Smart Data Analysis for Smart Water Networks

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ABSTRACT

Water is an indispensable resource for human and economical welfare, and modern society depends on complex, interconnected infrastructures to provide safe water to consumers. Given this complexity, efficient numerical techniques are needed to support optimal control and management of a water distribution system (WDS). This work presents a position paper on soft computing tools to suitably handle the huge amount of data generated by processes related to smart water applications.

The paper is structured in two main parts: the first part reviews a number of state-of-the-art soft computing techniques for WDS management and gives a prospective on future research directions. So, firstly, robust and efficient algorithms able to deal with non-linearities, mixed variables, and discrete processes to optimally approach various WDS problems [1] are reviewed. Time series and data-driven tools for monitoring service quality are also introduced [2]. This first part closes presenting state-of-the-art statistical and machine learning tools for handling several operational and managerial issues in WDSs [3]–[5].

The second part of the paper proposes a number of new hot topics coming up nowadays in the operation and management of smart water networks. These are Big Data, near real-time monitoring, epidemiology-based data analysis tools, uncertainty of asset states, and event-driven applications. This further research is essential to develop new algorithms to deal with the inherent volume and complexity of WDSs databases, able to exploit the information in advanced metering infrastructures as fully as possible. It also aims to contribute to water utilities decision support systems in both modelling extreme events and improving network resilience.

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