A New Programming Model to Simulate Wireless Sensor Networks : Finding The Best Routing Path

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Abstract

Sensor networks provide a number of extensive programming challenges for Wireless Sensor Networks (WSNs) application programmers. Application developers have proposed various WSNs programming models to avoid these challenges and make WSN programming much easier. In this work we proposed a new programming model to find the best routing path in WSNs. Then we describe the initial design and the implementation of our proposed model and compare the results in different network topologies and evaluate the new model in terms of cost and accuracy.

Introduction

Several programming approaches have been proposed to assist WSN programming in high-level languages. Two broad classes of WSN programming models have only been introduced recently: local behavior abstraction and global behavior abstraction.

The local behavior abstractions can be done at node-level. In opposition, global behavior abstractions has emerged as one of the most important aspects in sensor networks. The main objective behind macroprogramming approach is the ability to treat the whole network as one single unit rather than working on each node individually.

Since there are many programming models have been explored recently, we would focus on coding the actual sensors to find the shortest routing path, best possible routing path and the maximum routes in multiple wireless sensor networks topologies.

Requirements For Sensors Network Programming

- Energy-efficiency

The total lifetime of a battery-powered sensor networks is limited by the battery's capacity. and each sensor node is equipped with a limited computation processor to perform its tasks. Thus, programming model for sensor networks should deploy some applications that attain a proper level of energy-efficiency and to deliver demanded results.

- Scalability

Since we cannot predetermine the location of sensor nodes and we cannot assure the lifetime of sensor node, programming model should help in such a way to design scalable applications that able to deliver accurate results.

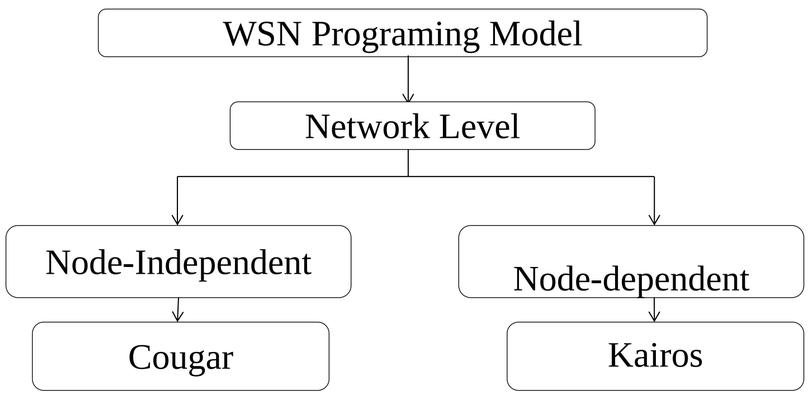
- Localization

Many localization techniques have been proposed recently, either by deploying self-localized technique or by installing a GPS in each node to determine the exact location of sensor node. Moreover, the location of each sensor node can be determined by calculating the distance between the selected sensor node and neighboring nodes.

- Time-Synchronization

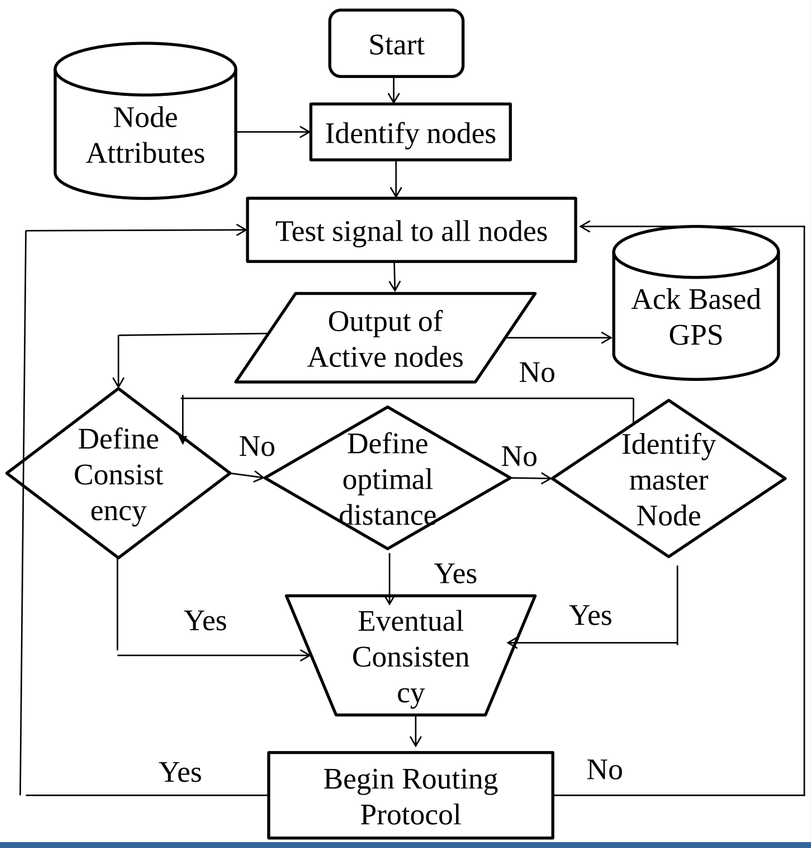
Clock synchronization is a process used to ensure an accurate scheduling between nodes with no collision. It is generally required for some reasons: to support the coordination and collaboration, to manage sleep and active state and to avoid collisions.

A Classification Of Network Programming Models In Wsn

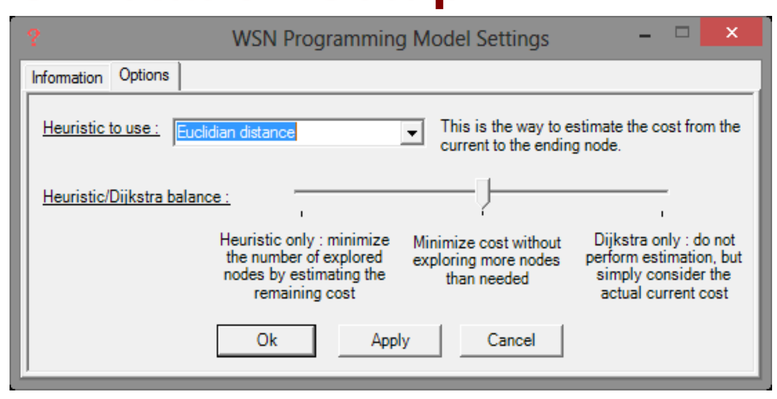


Proposed Solution

Our proposed work will employ a model of eventual consistency, the sensing nodes are able to deliver the most accurate result even if an internal node is not assured to be reliable.



Simulation Setup

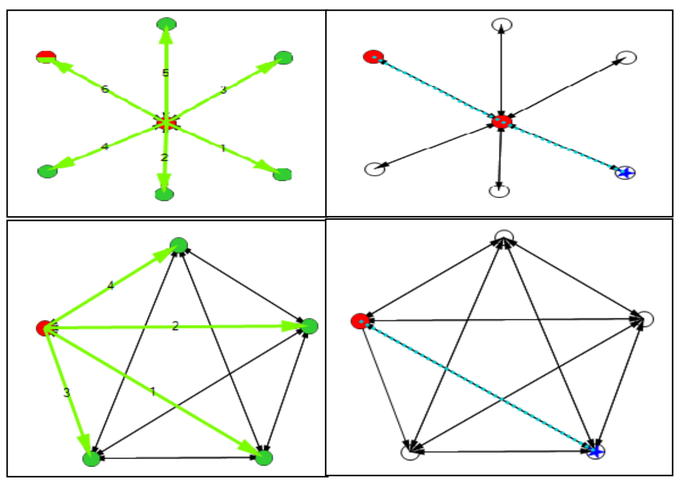


Options window to choose default set values for the proposed model

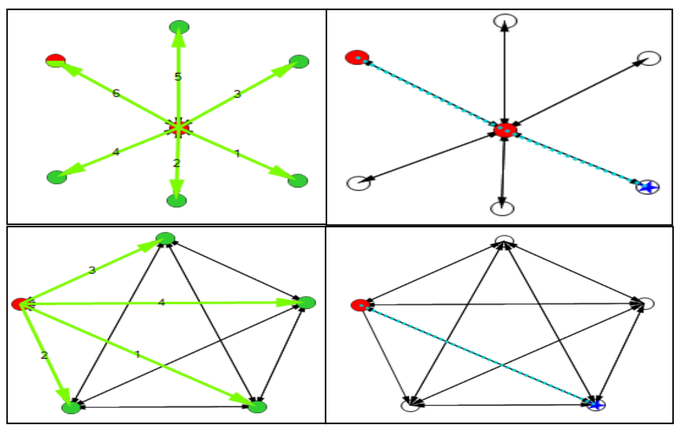
Analysis of Results

we sketch the details of our programming model by examining it in two topologies star network, and fully connected network

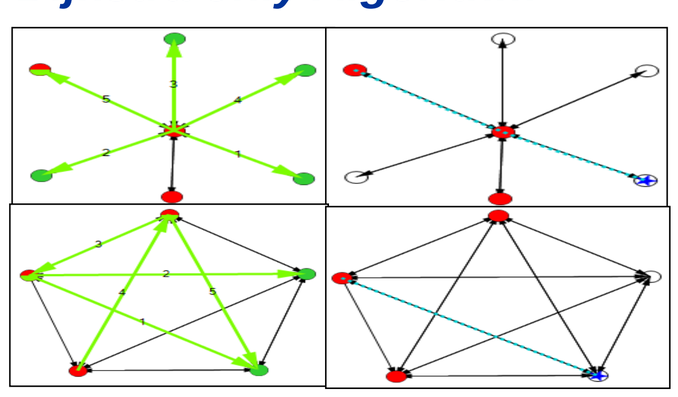
- Heuristic only Algorithm



- Costs- Minimization Algorithm



- Dijkstra only Algorithm



The number of steps needed in different topology when used different algorithm

Network Topology	Minimum Exploration	Minimum Cost	Actual Cost
Star	5	8	11
Fully Connected	8	2	3