Edge Computing System for Monitoring of the Aquatic Ecosystems ★

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Abstract. Rapid advances in the development of IoT and edge computing technologies have led to innovative solutions for environmental monitoring. In this paper is presented an edge computing system designed for real-time monitoring of aquatic ecosystems, which addresses the need for efficient processing of environmental state data. The system uses a swarm of mobile edge computing nodes, deployed on drone platforms, to monitor strategic areas in the aquatic environment, collecting, processing and analyzing data on-site, thereby reducing reliance on data transport infrastructure and the cloud centralized. Real-time data analysis enables early detection of environmental anomalies or threats, enabling their location and rapid interventions to protect aquatic life and ecosystems. The system architecture ensures scalability, reliability and algorithmic efficiency, making it a promising solution for various application domains.

Solved problems in the design and research process:

– Stabilization of the drone flight in relation to the interaction of the drone in flight and water, which involves multiple phenomena and specific challenges, due to the unique characteristics of the aquatic environment (unstable surface with waves and noise, air stream and

turbulence, etc.) and the reflection of radio waves or navigation and control signals (GPS, WiFi, GSM, GPRS);

- Orientation, navigation, take-off and landing of the drone from/on the water surface in exceptional cases;
- Protection of the drone against the aquatic environment, expressed through the use of water-resistant models, which avoid damage caused by splashes or condensation;
- Evaluation of the performance characteristics of the set of sensors (ultrasonic and optical) applied for spatial positioning and in-flight navigation of the drone.

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