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Leveraging Spatio-Temporal Redundancy for RFID Data Cleansing

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Abstract

Radio Frequency Identification (RFID) technologies are used in many applications for data collection. However, raw RFID readings are usually of low quality and may contain many anomalies. An ideal solution for RFID data cleansing should address the following issues. First, in many applications, duplicate readings (by multiple readers simultaneously or by a single reader over a period of time) of the same object are very common. The solution should take advantage of the resulting data redundancy for data cleaning. Second, prior knowledge about the readers and the environment (e.g., prior data distribution, false negative rates of readers) may help improve data quality and remove data anomalies, and a desired solution must be able to quantify the degree of uncertainty based on such knowledge. Third, the solution should take advantage of given constraints in target applications (e.g., the number of objects in a same location cannot exceed a given value) to elevate the accuracy of data cleansing. There are a number of existing RFID data cleansing techniques. However, none of them support all the aforementioned features. In this talk, I will introduce a Bayesian inference based approach for cleaning RFID raw data. The approach takes full advantage of data redundancy. To capture the likelihood, we design an *n*-state detection model and formally prove that the 3-state model can maximize the system performance. Moreover, in order to sample from the posterior, we devise a Metropolis-Hastings sampler with Constraints (MH-C), which incorporates constraint management to clean RFID raw data with high efficiency and accuracy.

Bio

Wei-Shinn Ku received his Ph.D. degree in computer science from the University of Southern California (USC) in 2007. He also obtained both the M.S. degree in computer science and the M.S. degree in Electrical Engineering from USC in 2003 and 2006 respectively. He is an Assistant Professor with the Department of Computer Science and Software Engineering at Auburn University, USA. His research interests include spatial and temporal data management, mobile data management, geographic information systems, and security and privacy. He has published more than 40 research papers in refereed international journals and conference proceedings. He is a member of the ACM and the IEEE.

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