ID46- LOW COST BUOY FOR MONITORING RECREATIONAL AREAS

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Abstract - By using buoy-based coastal monitoring systems we can build innovative solutions addressed to measure, among other activities, the marine cosastal conditions. This technology is continuously evolving mainly because the current high-cost of the buoy-based installations jepoardizes the full penetration of these products and their potential added-value applications in the consumer market. To mitigate these shortcomings, we propose a Samrt System for Marine Environments . This is a novel concept to monitor coastal areas: a low-cost, light weight, energy-efficient and surface buoy-based system to dedicate all the efforts in satisfying the demand of a wide variety of end-users and applications.

Keywords: buoy, marine environment, GPRS

I. INTRODUCTION

The main objective of Smart System for Marine Environments (SSME) is to obtain a versatile solution which is able to monitoring coastal marine areas, such as beaches and diving areas, which are particularly vulnerable to the effects of human activity and are an important economic resource for the touristic sector as important in Spain.

In comparison with other monitoring marine technologies, surface buoys provide simple installation and autonomy, becoming the most appropriate solution for measuring and controlling the status of waters close to the coast. There are several solutions based in this idea associated to projects funded by the European Union ([1], [2], [3]), patents [4], investigations published in the specialized literature [3], and commercial products ([5], [6], [7], [8]) and trial prototypes [9]. In these, buoys use satellite communications and other solutions consider the capture of the video, audio or image and remote control.

However, important concerns are still not solved, making difficult the penetration in the market (size, cost, etc.). It implies that the amount of envisaged applications is limited and that the number of possible end-users reduced to a few large enterprises and public administrations.

To this end, we describe the design and built of a buoy-based coastal monitoring system that, on real-time, transmits data from on-board physical sensors to users of its emplacement. This surface buoy system will provide a flexible/modular infrastructure to fit the buoy's equipment to a specific application. The marine system includes physical sensors that measure water temperature, pressure, ultraviolet radiation, weather conditions, etc. will result a product that allows knowing the state of a beach and diving areas.

This can be interesting for public administrations, and citizens, because SSME (see Fig. 1) could offer to the tourists/population via Internet, smartphone app, etc. which of their beaches are the most suitable for the swim and under which conditions.

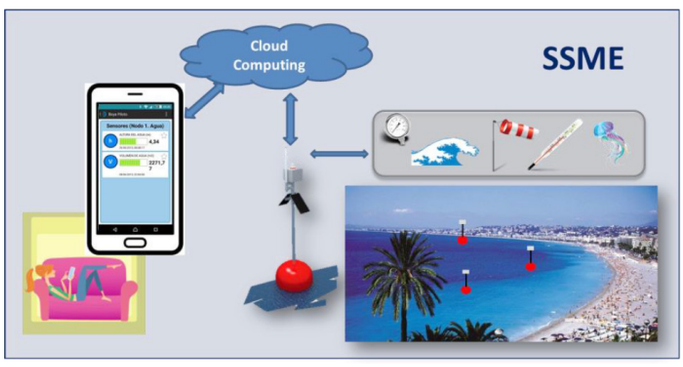

Fig. 1. SSME system

II. SMART SENSOR BUOY

To describe the buoy sensor we can distinguish two parts: (1) On the one hand, the electronic system that gives functionality to the system, (2) and secondly, the mechanical part supporting instrumentation. Regarding the electronics, it is a modular system that includes various electronic cards with different functionalities. A main board that manage general process of the buoy, an intermediate board which can be connected with sensors with different types of communications interface (0-3 V, 4-20 mA, SDI12), and a board to perform GPRS communication.

With respect to mechanic structure, the sensor buoy has to be mounted on a suitable mechanical structure and must meet a number of particular requirements dictated by conditions in the marine environment (see [10] for a detailed description).

In general, given the purpose for which the sensor buoy system was conceived, a number of requirements were defined. These are:

ψFlexibility: the sensor buoy system must be designed so as to facilitate different configurations in terms of the physical magnitudes that can be sensed, and the timing of sampling and of storage and periodic collection of data.

ψEnergy autonomy: the system should harvest energy from the environment in order to be able to operate without human intervention for a long time. Maintenance requirements and the associated cost will be reduced even further if the useful life of the buoy can be prolonged (buoy autonomy), as less intervention will be needed. We have used energy collection systems so that their batteries can be recharged using solar.

ψRobustness and fault tolerance.

ψMechanical design: components should guarantee an appropriate level of insulation and corrosion-proofing.

ψResource optimization: the sensor buoy system should be designed with efficient resource utilization in order to reduce the costs of manufacture, deployment, operation and maintenance.

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