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Editorial Open Access

Data Sampling in Sensor Networks: New Trends in Smart City Applications

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Editorial

When we think about "Data sampling in sensor networks applied to smart city applications", we depicted several interdisciplinary areas and problems [1]. The central concepts in smart city applications are traditional sensor networks with intelligent devices [2,3]; Internet of things [4]; social sensing [5]; and cloud sensing [6]. Nowadays, the central issue in these scenarios is "how to perform data sampling when these concepts are integrated".

Most smart city applications consider an environment that has a variety of phenomena monitored by sensor networks [2]. In traditional sensor networks, each sensor node can monitor one or more phenomena that are reported, through ad-hoc wireless communication [7], to the sink, these nodes receive and process the data extracting useful information for users [8]. However, in the context of smart city applications, the sensor network becomes a primary element of the IoT concept [9], where we have the several sensors associated with different "things" to monitor the environment and generate data for context-sensitive applications.

Additionally, one of the premises of smart cities is connectivity and iteration among people through the most different technologies. Currently, social networks correspond to one of the leading iteration tools among people, and they are responsible for generating a lot of data. In this context, in a complementary way, applications in smart cities can satisfactorily com-bine data generated by social networks (social sensors) with one produced by sensor networks (physical sensors). These applications are known as social sensors [5]. For instance, we can use a sensor networks monitoring vehicle traffic in a specific area and combine that information with social sensor data watching the people's comments on Twitter about the vehicles traffic in the same area. Thus, the application for traffic management uses both information to improve the user information.

The combination of this information requires an infrastructure for data storage and processing. Thus, the application adopts a cloud solution to favour and assist in this process. In some cases, the applications perform the data storage and query processing directly in the cloud, i.e., the data collected by physical or social sensors are stored in the cloud and available for future queries. This combination of sensor data (physical or social) and cloud computing solutions is known as cloud sensing [6,10]. A specific concept in cloud sensing is the fog infrastructure. Fog uses one or more collaborative end-user sensors or near-user edge devices to carry out a substantial amount of storage, rather than stored primarily in cloud data centres.

We observe these characteristics in different applications, for instance, traditional environmental monitoring, vehicular networks [11-14], smart buildings and smart grid [15] applications. So, we identify new trends in data sampling in a smart city as follows:

Internet of things

i) To design new solutions to integrate different physical sensors or networks through a generic middleware; ii) To design new solutions to allow plug-and-play physical sensors or networks in the smart city application; iii) To design new context-sensitive robust applications allowing the inference and decision oversampled or missed data.

Social sensing

i) To propose new data sampling algorithms applied to social sensing applications; ii) To propose new data fusion algorithms to infer different behaviours based on social and physical sensor data; and iii) To design new physical sensor applications, where social data sensing improves the inference layer.

Cloud sensing

i) To design new physical sensor applications, where we integrate the user application queries with data stored in a cloud or fog.

ii) To design new optimization strategies to define when and where to store the data collected by physical sensors; iii) to propose new code offloading strategies to de ne when the cloud of fog have to process a prohibitive task of physical sensors.

Finally, the main issue about data sampling in sensor networks is to integrate different data sampled solutions in a specific application. This integration must be focused on the Internet of Things, Social Sensing, and Could Sensing. By offering solutions for these presented problems, we will improve the smart city applications interoperability.

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