AN INTELLIGENT SYSTEM FOR MONITORING IN REAL TIME THE POLLUTANTS FROM RIVERS

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Abstract
In order to identify pollutants in real time, it is required at the level of sampling using automated systems to allow high resolution data monitoring. These are the real state of the quality of a river and allow the detection of both short-term events and long-term changes. At the international level there are specialized systems that monitor water in terms of its pollution. Some of them are made only for pollutants from the agricultural sector, for example the flow of nutrients from rivers [1, 2]; others focused on assessing the ecological status of rivers or the impact of river pollution on drinking water. Most studies have been performed on *in-situ* sensor placement [3, 4]. However, precision water monitoring devices, such as chemical analyzers, are not widely used due to high investment and maintenance costs, as they are used to monitor river basins through analysis stations of national agencies. These types of analyzers are, for example, for determining the amount of phosphorus in water. However, ammonium ($NH4-N$) and organic carbon (*Total Organic Carbon - TOC*) are of significant relevance to the chemical and ecological status of rivers, as well as to the identification of their sources.
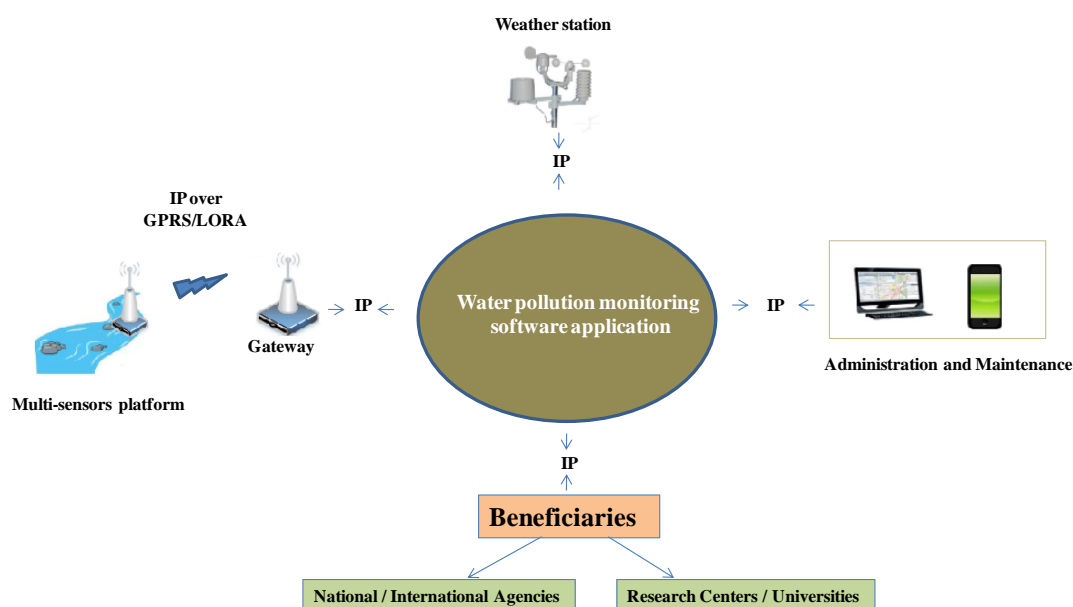
Figure 1: Block schematic diagram of an smart sensor system

The idea of the research starts from the need for real-time monitoring of waters along the entire course and its effluents to assess water quality and determine the sources of pollutants resulting from human activity. Developing of an intelligent system for monitoring in real time the

pollutants parameters of the rivers or urban sewerage systems represents the main aim of this research. In this way, were used modern technologies such as ultra-low power hardware, transmission, processing and storage the data in CLOUD and analysis software solutions of the data based on the artificial intelligence algorithms (Figure 1). Thus, the novelty of the study consist in application and interpretation of an extended set of data, focusing not only on a single type of pollution, but to characterize and classify the entire spectrum of pollution sources using the latest methods and technologies, and possibilities to achieve a competitive product on the market, respectively.

Acknowledgments

References

[1] C. E. M. Lloyd, J. E. Freer, P. J. Johnes, G. Coxon, and A. L. Collins, "Discharge and nutrient uncertainty: implications for nutrient flux estimation in small streams," Hydrological Processes, vol. 30, no.1, pp. 135–152, Jul. 2015

[2] P. J. Blaen, K. Khamis, C. E. M. Lloyd, C. Bradley, D. Hannah, and S. Krause, "Real-time monitoring of nutrients and dissolved organic matter in rivers: Capturing event dynamics, technological opportunities and future directions," Science of The Total Environment, vol. 569–570, pp. 647–660, Nov. 2016.

[3] P. Jiang, H. Xia, Z. He, and Z. Wang, "Design of a Water Environment Monitoring System Based on Wireless Sensor Networks," Sensors, vol. 9, no. 8, pp. 6411–6434, Aug. 2009.

[4] F. Ungureanu, R. G. Lupu, A. Stan, I. Craciun, and C. Teodosiu, "Towards real time monitoring of water quality in river basins," Environmental Engineering and Management Journal, vol. 9, no. 9, pp. 1267–1274, 2010