First Flight Drone

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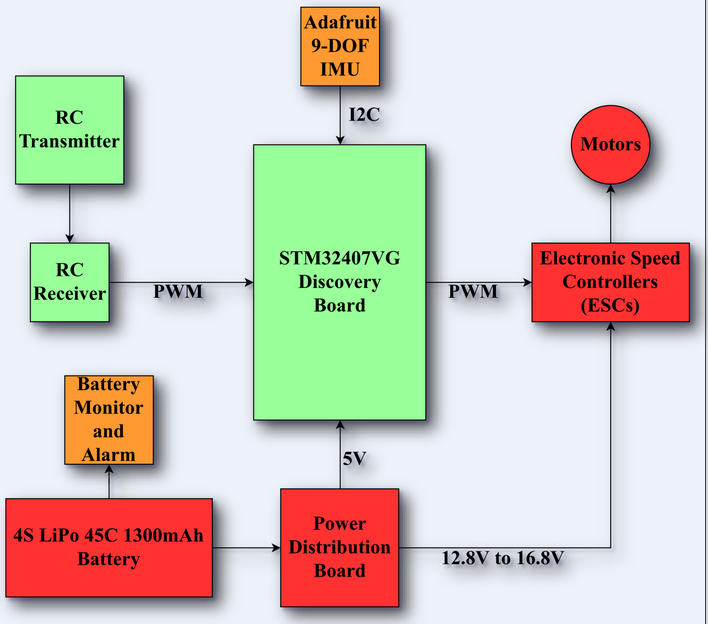
Introduction

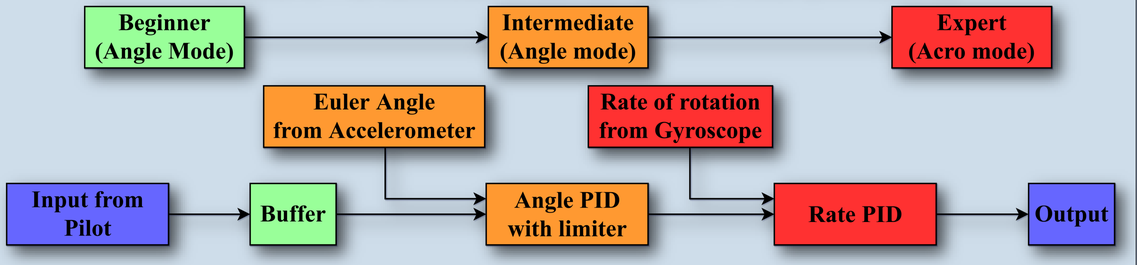
This drone allows a person who has never flown a drone before to learn to fly indoors. Learning to fly inside is less risky than outside with no risk of wind or trees. The design was kept simple by following typical drone layout and communication protocols, while utilizing a custom flight controller programmed using the STM32407VG (shown below).



Flight Controller

- **Beginner (Angle mode):** Inputs control how **far** the drone rotates from horizontal; buffers allow only a small degree of rotation.
- **Intermediate (Angle mode):** Same as Beginner but with no buffer
- **Expert (Acro mode):** Inputs control how **fast** the drone rotates.
- Each Axis (pitch, roll, and yaw) has its own PID loop, constants, and limits; all had to be tuned individually to achieve every mode.

Portions of PID controller in use during each mode (Cumulative)



Inputs

	Channel 1	Channel 2	Channel 3	Channel 4	Channel 5	Channel 6	I²C
Purpose	Roll	Pitch	Throttle	Yaw	Arm & Kill	Mode	IMU
Timer	T5C2	T3C2	T3C3	T3C4	T3C1/T5C1	T5C3	N/A
Port	A1	B5	C8	C9	B4/A0	A2	B10/B11
Pulse	PWM		Period: 20ms		High Time: 1-2ms		5us CLK

Outputs

	Motor A	Motor B	Motor C	Motor D
Position	Front-Left	Front-Right	Back-Left	Back-Right
Timer	T4C1	T4C2	T4C3	T4C4
Port	B6	B7	D14	D15
PWM	Period: 500us		High Time: 125-250us	

Final Product

- Carbon Fiber body and aluminum mounting bracket are strong but lightweight.
- Tin foil shielding around the IMU to prevent interference and the crystal from seizing. Nylon bolts and rubber grommets used to prevent high frequency vibration.
- Open-cell foam padding added to protect the microcontroller from dangerous crashes.