

Paper Title

ARGO An Open Designed USV Mapping Autonomous Platform

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Abstract

For years unmanned and remotely operated robots have been used as tools in industry research and education. The rapid development and miniaturization of sensors that can be attached to remotely operated vehicles in recent years allowed industry leaders and researchers to utilize them as an affordable means for data acquisition in air, land, and sea. Despite the recent developments in ground and unmanned airborne vehicles, a small number of Unmanned Surface Vehicle (USV) platforms are targeted for mapping and monitoring environmental parameters for research and industry purposes. The ARGO project is developed an open-design USV equipped with multi-level control hardware architecture and state-of-the-art sensors and payloads for the autonomous monitoring of environmental parameters in large sea areas. The proposed USV is a catamaran-type USV controlled over a wireless radio link (5G) for long-range mapping capabilities and control for a ground-based control station. The ARGO USV has a propulsion control using 2x fully redundant electric trolling motors with active vector thrust for omnidirectional movement, navigation with opensource autopilot system with High Accuracy GNSS device, and communication with the 2.4Ghz Digital Link able to provide 20km of Line of Sight (Los) range distance. The 3-meter dual hull design and composite structure offer well above 80kg of usable payload capacity. Furthermore, sun and friction energy harvesting methods provide clean energy to the propulsion system. The design is highly modular, where each component or payload can be replaced or modified according to the desired task (industrial or research).

The system can be equipped with Multiparameter Sonde, measuring up to 20 water parameters simultaneously, such as Conductivity, Salinity, Turbidity, Dissolved Oxygen, etc. Furthermore, a high-end multibeam echo sounder can be installed in a specific boat datum for shallow water high-resolution seabed mapping. The system is designed to operate in the Aegean Sea.

The developed USV is planned to be utilized as a system for autonomous data acquisition, mapping, and monitoring bathymetry and various environmental parameters. ARGO USV can operate in small or large ports with high maneuverability and endurance to map large geographical extends at sea. The system presents state of the art solutions in the following areas i) the on-board / real-time data processing/analysis capabilities, ii) the energy-independent and environmentally friendly platform entirely made using the latest aeronautical and marine materials, iii) the integration of advanced technology sensors, all in one system (Photogrammetric and radiometric footprint, as well as its connection with various environmental and inertial sensors) and iv) the information management application. The ARGO web-based application enables the system to depict the results of the data acquisition process in near real-time. All the recorded environmental variables and indices are presented, allowing users to remotely access all the raw and processed information using the implemented web-based GIS application.

Keywords

Monitor Marine Environment, Unmanned Surface Vehicle, Mapping
Bythometry, Sea Environmental Monitoring

What Are the Objectives of Your Research? 250 characters

Water quality assessment and seabed mapping using a USV mapping autonomous platform and web services

What Methodologies Were Used in Your Research? 250 characters

Grab sampling and sample analyses in the lab in combination with in-situ profilers for real-time data collection.

- Energy harvesting
- Composite Design
- Edge GIS and IoT
- Sensor fusion
- Edge DSS for aquaculture

What Are the Main Contributions of Your Research?

Bathymetry measurements in near-shore shallow marine coast to estimate the potential distribution of seagrass and other macroalgae. Rapid assessment of water quality for aquaculture environmental impact assessment.