



The principal component analysis for detecting leaks in water pipe networks utilizing flow and leak record data

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ABSTRACT

In this paper, the potential of the principal component analysis (PCA) technique for the application of detecting leaks in water pipe networks was evaluated. For this purpose, the PCA was conducted to evaluate the relevance of the calculated statistical outliers of a PCA model utilizing the recorded inflows of district metered areas (DMAs) and the records of leak repair completion of a case study water pipe network. The PCA technique was enhanced by applying the computational algorithm developed in this study which was designed to use flow data in a time window from the original 24-h flow data so that the effective outlier detection rate was maximized. Sensitivity analyses of the parameters of the PCA model and the developed algorithm on the results of the study were conducted. Consideration on how to apply the parameters in the practical applications was also presented. The developed algorithm may be applied in determining whether further leak detection field work for DMAs needs to be performed.

Keywords: Principal component analysis (PCA); DMA; Water pipe network; Leak detection; Computational algorithm; Flow data

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