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Data Modeling for the Internet of Things

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Internet of Things (IoT) devices are reshaping industries (Ang and Seng 2019), including the battlefield (Kott et al. 2016), healthcare (Dimitrov 2016), and wearable technology (Dian et al. 2020). IoT devices are (traditionally mundane) objects exhibiting computing properties that interact with other devices with or without human intervention (Baiyere et al. 2020).

Nevertheless, engagement by information systems scholars on the topic is sparse and high level. Most of our programs don't teach it, and there has been very little focus on the unique empirical issues concerning IoT.

This TREO will focus on one specific systems analysis and design (SAND) issue in the IoT, the modeling of stream data generated/processed by IoT devices. It is hoped this sparks a more general discussion about the unique problems of SAND in IoT.

Stream data in the IoT context has unique characteristics that make it difficult to represent in traditional data models such as the relational data model (Babcock et al. 2002). (1) Streams are transient. The temperature a temperature sensor measures now is not the same as 1 microsecond ago. Traditional database representational forms assume data is semi-permanent. (2) Many traditional forms of processing such as sorting do not work on streams. (3) Streams are infinite, not atomic data types and thus are difficult to store. (4) Many IoT contexts involve limited processing, memory and energy capabilities. High-end relational/NoSQL/XML databases cannot be used and instead data must be stored as simple text files, or distributed memory structures across multiple simple devices.

We need new standard languages and systems for modeling in the IoT context- for example, a new standard query language to replace SQL for obtaining information for IoT sensors or providing information to IoT motors.

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