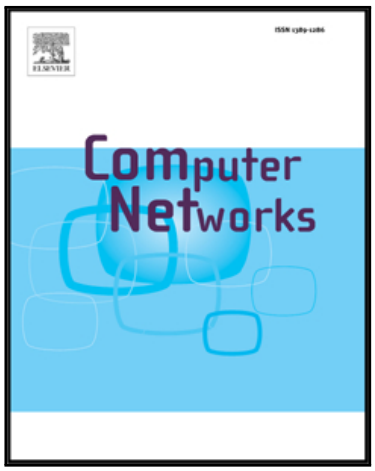

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Robust Decentralized Data Storage and Retrieval for Wireless Networks

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Abstract

In this paper we study the problem of distributed data storage using Rateless codes for large-scale resource-constrained wireless networks. We focus on building a robust storage system using Fountain codes from physically decentralized sources. Fountain codes, e.g. LT-codes, can achieve reduced complexity of both encoding and decoding, which caters well to the nature of such networks. We propose an energy-efficient distributed dissemination and coding scheme to build a decentralized LT-codes based storage over a network of resource-limited nodes to provide data survivability against possible failures. In the proposed scheme, each sensor node is assigned a selection probability derived from a Robust Soliton Distribution (RSD) in a distributed fashion. Source nodes then disseminate their data over the storage network randomly, in accordance with the selection probabilities. The proposed scheme is compared to similar schemes in the literature by means of simulations. We evaluate the energy required for building the storage as well as the energy needed for data retrieval from the storage system. Results show that energy consumption can be substantially reduced while achieving the required storage requirements.

Keywords: Wireless Sensor Networks, Decentralized Storage, Data Survivability, Energy Efficiency, Fountain Codes.

1. Introduction

We are witnessing a new technological era that is enabled by advances in ubiquitous sensing, computing and connectivity. New applications such as Internet of Things (IoT), Intelligent Transportation Systems (ITS), Smart Grid, and Smart Homes, all benefit from the pervasiveness provided by connected smart embedded devices. Despite this potential, there seems to be a constant need for alternative paradigms to cope with the challenges and requirements that

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