

D-Code: A Universal Drone Control Language

1. Introduction

D-Code is a proposed universal, text-based control language designed to provide a modular and extensible command structure for real-time operation of aerial drones. Inspired by G-code used in CNC and 3D printers, D-Code adapts the concept to dynamic, sensor-feedback-driven systems like quadcopters and other UAVs.

2. Core Syntax and Commands

D-Code provides intuitive commands for position control, attitude adjustment, sensor feedback handling, and emergency override. Below is a summary of key commands:

- D1: Move to absolute position (X, Y, Z or GPS)
- D2: Move relative to current position
- D3: Set pitch/roll/yaw
- D4: Hover for specified time
- D5: Takeoff or land
- D6: Wait for a condition (e.g. GPS fix)
- D7: Set individual motor power
- D8: Loop or routine execution
- D9: Emergency stop

Modes can include ABS, REL, GPS, or VEL for flexibility in navigation systems.

3. Real-Time Feedback Integration

D-Code supports conditional execution based on real-time sensor input. For example:

- IF TILT > 30 THEN D4 T1
- IF GPSFIX = 0 THEN D4 T5

This allows for reactive behavior and stabilization logic embedded in the control sequence.

4. Sample Script: Square Flight Pattern

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; Initialize

D5 MODE=TAKEOFF

D4 T3 ; hover for 3 seconds

; Fly in square

D2 X5 Y0 Z0

D2 X0 Y5 Z0

D2 X-5 Y0 Z0

D2 X0 Y-5 Z0

; Return and land

D2 X0 Y0 Z-2

D5 MODE=LAND

5. Interpreter Design

D-Code should be interpreted by a lightweight virtual machine (DVM) running on an embedded controller like STM32 or ESP32. The interpreter parses instructions line-by-line, integrates IMU/GPS data, and commands ESCs through PWM/DSHOT protocols in real time.

6. Extensibility

D-Code supports user-defined commands for modular payload control or specialized tasks, such as:

- D100 USER=SPRAY
- D101 PAYLOAD=DROP

Subroutines (FUNC) and conditionals allow for compact reusable routines and advanced mission logic.

7. Conclusion

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D-Code is a flexible, open standard for UAV scripting. By merging G-code simplicity with real-time embedded feedback, it enables universal drone programming that is platform-independent and mission-scalable.