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Interactive comment on "Efficient Online Source Identification Algorithm for Integration within Contamination Event Management System" *by* Jochen Deuerlein et al.

Jochen Deuerlein et al.

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please find attached response to review and modified discussion paper

Interactive comment on Drink. Water Eng. Sci. Discuss., doi:10.5194/dwes-2017-16, 2017.

Efficient Online Source Identification Algorithm for Integration within Contamination Event Management System

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Abstract. The automatic identification of the source of a contamination is an important component of an early warning and event management system for security enhancement of water supply networks. Whilst a number of algorithms have been published on the algorithmic development, only few information exists about the integration within a comprehensive real-time Event Detection and Management System. In the following the analytical solution and the software implementation of a real-time source identification module and its integration within a web-based Event Management System is described. The development was part of the project SAFEWATER, which was funded under FP 7 of the European Commission.

Introduction

For more than one decade a number of researchers have been working on methods for civil protection, real-time detection of contaminations and specific sensor development. Different software tools have been developed tackling problems such as optimal placement of sensors in the system (e.g. TEVA-SPOT, 2016) and detection algorithms (e.g. CANARY, 2016). In the SAFEWATER project, which was funded by the European Union, a comprehensive water supply system security solution was developed. One part of the project was concerned with the development of new sensors for detection of chemical, biological and radio-nuclear contaminations. The other part dealt with development of a comprehensive Event Management Software (EMS) that collects all information from the field and from different software components that are connected with the EMS including a newly developed Event Detection System (EDS) as well as offline and online hydraulic and water quality simulators. For response and mitigation of contamination events a software component for the identification of possible contamination sources has been developed, which was also integrated within the Web-GIS-based Event Management System of SAFEWATER. The communication channels between the individual modules were implemented by use of ActiveMQ (2015). With the help of continuous calculations the module enables the user to observe the current monitoring state of the system (area observed by the sensors) also in case of no alarm. In case of an event the possible locations for the contamination sources are additionally calculated and highlighted. A look ahead-calculation shows the estimated future spread of contaminant and indicates the valves that have to be closed for isolation of the contamination. All calculations run automatically in regular time intervals (e.g. 1 min) in combination with the hydraulic real-time simulation. To guarantee the proper order of actions and calculations a Petri-Net has been implemented within the online

Fig. 1.

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Interactive comment on "Efficient Online Source Identification Algorithm for Integration within Contamination Event Management System" by Jochen Deuerlein et al.

Anonymous Referee #1
Received and published: 29 April 2017

General Comments:
The manuscript "Efficient Online Source Identification Algorithm for Integration within Contamination Event Management System" describes an algorithm for the identification of the location of a contamination event in a water distribution system. I think the paper is interesting and should be published, because (as highlighted by the Authors) existing software and approaches are not implemented for a real-time (or near-real time) control. Therefore, this manuscript provides a clear contribution to the current knowledge. I think the paper is in general well written and I don't have any major issue. However, I think that the paper could be clarified in some aspects (see below). While I understand that the Authors may have been limited (in terms of paper length) by the conference guidelines, I hope that the Journal will allow them to extend the manuscript, so that the content can be easily understood by a larger audience.

Specific Comments:
- Introduction, Line 27-28: I am not sure I understand this sentence. Do you mean that the algorithm is always running? Or it will be run (with a 1 minute time step) when there is an event?
The backtracking algorithm calculates the propagation of sensor signals in reverse time for both, negative (no alarm) as well as positive (alarm) signals. As result, the monitoring state of the observed network parts is always available. In other words for each location the time and the value of the last observation are regularly updated.

- Introduction, Line 28-29: I don't understand why there could be problems with the order of calculations. Could you please explain it? (Are the calculations performed on multiple processors or something similar? Or is it in case some of the inputs from the network are delayed?) Or maybe you can move this line in page 4 (about line 29) and give some details here.
The monitoring system in combination with hydraulic online simulation consists of several software components that share data using customized interfaces. In order to maintain proper workflow, the sequence of calculations follows specific rules. For example, the

Fig. 2.