Università di Genova | DIBRIS DIPARTIMENTO DI INFORMATICA, BIOINGEGNERIA, ROBOTICA E INGEGNERIA DEI SISTEMI

Dibris

Urban Aerial Drug Delivery: Revolutionizing Healthcare with Quadrotor Technology

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Introduction

Objective	Drone navigation system for transporting medicals within an urban area.
Scenario	Photogrammetry of the map of Genova.
How	The drone must travel from a start position to a goal position with a payload while avoiding obstacles and managing battery consumption.

Introduction

Challenges

Determine maximum allowed elevation based on the **flight restrictions**.

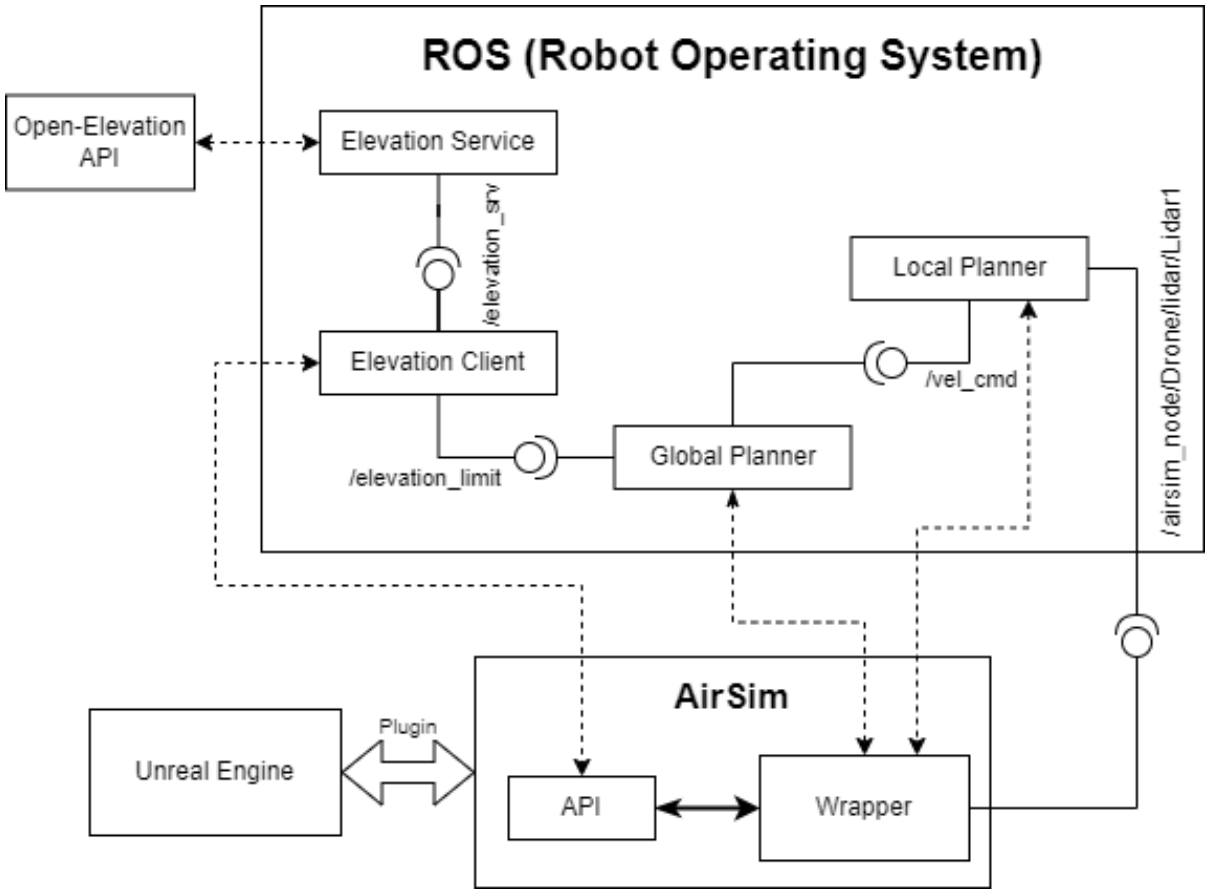
Implement an effective **obstacle avoidance** algorithm.

Ensure that the drone has enough **battery autonomy** to reach its goal.

Use **intermediate charging station** if the drone can't reach directly the goal.

Tools

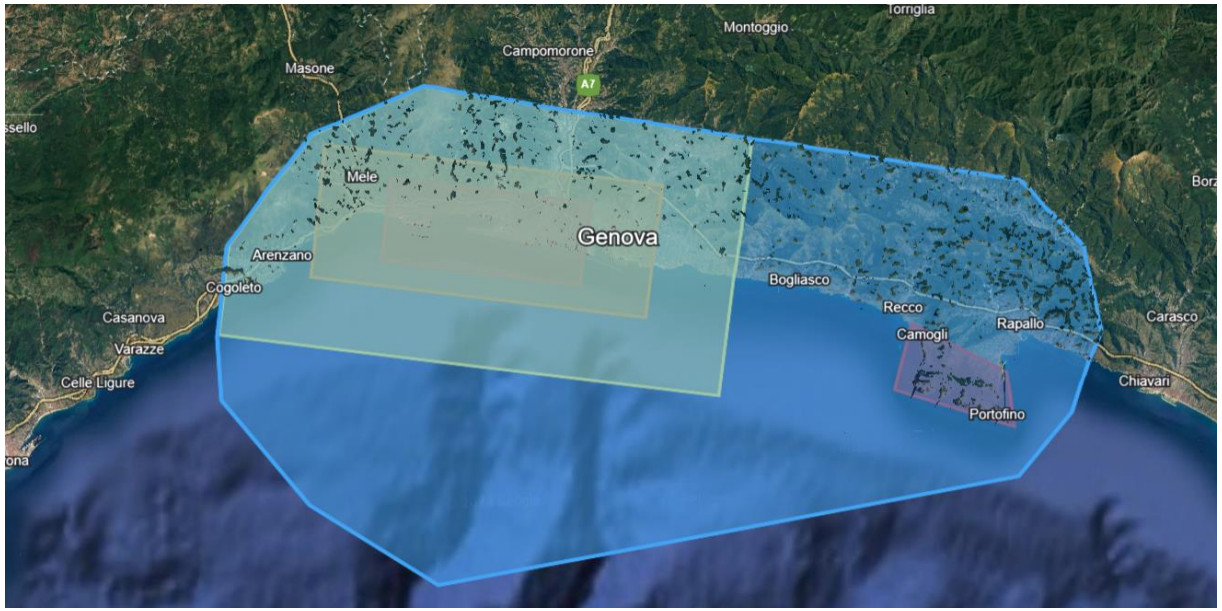
Software architecture



Elevation management

Manually defined flight restriction areas using Google Earth due to lack of D-Flight API.

KML generated file with shapes with color codes.



Elevation management

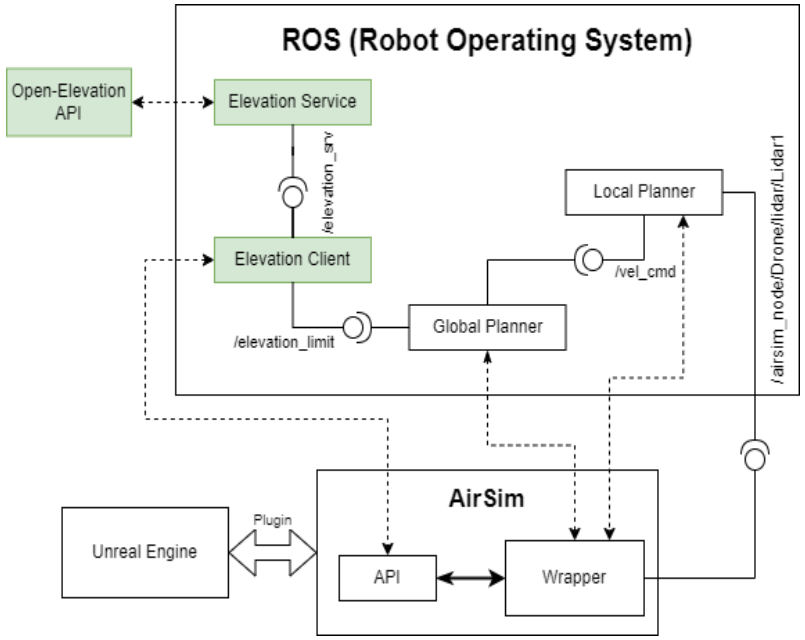
Elevation Client

Queries for elevation data at current coordinates.

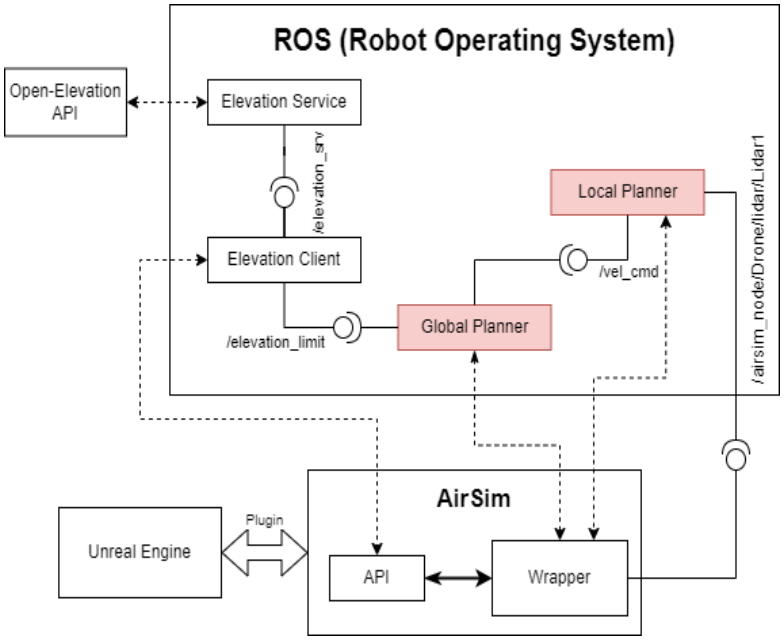
Determines current max allowed elevation.

Elevation Service

Upon request queries the *Open-elevation API* for current altitude and returns it to the client.



Obstacle avoidance and navigation



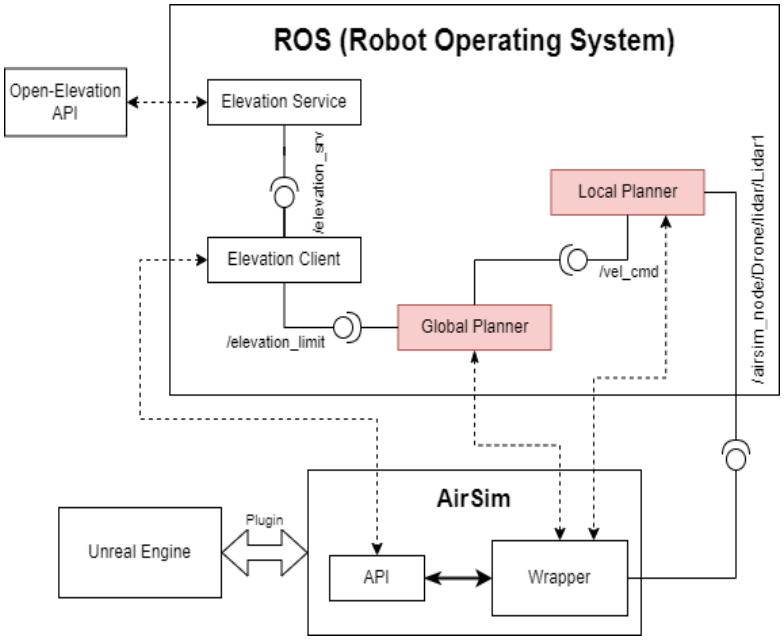
Local Planner

LIDAR sensor to detect obstacles.

Velocity commands referenced to the drone's local reference frame (NED).

Turn in the direction with less detected obstacles.

Obstacle avoidance and navigation



Global Planner

Initialize drone.

Load weather effects.

Manages drone's autonomy.

Decides movement (vertical/horizontal)

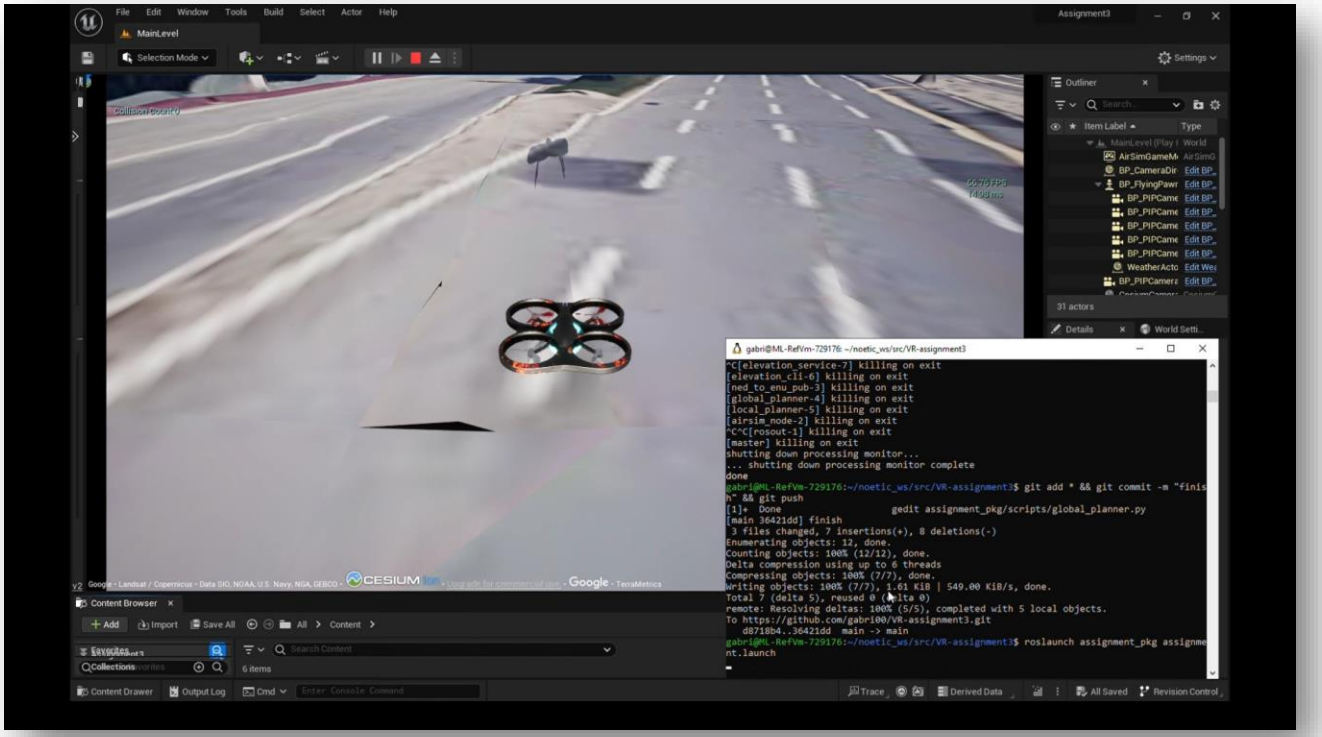
sends velocity commands to AirSim API.

$$autonomy = \frac{100}{0.03 * (w_{drone} + w_{payload}) + weather}$$

Simulation

Launch the demo

1. Start the game mode in UE editor.
2. In WSL launch the *assignment.launch* file.



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