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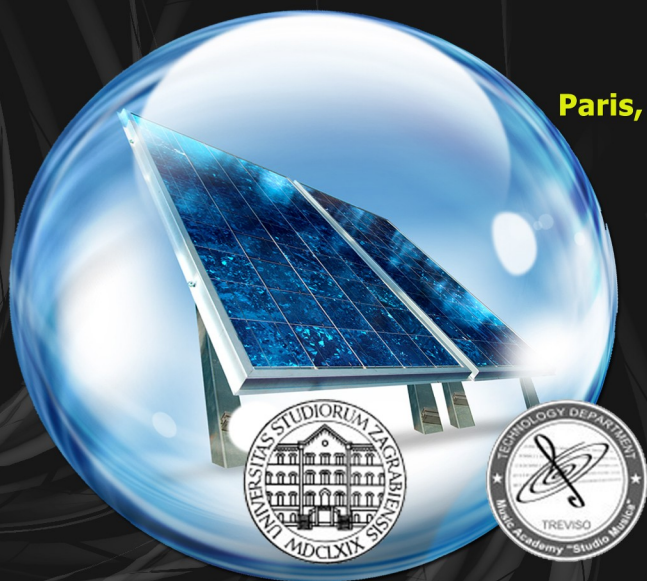
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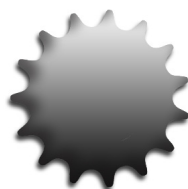
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Plenary Lecture 1

An Event-Driven Method for Simulating Water Quality in Distribution Systems



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Abstract: In the Event-Driven Method (EDM) the time-varying water quality problem is simulated in an event-oriented environment. In this environment, the contaminant-transport process is driven by the distribution-system activities. Basically, the EDM creates, identifies, and places (removes) events –which can be hydraulic or sub-hydraulic –, into or from an activity list in a chronological order. It is assumed that the initial constituent concentration at every junction node is zero. Since the only factors affecting the concentration at any node are the concentrations and flows in the pipes immediately upstream of the given node, the only information that must be available during any point in the simulation are the different pipe segment concentrations. A sub-hydraulic event takes place whenever a water front with a different constituent concentration reaches a node. To each pipe we dynamically assign records called “seps” (there may be more than one per pipe). Their function is to serve as separators between volumes of water with different concentrations. When a relatively large number of seps are simultaneously active, a partial aggregation of the “seps” may be performed (using the Gauss formula with Legendre polynomial of second degree). The performance of the proposed method is demonstrated by applying it to an example water-distribution network. The main advantage of this method is that it allows a dynamic modeling of the water-quality, which is less sensitive to the structure of the network and to the length of the simulation process itself. In addition, the numerical dispersion of contaminant-concentration resolution is nearly eliminated. The method can be used for all network configurations and for all dynamic hydraulic conditions, and has been shown to exhibit excellent convergence characteristics.

Brief Biography of the Speaker: Dr. Camelia GAVRILA holds a BSc in Mathematics from the University of Bucharest, Faculty of Mathematics, Romania and a Ph.D. in Civil Engineering (2003) from the Technical University of Civil Engineering Bucharest, Romania. Since 2005 she is associate professor at the Thermal-Hydraulic Systems and Atmosphere Protection Department of the Technical University of Civil Engineering, Bucharest, Romania. She has ISI publications in the Optoelectronics and Advanced Materials–Rapid Communications, SPIE journals, Chemistry Magazine, Proceeding Conference IEEE. She has research agreements and projects in the field of: Identification Methods for Nonlinear System; Numerical Methods for solving PDE's: finite difference method, discrete volume method, finite element method; Modelling Water Quality; Environment Protection; Optics and Lasers; Abel Modelling; Modelling and Simulation with COMSOL Multiphysics. Assoc. Prof. Dr. GAVRILA is a member of several professional bodies: The Romanian Association of Water (ARA), The International Water Association (IWA), IEEE, SPIE, OSA.

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