Paper Title : Distributed Sensor Data Computing in Smart City Applications
Paper Link : https://sci-hub.se/10.1109/WoWMoM.2017.7974338

1 Summary

1.1 Motivation

The Internet of Things technologies enable embedded devices to be connected to each other but because of continuous huge growth of the sizes of the IoT data, transferring all raw data to a centralized, cloud-based data centre and performing effective analytics becomes difficult. This results in low-quality sensor data, which must also be managed.

1.2 Contribution

The authors designed such a data search method based on a number of searching criteria, e.g., location of interest, observed features, and spatial extent. This distributed sensor data computing system enables processing of vast amounts of sensor data in real-time. Moreover, it reduces latency by distributing computing tasks across sensor nodes.

1.3 Methodology

In this study, the researchers developed ontological models for sensor services and data in the EU FP7 IoT.est project which generate fine-grained semantic annotations, and to create meaningful linked sensor data for service and data discovery. Moreover, they invented a semantic sensor service discovery platform based on spatial indexing and semantic search that takes a SPARQL query, searches against spatial index and returns one or more WSN gateways with which the sensors are associated. Afterwards, it queries the semantic repository and retrieves a list of sensor services and returns addresses of services to the requesters. They developed a novel ranking method by looking into the WSNs and estimating the cost of accessing sensor services.

1.4 Conclusion

This study becomes successful to find a data search strategy based on a variety of searching parameters, such as location of interest, observable attributes, and spatial extent, to run various searches within a specific time range. It provides a foundation for application-independent data processing as well as has great potential in preserving the energy of the Wireless Sensor Networks.

2 Limitations

2.1 First Limitation

Data processing distribution raises concerns about data security and potential weaknesses in decentralized nodes. Robust protocols are necessary to manage permission and authentication across heterogeneous nodes and avoid data modification and unauthorized access. Furthermore, maintaining data integrity when it transfers across dispersed nodes is essential since any compromise could result in erroneous information and consequent mistakes in decision-making.

2.2 Second Limitation

It might be difficult to manage and keep up a distributed system with many nodes; it needs constant updates and monitoring. Sustaining many nodes' health and functionality necessitates ongoing observation in order to identify and resolve problems early. The replacement of malfunctioning nodes and the integration of new nodes for system expansion provide challenges in the maintenance process.

3 Synthesis

People will be able to use distributed computing in agricultural sensor networks for precision farming, crop monitoring, irrigation optimisation, and overall agricultural productivity. Furthermore, distributed computing provides real-time analysis of traffic sensor data for dynamic traffic signal management, congestion prediction, and transportation network optimization. This also allows for remote patient monitoring, illness outbreak identification, and healthcare resource allocation via distributed sensor networks. Furthermore, by analyzing sensor data, this system may optimize building management systems, adding to energy efficiency, occupant comfort, and predictive maintenance.