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Looking for MSc/PhD students (preferable graduates of: Civil and Environmental Engineering, Mathematics, Electrical Engineering, Computer Science, Physics, Industrial Engineering) for immediate hiring on an ISF (Israeli Science Foundation) project on:

Dynamic Approach for Water Distribution Systems Clustering and Aggregation

It is hard to overestimate the significance of water distribution infrastructure for modern day society sustainable existence and development. Management of water distribution system (WDS) that usually comprises thousands to tenth thousands of nodes and links is a complex problem, since its objectives include, in addition to supplying the water in the required quantities and quantities, sustaining conditions such as failure scenarios, detection of contamination intrusions sources, sensor placement, leakage minimization, etc. Consequently, to achieve save and resilient water supply, the efforts might be assigned (1) to obtain WDS representation in a simplified form that helps to gain insight into the system's structure and the interaction of its components, (2) to change actual WDS structure to simplify its management without worsening the network performance. An effective and accurate method for WDS separation into clusters will be beneficial for both applications. To date, WDS clustering is based on static representation of the system. Though, it has been shown that dynamic approach to WDS operation results in drastically different system partitioning, which affects partition-dependent tasks. This opens a new and very perspective angle in WDS clustering study – a dynamic clustering approach. The main objective of the proposed research is to develop a generic method for WDS dynamic clustering, implement it for real-sized water networks, and investigate the method's performance on benchmark clustering problems including optimal sensor placement, contaminant identification and seclusion, leakage detection and minimization, and WDS partitioning to district metering areas. Preliminary results show that dynamic system properties that form the basis of dynamic clustering provide crucial insights into system behavior requisite for appropriate actions following WDS contamination. As a result of the proposed study, new generic methodology for WDS dynamic clustering is expected to be developed featuring exploration, adaptation, and modification of dynamic clustering algorithms for their use in WDS in accordance to its specific characteristics, and automatic, self-organized algorithms for clustering update in response to changes in WDS operation.

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