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Interactive comment

Interactive comment on "Real-Time Hydraulic Interval State Estimation for Water Transport Networks: a Case Study" *by* Stelios G. Vrachimis et al.

Anonymous Referee #1

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The manuscript presents a case study that uses an iterative interval state estimation algorithm to compute the bounds on state variables for a water transport system. The methodology is intended to facilitate event and fault detection within the system. However, the application of the proposed method to the specific problem presented in this article is questionable. The article also lacks necessary technical details in the case study section. The authors are invited to consider the following comments:

1. The practical problem as described in Section 3 does not seem to require a hydraulic solver. Per Line 17, Page 5, "the challenge ... is the difference between the volume of water entering and exiting the transport network". Because the pressures are not

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relevant here, for the network topology shown in Figure 2, a simple mass balance model is sufficient to represent the relationship:

$$q_0 = A\frac{dL}{dt} + q_1,\ q_1 = F_1 + q_2,\ \ldots,\ q_{16} = F_{16},$$

in which A is cross-sectional area of the tank, and F_i is the demand at the i-th node. The linear system allows a straight-forward computation of the bounds of flow rates that can be used in diagnosing the system.

2. The discussion between Line 11, Page 6 to Line 4, Page 7 is inconsistent with the proposed algorithm. The computation of θ in Line 12-16 seems to suggest that there is a constant unaccounted-for flow, but "it was eventually validated that there was a metering error at the tank inflow". If the method "could not confirm whether the difference . . . was due to background leakage. . . or metering error", why do we compute θ in the first place? The anomaly should be evident by just comparing the SCADA measurements at q_0 and the interval estimates of q_0 generated by the algorithm.

3. Section 3 "Case study: Limassol, Cyprus" does not provide sufficient information about the performance aspect of the algorithm. More specifically, important topics, such as (1) time and number of iterations needed to obtain convergence in the state estimates and (2) how the sizes of bounds change with each iteration, are not discussed. These pieces of information would be beneficial in evaluating the overall feasibility of the algorithm in this and potentially further studies.

Due to the limitations above, the paper does not convincingly establish the necessity and applicability of the proposed method in addressing the problem shown in the case study. A better application of the interval estimator may be in a looped distribution system with both flow and pressure bounds estimated for event/fault detection. The reviewer therefore could not recommend the manuscript for publication in DWES.

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