

## MONITORING OF RIVER-TYPE AQUATIC ECOSYSTEMS FOR FORECASTING THE POLLUTANT SPREADING PROCESS

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The given work is dedicated to the development of a system for real-time monitoring of river-type aquatic ecosystems. The developed system can be applied to forecast the dispersion of pollutants on the surface and on the river banks [1]. The monitoring system presents a network of mobile sensors, which are located on the surface of the river water, moving along its course, carrying out operations of occurrence of pollutants in water, data processing and storage. When approaching the reference stations (Access Points) the mobile sensors transmit the data accumulated on a server for their centralized storage, processing and analysis.

For modeling the process of pollutants' spread, in the paper work, the aquatic ecosystem of river type, is defined as a dynamic process  $P \in R^4$ , where  $R^4 = \{x, y, z, t\}$  is a system of space-time coordinates [2]. The surface of the water is defined as a set of discrete nodes in which the respective calculations are performed. The mathematical models of interpolation or extrapolation are applied to calculate the intermediate values between the nodes.

If in the process of the evolution of the aquatic ecosystem is satisfied the condition:

$$\frac{dx}{dt} + \frac{dy}{dt} + \frac{dz}{dt} \neq 0,$$

then the dynamic of pollutants' spread is defined by the expression:

$$\sqrt{\left(\frac{\partial p}{\partial x}\right)^2 + \left(\frac{\partial p}{\partial y}\right)^2 + \left(\frac{\partial p}{\partial z}\right)^2} = \frac{dp}{dt}$$

The ratio  $\frac{d^2 p}{dt^2}$  allows to calculate the amount of pollutants that have been dispersed on the surface and on the river banks.

The method of monitoring the aquatic ecosystems, presented in the paper work, allows locating in space and time the source of pollution in the coordinate system  $\{x, y, z, t\}$  and the amount of pollutants dispersed on the surface and on the river banks.

**Keywords:** *monitoring systems; aquatic ecosystems; transport of pollutants; distributed nodes; interpolation; extrapolation.*

### References

1. PARK, Y.-S., HWANG, S.-J. Ecological Monitoring, Assessment, and Management in Freshwater Systems. *Water* 2016, 8, 324; DOI: 10.3390/w8080324 [online: <http://www.mdpi.com/journal/water>].
2. MARUSIC, G. *Modelarea Evoluției Spațio-Temporale a Caracteristicilor Ecosistemelor Acvatice de tip Râu în Vederea Estimării Parametrilor Calității Apelor*. Teză de doctor în informatică. UTM. Chișinău 2016, 253p.