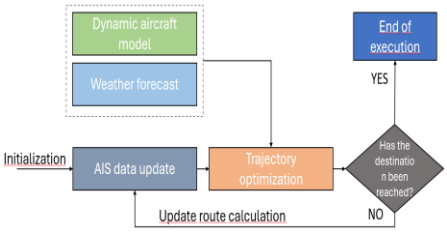
Path Planning Software for Drones in Offshore Logistics Operations

***Inventors*:** Enrique Aldao Pensado; Gabriel Fontenla Carrera; Fernando Veiga López; Higinio González Jorge;

Description



The proposed trajectory calculation software is a cutting-edge solution for planning logistics operations with unmanned aerial vehicles (UAVs) in marine environments, addressing critical inefficiencies and risks in traditional shore-to-ship delivery methods. This innovative system leverages UAV versatility to reduce resupply costs by up to 90% and delivery times by sixfold compared to conventional support vessels. Additionally, it incorporates advanced predictive analytics and real-time data integration to ensure safe operations near crewed ships. By adhering to European Union Aviation Safety Agency (EASA) regulations, the software prioritizes safety while enhancing efficiency, offering a scalable and environmentally friendly alternative to fuel-intensive marine logistics.

Advanced UAV Navigation with Risk Mitigation: Utilizes weather forecasts and AIS data to optimize trajectories while minimizing risks of turbulence and collisions in dynamic marine environments.

Seamless Integration and Accessibility: Built on open-source Python, ensuring compatibility, portability, and ease of integration with existing systems, fostering broader adoption and cost-effective deployment.

Innovative aspects and advantages

Purpose and Innovation: This software optimizes logistics operations for unmanned aerial vehicles (UAVs) in marine environments, offering a modern alternative to costly and risky support vessel methods.

Tools and Methods for Researchers: The software integrates weather forecasts and AIS data into a trajectory optimization system using Python and libraries like Numpy, SciPy, and Matplotlib.

Risk Mitigation: It ensures compliance with EASA regulations by maintaining safe separation distances and simulating UAV behavior under weather constraints to minimize operational hazards.

Edificio Filomena Dato
Campus Universitario
36310 Vigo
España
Tel. +34 986 812236
www.uvigo.gal
otri@uvigo.gal

Multi-Objective Optimization: The system calculates optimal trajectories balancing flight time and risks such as turbulence, leveraging dynamic graphs and probabilistic models for accuracy.

Commercialization Value: With potential cost reductions of up to 90% and sixfold faster deliveries, this software is a cost-effective, scalable solution for the shipping and logistics industry.

Environmental Benefits: UAV operations significantly lower carbon emissions compared to traditional fuel-intensive support vessels, making it an eco-friendly alternative for logistics.

Programming and Portability: Developed in Python and embedded in the open-source WinPython environment, the software is portable and compatible with modern Windows systems without additional installations.

File Structure and Functions: Key files include modules for UAV behavior, weather processing, AIS constraints, grid-based trajectory planning, and dynamic graph optimization.

Commercial and Research Applications: This software is ideal for commercial logistics, UAV research, and environmental studies, offering seamless integration with existing systems and fostering technological advancements.

Commercial applications and potential users

The path planning software for drones in offshore logistics operations has significant commercial applications. It can revolutionize the shipping and logistics industry by enabling efficient, cost-effective shore-to-ship deliveries. The software is ideal for maritime resupply operations, offshore energy sector logistics, and emergency response deliveries in marine environments. It also offers opportunities for integration with smart port technologies and autonomous shipping systems.

Potential users include shipping companies seeking to reduce costs and delivery times, offshore oil and gas firms requiring reliable resupply solutions, and organizations involved in marine research or environmental monitoring. Government agencies and defense sectors can also leverage this software for strategic operations, ensuring compliance with safety regulations while promoting eco-friendly logistics practices.

Intellectual Property Registry

- Registry Entry Number: **03 / 2024 / 1305**

Type of collaboration

Looking for industry interested in licensing or joint development of the process and/or product.

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otri@uvigo.gal