

EdTech Rocketry

Aditya Rajmane
Sanchita Jadhav

Overview of the Project

- Purpose of the simulation
- Importance of real-time telemetry in aerospace

Key Goals of the Simulations

- Simulate rocket flight stages
- Generate realistic telemetry data
- Analyze data for educational purposes

Phases of Rocket Flight

- Launch
- Ascent
- Coasting
- Descent

Telemetry Data Generated

- Altitude
- Temperature
- Velocity
- Orientation (bno_x, bno_y, bno_z)
- HDOP (Horizontal Dilution of Precision)

Randomness in Data

- Explanation of how randomness simulates real-world conditions
- Example of altitude and acceleration variations

1. Launch Phase

$$bno_x = A \cdot \sin(\omega_1 t)$$

$$bno_y = A \cdot \cos(\omega_1 t)$$

Where A is the amplitude (0.2) and ω_1 is the angular frequency (base frequency = 0.1).

2. Ascent Phase

$$bno_x = 2A \cdot \sin(2\omega_1 t)$$

$$bno_y = 2A \cdot \cos(2\omega_1 t)$$

3. Coasting Phase

$$bno_x = A \cdot \sin\left(\frac{1}{2}\omega_1 t\right)$$

$$bno_y = A \cdot \cos\left(\frac{1}{2}\omega_1 t\right)$$

4. Descent Phase

$$bno_x = 3A \cdot \sin(3\omega_1 t) + \epsilon$$

$$bno_y = 3A \cdot \cos(3\omega_1 t) + \epsilon$$

Where ϵ represents random noise added to the oscillation.

Orientation Data

- Role of orientation in rocket stability
- Update mechanism for orientation data
- Oscillation patterns based on flight stage

Real-time Data Transmission

- Use of WebSocket for data streaming
- Benefits of real-time telemetry

Proposed Graphs

- Altitude vs. Time
- Temperature vs. Time
- Velocity vs. Time

Importance of data visualization for analysis

Challenges Faced

- Creating realistic simulations
- Handling data volume and transmission

Solutions Implemented

- Introducing randomness
- Optimizing data handling

Summary of Key Points

- Importance of real-time telemetry
- Potential applications of the simulation