

MINI PROJECT

IoT project : object detection using servo motor and IR sensor

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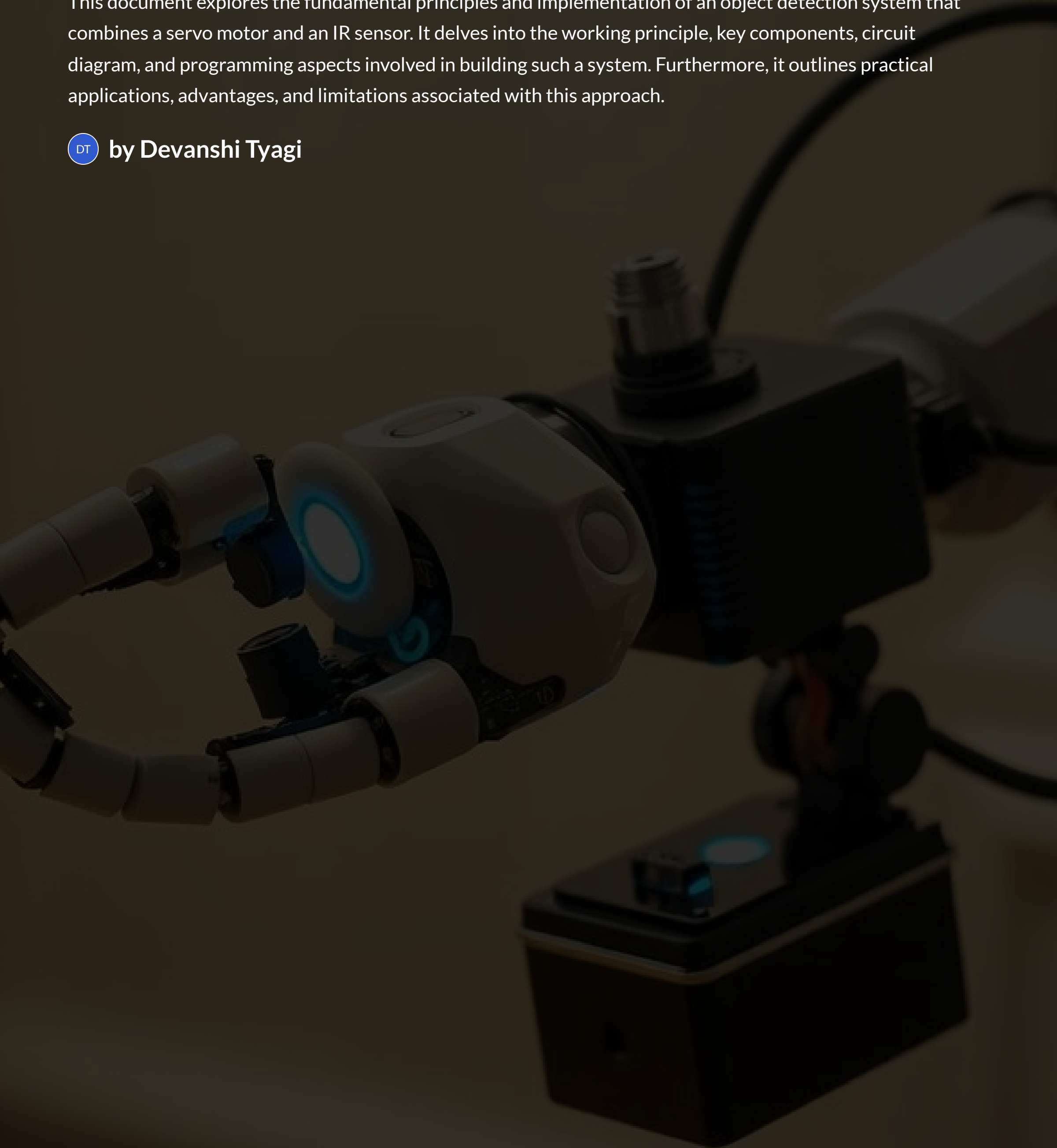
SUBMITTING(FIRST YEAR END SEMESTER PROJECT):

Project coordinator

Object Detection Using Servo Motor and IR Sensor

This document explores the fundamental principles and implementation of an object detection system that combines a servo motor and an IR sensor. It delves into the working principle, key components, circuit diagram, and programming aspects involved in building such a system. Furthermore, it outlines practical applications, advantages, and limitations associated with this approach.

 by Devanshi Tyagi



Introduction

Object detection plays a crucial role in various robotics and automation applications. One common approach involves using an IR sensor and a servo motor to detect and track objects in the surrounding environment. This system combines basic robotics with sensor technology to create an effective and cost-efficient solution for obstacle avoidance, surveillance, and other smart systems.

Components Required

- Microcontroller: Arduino Uno or compatible microcontroller board.
- Servo Motor: Responsible for rotating the IR sensor to scan the environment.
- IR Sensor: Detects objects based on infrared light reflection.
- Power Supply: Batteries or an external power source to provide power to the components.
- Wires: For connecting the various components together.
- Breadboard: A prototyping platform for assembling the electronic circuit.

Working Principle

The object detection system operates by combining the capabilities of an IR sensor and a servo motor, orchestrated by a microcontroller.

IR Sensor

The IR sensor emits a beam of infrared light. This light reflects off any objects in its path. The sensor then measures this reflection to determine the presence of an object. When an object is detected, the sensor sends a signal to the microcontroller.

Servo Motor

The servo motor is controlled by the microcontroller. It rotates to specific angles, enabling the IR sensor to scan different areas. This allows the system to detect objects within a wider range.

Circuit Diagram

The circuit diagram illustrates the connections between the components:

- Connect the VCC and GND pins of the IR sensor to the power supply (either batteries or an external power source).
- Connect the output pin of the IR sensor to a digital input pin on the Arduino.
- Connect the signal pin of the servo motor to a PWM pin on the Arduino.
- Connect the power and ground pins of the servo motor to the appropriate power supply.

Theory

The system's functionality is based on the interaction between the IR sensor, servo motor, and microcontroller:

1

Object Detection

The IR sensor's emitted light reflects off objects in its path. This reflected light is detected by the sensor, indicating the presence of an object.

2

Servo Motor Operation

The servo motor rotates in specific increments, guided by the microcontroller's commands. This rotational movement allows the IR sensor to scan different areas of the environment.

3

Microcontroller Programming

The microcontroller continuously receives signals from the IR sensor. Based on these signals, it determines the presence of an object and adjusts the servo motor's position accordingly.

Applications

Object detection systems using IR sensors and servo motors have diverse applications in robotics and automation:

Obstacle Detection

Used in autonomous robots to detect and avoid obstacles in their path. This helps robots navigate safely through their environment.

Surveillance

Tracks objects or individuals within a specific area. This can be used for security purposes or for monitoring specific locations.

Smart Systems

Forms a component of automated systems in industries and homes. It can be used for tasks like controlling appliances, monitoring environments, or interacting with users.

Advantages

- Cost-effective and relatively easy to implement.
- Provides real-time detection and tracking of objects, allowing for immediate responses.
- High versatility, making it suitable for a wide range of applications.

Limitations

- IR sensors have a limited detection range, meaning they can only detect objects within a certain distance.
- The effectiveness of IR sensors can be affected by environmental conditions such as sunlight or strong reflections.
- Servo motors have limitations in terms of speed and range of motion. They may not be able to rotate at extremely high speeds or cover a full 360 degrees.

Conclusion

This project demonstrates the integration of servo motors and IR sensors for object detection, forming a foundational system for robotics and automation. The principles and techniques discussed provide a starting point for developing more complex object detection systems. The cost-effectiveness, real-time capabilities, and versatility of this system make it a valuable tool for various applications. However, it is important to consider the limitations associated with IR sensors and servo motors to ensure optimal performance.