detected!");
39
40      // Activate servo motor
41      for (int angle = 60; angle <= 120; angle++) {
42        myServo.write(angle);
43        delay(10);
44      }
45      for (int angle = 120; angle >= 0; angle--) {
46        myServo.write(angle);
47        delay(10);
48      }
49      for (int angle = 0; angle <= 60; angle++) {
50        myServo.write(angle);
51        delay(10);
52      }
53    // Activate laser lights and buzzer
54    }
55    if (pirState == HIGH) {
56      digitalWrite(laserPin, HIGH);
57      digitalWrite(buzzerPin, LOW);
58      delay(1000); // Keep them on for 1 seconds
59
60    } else {
61      // No motion detected
62      digitalWrite(laserPin, LOW);
63      digitalWrite(buzzerPin, HIGH);
64      myServo.write(60);
65      delay(100);
66      Serial.println("No motion");
67    }
68    // Small delay to avoid bouncing
69    delay(200);
70  }
```

Advantages

- **Effective:** Combines multiple deterrents for higher success.
- **Humane:** No harms to monkeys.
- **Cost-effective:** Reduces crop loss and property damage
- **Eco-friendly:** Uses sustainable energy options and materials.
- **Customizable:** Adjustable settings for different needs.

Installation and setup

- Install the model on a tree or a house where monkeys are found most.

- Place the model in such an angle that PIR sensor covers the maximum area.

- Once the system is powered on, it will continuously monitor for motion. Upon detecting motion, the PIR sensor sends a signal to the Arduino, which then activates the laser lights and speaker buzzer.

- Can be solar-powered for remote areas.

Video demonstration

Applications

Agricultural farms:

- Protects crops from monkey raids.
- Reduces financial losses due to damaged produce.

Residential Area:

- Keeps monkeys away from homes and gardens.
- Ensures safety for residents.

Commercial properties:

- Safeguards warehouse and factories.
- Minimizes property damage.

Schools:

- Prevents disruptions from monkeys.
- Creates a safer environment for students

Results

Reduction in monkey raids: Effective deterrent for farms and properties.

Increased crop yields: Significant decrease in crop damage.

Enhanced safety: Reduced monkey invasions in residential and urban areas.

Future scope

Customization and Personalization: Users can customize light, sound patterns and physical model to meet specific needs.

Image Detection: Advanced image detection for more precise threat identification and response.

AI and Machine Learning: Enhance system accuracy by distinguishing between different types of motion, reducing false alarms.

Integration with IoT: Real-time monitoring and remote control through smartphones and other devices.

Energy Efficiency: Development of solar-powered and low-energy systems for sustainability.

Conclusion

The smart-motion activated light and sound scare system offers an innovative, effective, and humane solution to the problem of monkey invasions in agricultural and residential areas. By combining motion sensors with flashing lights and high-frequency sounds, the system deters monkeys while conserving energy by activating only when motion is detected. Its customizable settings allow for versatility in various environments. This eco-friendly approach not only reduces financial losses and safety concerns but also aligns with sustainable practices. As technology advances, this system promises even greater effectiveness and broader applications, providing a smarter way to coexist with wildlife.

References

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