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Fast Temporal Continuous Scanning in RFID Systems

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Abstract

This paper studies the problem of temporal continuous scanning for large-scale RFID systems, which is an essential operation to keep the inventory up-to-date. The existing solutions need to execute unknown and missing tag identification protocols separately, which are of low time-efficiency because the unknown tags disturb the identification of missing tags and vice versa. To this end, we design a Fast Continuous Scanning (FCS) protocol based on the proposed multiple categories filter which can detect unknown tags and skip the empty and collision slots for improving the efficiency of missing tag identification. FCS is faster than the prior methods because the proposed filter is helpful to decreasing the interference between unknown and missing tags. We also investigate the optimization of the involved parameters to minimize the execution time. Extensive simulation results demonstrate that the proposed protocol outperforms the state-of-the-art solutions by saving 39% $\sim$ 58.5% of the execution time.

Keywords: RFID, Missing tag identification, Unknown tag identification

1. Introduction

Compared with the traditional barcode systems, Radio Frequency Identification (RFID) technology possesses noticeable benefits of proving storage and computation ability [1, 2], not requiring a line-of-sight and low deploying cost. Owing to these features, RFID techniques have been widely applied in many object monitoring scenarios [3, 4, 5, 6]. A typical RFID system is composed of a host, an RFID reader and a large number of tags. An RFID reader has a dedicated source with a certain computing ability. Following the commands sent from the host, the reader quires the tags and transmit the received data back to the host [7, 8]. A passive tag is a microchip with an antenna; it is powered by the electromagnetic induction from magnetic fields produced by the reader and sends its response back to answer the reader's query.

This paper concentrates on temporal continuous scanning, which contains a series of scanning operations performed at different time instants with the goal of obtaining the latest tag list in the interrogation zone of reader. It is a basic operation in dynamical system where the set of tags frequently changes with the time. For example, suppose a sports retailer stocks tens of thousands of

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