Autonomous Mobile Laboratory for Comprehensive Radiation, Pollution, and Chemical Detection in Marine Environments

Veysel KOÇ[1] , Fatma CENGİZ[2]

[1] Mergen Aero, Ankara/Türkiye,(mergenaero@gmail.com)
[2] Health Science University, Ankara/Türkiye,(ftmacz@gmail.com)

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The Autonomous Mobile Laboratory project introduces a groundbreaking, fully autonomous system designed to monitor and analyze radiation levels, pollution, and chemical waste in marine environments. Utilizing cutting-edge technologies such as artificial intelligence (AI), unmanned underwater vehicles (UUV), and solar-powered autonomous surface vehicles (ASV), this system provides a comprehensive solution for environmental monitoring. It is capable of collecting samples from multiple sea depths and diverse geographical locations, including areas near nuclear facilities. The collected data, including radiation levels, pollutant concentration, and chemical waste detection, is transmitted in real-time to a central laboratory, enabling immediate analysis and response.

This innovative approach addresses critical environmental hazards such as oil spills, radioactive contamination, chemical pollutants, and marine mucilage, particularly in regions like the Mediterranean, which is home to numerous nuclear power plants. The system's real-time data analysis allows for early warning and intervention in case of environmental threats, significantly enhancing response capabilities. Moreover, the integration of renewable energy via solar panels ensures that the system is both sustainable and cost-effective, reducing the carbon footprint associated with conventional monitoring techniques.

Key features include multi-sensor data collection, advanced AI-driven analysis, and the ability to autonomously collect and store data over extended periods using modular buoy systems. This autonomous operation minimizes human intervention, reduces operational costs, and offers a scalable, replicable solution for continuous environmental surveillance. The laboratory also includes chemical, biological, radiological, and nuclear (CBRN) detection capabilities, making it highly versatile for diverse applications.

The project has significant implications for radioprotection, radioactive waste management, and environmental sustainability, and it represents a disruptive innovation in the nuclear safety and marine protection sectors. The system's capacity to preemptively identify and mitigate threats ensures enhanced safety for both human populations and marine ecosystems.

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