#### **ESP32-Quadcopter Drone**

**ESP32-Quadcopter** is a palm-sized drone project built using ESP32 Wi-Fi microcontrollers, custom-made flight controller and ESC (Electronic Speed Controller) PCBs, and is developed using ESP-IDF. The drone is designed for control via a mobile app over Wi-Fi, and is cost-efficiency, with simple hardware and clear, extensible code architecture.

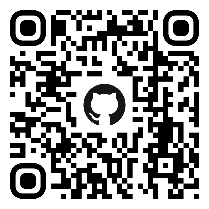
**Why Drones?**

Drones are at the forefront of future technology. From agriculture to logistics, defence to filmmaking, autonomous and semi-autonomous drones are reshaping how tasks are approached across numerous industries. As the number of fields adopting drone technology continues to grow, early exposure to these systems becomes essential for staying prepared and contributing meaningfully to the next wave of innovation.

##### **Features and Hardware:**

|  |  |  |
| --- | --- | --- |
| Modes | Description | Modules |
| Stabilize Mode | Maintains stable flight using accelerometer and gyroscopic sensor data. | MPU6050 IMU (Inertial Measurement Unit) |
| Height-hold Mode | Maintains a fixed flight height using Time-of-flight (ToF) distance sensor data. | VL53L0X/VL53L1X ToF ranging sensor |
| Altitude-hold Mode | Maintains constant altitude relative to sea level using barometric data. | BMP280 or MS5611 Barometric pressure sensor |
| Position-hold Mode | Holds drone at a set position using optical flow sensor and Time-of-flight (ToF) distance sensor data. | PMW3901MB-TXQT optical motion tracking sensor, VL53L0X/VL53L1X ToF ranging sensor |
| Hover Mode | Holds drone at set position and height using optical flow sensor and Time-of-flight (ToF) distance sensor data. | PMW3901MB-TXQT optical motion tracking sensor, VL53L0X/VL53L1X ToF ranging sensor |
| App Control | Operate and fine-tune the drone via a mobile app. Connect to the drone using a phone via Wi-Fi. | Wi-Fi enabled ESP32 microcontroller |
| CFclient Supported | Uses Crazyflie’s flight control and tuning software. | Crazyflie client software |

##### **Potential use-cases:**

1. **STEM Education:** Learn about embedded systems, flight control, sensor integration, and wireless communication in a cost-efficient way while making this project.

YouTube GitHub

2. **Recreational Flying and Drone Racing:** Enjoy remote-controlled flight using a phone or joystick.

3. **Disaster Rescue:** Its small form-factor allows entry into collapsed buildings for gathering information.

4. **Emergency Deliveries:** Can be quickly deployed to deliver medicines and vaccines over short distances in times of emergency.

5. **Agricultural Surveying:** Can be adapted for crop health analysis or livestock monitoring over small farmland areas using thermal or NDVI cameras.

6. **Environmental Monitoring:** Attach temperature, gas, or air quality sensors to monitor environmental conditions in hard-to reach areas like forests, rooftops, or industrial sites.

7. **Aerial Photography/Videography and Surveillance**: With a lightweight camera module, this drone can capture images or videos from unique angles for documentation, mapping, or remote surveillance.

8. **Plug-and-play kits**: Can be made into an intuitive plug-and-play assembly kit for children to help them make their own drones by simply connecting the various modules and parts.