Performance analysis of a beaconless geo-routing protocol GeRaF in WSN

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1. Abstract

In this work, we study a WSN Geo-routing protocol named GeRaF, which uses a forwarding technique based on the geographical location of the nodes involved and a random selection of the relaying node. We performed extensive simulations to evaluate GeRaF under different scenarios. This allowed us to monitor and analyze GeRaF performance varying nodes speed, field surface and the number of forwarding regions.

Index Terms— WSN, Routing, Performance evaluation, Simulation, GeRaF.

2. Introduction

Wireless Sensor Networks (WSNs) are made by small and cheap nodes with processing, communication and sensing capabilities, that cooperatively interact to carry out complex monitoring tasks in a geographical area of interest. They represent a key technology that will revolutionize the human life in the upcoming years, providing at the same time new business opportunities. Current and envisaged applications will cover many important domains such as: smart-cities, environmental monitoring, distributed sensing in industrial plants, and health care.
In WSN applications, the overall network load is low; nevertheless, such networks poses challenging issues related to the communication reliability and to the efficient use of node batteries. In particular, the routing is a crucial problem in WSNs, due to possible link failures, low data rates, and limited energy reserves. In fact, sophisticated techniques are required for setting up and maintaining reliable paths, as well as for promptly detecting link failures, without wasting energy and communication resources.

3. Material

We used Omnet++ and Castalia to implement GeRaF routing protocol and its functionalities, also to run different sumilations though. Omnet++ is build with C++ programming language, this gives us extra flexibility to realize and run simulations.

4. Results

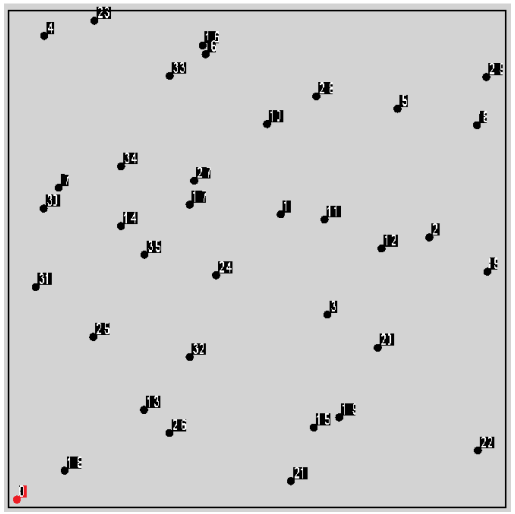

Fig. 1. Random Topology example with 35 nodes + sink (left bottom corner)

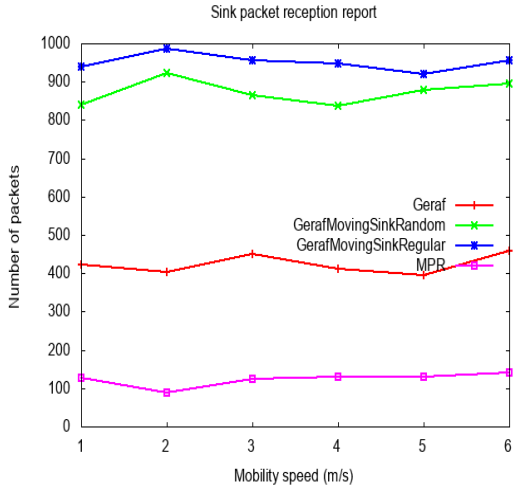

Fig. 2. Sink packet delivery report vs. mobility speed variability

5. Conclusions

We evaluated the five performance measures i.e. packet delivery report, end-to-end delay, latency, duplicated packet report and consumed energy with different speed, different forwarding regions number and variable field length. In general, case, for high mobility conditions of nodes GeRaF gives better results than multipath rings routing protocol. Similarly, in term of packet delivery report and consumed energy, it is observed that GeRaF gives better results when the sink moves regularly than randomly. In term of latency, end-to-end delay and duplicated packet report, GeRaF shows better performance using a fixed sink than moving sink.

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