Novel System Architectures for Semantic-Based Integration of Sensor Networks

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References:
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Abstract:
There are many on-going projects and research initiatives that are proposing new semantic-oriented services for obtaining, delivery, and processing sensor data gathered from integrated sensor networks. Rich information models based on the ontologies for heterogeneous sensor data description are necessary for achieving interoperability among various deployed sensor networks while providing context-related information with raw sensor data. As expected by the Sensor Web vision and the Future Internet initiatives, certain architecture is faced with performance requirements while providing complex services. This study identifies main challenges and design issues of sensor networks integration platforms, and gives a survey of existing approaches specifically emphasizing semantic-oriented approaches. The survey includes non-semantic approaches that are improved by employing semantics on certain levels, as well as approaches fully based on semantic technologies. As their original contribution, the authors propose a new architecture designed as an infrastructural platform for enabling semantic-based sensor networks integration. The key idea behind the proposed innovation is to utilize a flexible distributed repository called column store for keeping semantically modeled sensor data providing a scalable platform capable of supporting huge amounts of sensor data and large numbers of users. Moreover, column store is employed for push-based data propagation and support for including more complex processing elements.

Keywords:
Sensor networks, Ontology, Query processing, Distributed systems, Semantic web technologies, mobility