Circuit Documentation

Summary

This circuit is a smart cat feeder system that utilizes an ESP32-CAM microcontroller to control a servo motor for dispensing food, a PIR motion sensor for detecting motion, and a 4G antenna for communication. The system is powered by a combination of a 4 x AA battery mount and a USB to serial converter connected to a 10,000 mAh power bank. The ESP32-CAM is programmed to send alerts and receive commands via Telegram, allowing remote control and monitoring of the feeder.

Component List

1. **4 x AA Battery Mount**
   - **Description**: Provides power to the servo motor.
   - **Pins**: Negative terminal, Positive terminal.
2. **10,000 mAh Powerbank**
   - **Description**: Supplies power to the USB to serial converter.
3. **4G Antenna**
   - **Description**: Used for wireless communication.
   - **Pins**: Connection.
4. **Servo**
   - **Description**: Controls the dispensing mechanism of the feeder.
   - **Pins**: GND, VCC, Pulse.
5. **PIR Motion Sensor**
   - **Description**: Detects motion to trigger the ESP32-CAM.
   - **Pins**: VCC, OUT, GND.
6. **LED Two Pin (Blue)**
   - **Description**: Provides visual feedback.
   - **Pins**: Cathode, Anode.
7. **Resistor**
   - **Description**: Limits current to the LED.
   - **Pins**: Pin1, Pin2.
   - **Properties**: Resistance: 200 Ohms.
8. **ESP32 - CAM**
   - **Description**: Main microcontroller for processing and communication.
   - **Pins**: 5V, GND, IO12, IO13, IO15, IO14, IO2, IO4, VOT, VOR, VCC, IO0, IO16, 3V3, Antenna.
9. **USB to Serial Converter**
   - **Description**: Facilitates communication between the ESP32-CAM and a computer for programming and debugging.
   - **Pins**: GND, TXL, RXL, +5V OUT, +3V3 OUT, CTS, SLEEP, PWREN, DCD, RSD, RI, RXD, +VCC IN, RTS, DTR, TXD, TXDEN, RX, TX, USB, Jumper Common, Jumper +5VCC, Jumper +3V3.

Wiring Details

1. **4 x AA Battery Mount**
   - **Positive terminal** is connected to the **VCC** pin of the **Servo**.
   - **Negative terminal** is connected to the **GND** pins of the **Servo**, **PIR Motion Sensor**, **USB to Serial Converter**, **ESP32 - CAM**, and **Pin1** of the **Resistor**.
2. **10,000 mAh Powerbank**
   - Connected to the **USB** pin of the **USB to Serial Converter**.
3. **4G Antenna**
   - **Connection** pin is connected to the **Antenna** pin of the **ESP32 - CAM**.
4. **Servo**
   - **GND** pin is connected to the common ground.
   - **VCC** pin is connected to the **Positive terminal** of the **4 x AA Battery Mount**.
   - **Pulse** pin is connected to the **IO12** pin of the **ESP32 - CAM**.
5. **PIR Motion Sensor**
   - **VCC** pin is connected to the **+VCC IN** pin of the **USB to Serial Converter** and the **5V** pin of the **ESP32 - CAM**.
   - **OUT** pin is connected to the **IO13** pin of the **ESP32 - CAM** and the **Anode** of the **LED Two Pin (Blue)**.
   - **GND** pin is connected to the common ground.
6. **LED Two Pin (Blue)**
   - **Anode** is connected to the **OUT** pin of the **PIR Motion Sensor** and the **IO13** pin of the **ESP32 - CAM**.
   - **Cathode** is connected to **Pin2** of the **Resistor**.
7. **Resistor**
   - **Pin1** is connected to the common ground.
   - **Pin2** is connected to the **Cathode** of the **LED Two Pin (Blue)**.
8. **ESP32 - CAM**
   - **5V** pin is connected to the **VCC** pin of the **PIR Motion Sensor**.
   - **GND** pin is connected to the common ground.
   - **IO12** pin is connected to the **Pulse** pin of the **Servo**.
   - **IO13** pin is connected to the **OUT** pin of the **PIR Motion Sensor** and the **Anode** of the **LED Two Pin (Blue)**.
   - **Antenna** pin is connected to the **Connection** pin of the **4G Antenna**.
9. **USB to Serial Converter**
   - **USB** pin is connected to the **10,000 mAh Powerbank**.
   - **+VCC IN** pin is connected to the **VCC** pin of the **PIR Motion Sensor**.

Documented Code

The ESP32-CAM is programmed to function as a smart cat feeder. The code includes the following key functionalities:
- **WiFi Connection**: The ESP32-CAM connects to a specified WiFi network using the provided SSID and password.
- **Telegram Integration**: The system sends alerts and receives commands via Telegram. It can send photos and receive commands to feed or ignore.

- **Camera Initialization**: The camera is initialized to capture images when motion is detected.
- **Servo Control**: The servo motor is controlled to dispense food based on commands received.
- **PIR Motion Detection**: The system wakes up from deep sleep when motion is detected by the PIR sensor.
- **Deep Sleep Mode**: The ESP32-CAM enters deep sleep mode to conserve power and wakes up on motion detection.

The code is structured to handle WiFi connections, Telegram messaging, camera operations, and servo control efficiently. It includes functions for sending messages and photos to Telegram, handling motion detection, and controlling the servo motor for feeding.

The code is well-documented with comments explaining each section and function, making it easy to understand and modify for specific requirements.