

PyBullet UAV Simulation Environment

State Vector $x(t)$

Position: $[x, y, z]$
Velocity: $[v_x, v_y, v_z]$
Angles: $[\phi, \theta, \psi]$
Rates: $[p, q, r]$

Control Input $u(t)$

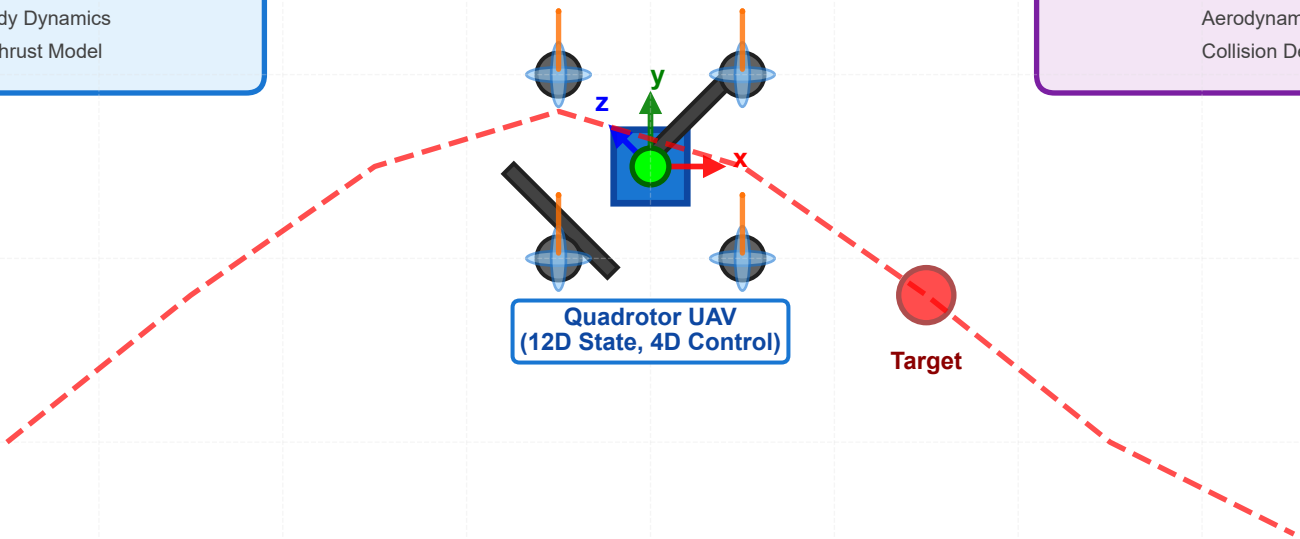
Thrust: T
Roll rate: ω_ϕ
Pitch rate: ω_θ
Yaw rate: ω_ψ

PyBullet Physics

RK4 Integration ($\Delta t=1\text{ms}$)
Rigid Body Dynamics
Motor Thrust Model

Environment Features

Ground Effect Modeling
Aerodynamic Drag
Collision Detection



Ground Plane (Collision Detection)

High-Fidelity 3D Simulation | Real-Time Physics | 240Hz Update Rate