### Introduction

Modern advancements in UAV (Unmanned Aerial Vehicle) technology enable autonomous operations, eliminating the need for human intervention in finding lost or required items. This technology can be utilized in various fields, including military applications, where drones can help locate enemies who have illegally crossed national boundaries by recognizing predefined specifications like uniform patterns.

### Methodology

#### a) Understanding Swarm Drones

Swarm drones are a group of UAVs that operate in a coordinated and synchronized manner to complete tasks collectively. These drones communicate with each other to share information about their surroundings, optimize their movement, and efficiently complete objectives. Characteristics of swarm drones include:

* **Decentralized Control**: Each drone operates independently but shares information with the group.
* **Scalability**: The system can handle the addition or removal of drones without significant performance loss.
* **Robustness**: The system can tolerate the failure of individual drones without collapsing.

#### b) Using ESP8266 with a Controller

To use an ESP8266 module with a controller (like an Arduino or a flight controller), follow these steps:

1. **Hardware Connections**:
   * Connect the ESP8266's VCC and GND to a suitable power supply.
   * Connect the TX and RX pins of the ESP8266 to the RX and TX pins of the controller, respectively, ensuring they use the same logic level (use a voltage level converter if necessary).
   * Connect the CH\_PD (chip enable) to VCC through a pull-up resistor.
2. **Software Configuration**:
   * Use a library like ESP8266WiFi for Arduino to manage WiFi connections.
   * Write a sketch to initialize the ESP8266 and connect to a WiFi network.
   * Use the ESP8266 to send and receive data via HTTP requests, MQTT, or other communication protocols.
3. **Example Code** (Arduino Sketch):

cpp

#include <ESP8266WiFi.h>

const char\* ssid = "your\_SSID";

const char\* password = "your\_PASSWORD";

void setup() {

Serial.begin(115200);

WiFi.begin(ssid, password);

while (WiFi.status() != WL\_CONNECTED) {

delay(1000);

Serial.println("Connecting to WiFi...");

}

Serial.println("Connected to WiFi");

}

void loop() {

// Implement your communication logic here

}

#### c) Suggested Design Changes for a Regular Drone

If allowed to make design changes to a regular drone, I would:

1. **Improve Battery Life**:
   * Implement more efficient power management systems.
   * Use higher capacity batteries or advanced battery technologies like Li-ion or Li-polymer.
2. **Enhance Sensor Suite**:
   * Integrate additional sensors like infrared, ultrasonic, and thermal cameras to improve object detection and environmental awareness.
   * Use high-resolution cameras for better target recognition and tracking.
3. **Upgrade Communication Systems**:
   * Employ advanced communication protocols like 5G or dedicated RF modules for faster and more reliable data transfer.
4. **Aerodynamic Optimization**:
   * Redesign the drone's body for improved aerodynamics, reducing drag and enhancing flight efficiency.
5. **AI Integration**:
   * Incorporate AI algorithms for better decision-making and autonomous navigation.

**References**:

* "Drone Design: Improving Flight Efficiency and Battery Life" [Research Paper/Journal].
* "Advanced Sensor Integration in UAVs" [Technical Report].
* "AI and Machine Learning in Autonomous Drones" [Conference Paper].

#### d) Autonomous Drone Operation and Target Detection

Three drones are made autonomous and programmed to search a specified area for a target. Each drone is equipped with a LiDAR sensor and a color sensor. The process involves:

1. **Search and Detection**:
   * Drones navigate the target area using predefined coordinates.
   * LiDAR sensors detect objects of height 15 cm.
   * If detected, the drone measures the object's other dimensions.
2. **Color Verification**:
   * The color sensor checks if the object is green.
   * If the object is not green, the drone resumes its search.
3. **Communication and Coordination**:
   * If a green object is found, the drone communicates this information to the other two drones using swarm technology.
   * The other drones stop their search once they receive the confirmation.

### Primarily Work

A UAV drone system is designed to operate using a flight controller with swarm technology for communication. The system initiates an open field test flight via remote control to validate its functionality.

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