A Bayesian Approach to Predicting Water Supply and Rehabilitation of Water Distribution Networks

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Abstract

Water distribution network (WDN) consists of several elements the main ones: pipes and valves. The work developed in this article focuses on a water supply prediction in the short and long term. To this end, reliability data were conjugated in decision making tools on water distribution network rehabilitation in a forecasting context. The pipes are static elements that allow the transport of water to customers, while the valves are dynamic components which perform ensure management of water flow. This paper presents a Bayesian approach that allows management of water distribution network based on the evaluation of the reliability of network components. Modeling based on a Static Bayesian Network (SBN) is implemented to analyze qualitatively and quantitatively the availability of water in the different segments of the network. Dynamic Bayesian networks (DBN) are then used to assess the valves reliability as function of time, which allows management of water distribution based on water availability assessment in different segments. Finally an application on data of a fraction of a distribution network supplying a town is presented to show the effectiveness and the strong contribution of Bayesian networks (BN) in this research field.

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