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ScienceDirect

Procedia Computer Science 78 (2016) 530 – 536

Procedia Computer Science

International Conference on Information Security & Privacy (ICISP2015), 11-12 December 2015, Nagpur, INDIA

GPS Based Distributed Communication Protocol for Static Sensor Network (GDCP)

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Abstract

Overall energy of network is a major issue in current sensor network. This paper proposes (GDCP) GPS (Global Positioning System) based reactive communication protocol for Static WSN (Wireless Sensor Network) to extend the life time of entire network. In GDCP, energy efficient routing is achieved using local communication among sensor nodes. While routing, packets are routed via reliable shortest path from source node to sink node. The shortest path is determined with the help of a Neighbouring Table (NT) of a node. This table stores information such as location, distance to neighbour node and distance to a sink node. If the neighbouring node has sufficient energy and its distance to a sink node is less than other neighbours then it becomes the receiver and packet forwards to neighbour node. After receiving the packet, receiver becomes sender node and it checks its neighbouring table for minimum sink node's distance and sufficient energy. This process continues till the packet reaches the sink node. Sink node is assumed to move from one location to another as its neighbour node's energy becomes less than threshold energy. Energy consumption is analysed on 100 static sensor nodes and one sink node. A simulated result shows that overall energy of network is improved.

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Peer-review under responsibility of organizing committee of the ICISP2015

Keywords: Local Communication, Static WSN, GPS, Multi-hop Communication

1. Introduction

Wireless sensor networks (WSNs) use a large quantity of sensors in a target area for performing surveillance tasks such as environmental monitoring, military surveillance, animal tracking, and home applications. Each sensor collects information by sensing its surrounding region and transfers the information to a sink (also called a data centre) via wireless transmission. There are some limitations of Sensors like: limited power, limited processing capability, sensing range, connection ability and memory etc.[1]. Every node in the network is responsible to gather

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Peer-review under responsibility of organizing committee of the ICISP2015
doi:10.1016/j.procs.2016.02.098

specific information, monitor its surrounding area and transmit the collected data to a sink node. Most of the energy is utilized to find the shortest path form source node to sink node and transmit data to sink node [2].

This paper explores a distributed communication protocol using GPS for static WSN. Paper is organized as follows: Section 2: explores related work of secure communication protocol for WSN. Section 3: focuses on motivation of work. Section4: explains proposed distributed communication and routing protocol. Finally, in Section 5: comparative results of proposed technique with existing techniques are shown.

2. Related work

Energy focussed literatures are studied and compared with GDCP. They are as follows:

2.1 Low Energy Adaptive Clustering Hierarchy (LEACH)

LEACH is the first protocol proposed for energy consumption in sensor network [3]. Random cluster heads are selected dynamically to gather data from the nodes and to send it to the sink node in every round. Any node can become the cluster head (CH) to save energy and send data to the sink node directly. This algorithm uses data aggression and data fusion technique. It combines all the data of the cluster node, aggregates it into smaller size and transfers only the required information.

Advantages of LEACH are:

LEACH reduces the energy by 8 times than direct communication. It is a distributed protocol having only local knowledge of nodes. But it has some limitations-

- For electing CH it requires lot of energy.
- It is not suitable for large network in which the sink node is located too far.
- It is also not suitable for multi-hop communication.

2.2 Geographic Adaptive Fidelity (GAF)

GAF disables nodes which are not part of routing [4]. Only nodes which are on the path of sending packet are made active. So, the networks energy consumption is reduced. GAF creates a virtual grid, so GPS enabled sensors form a cluster, based on their geographic locations. In every grid leading node forwards data to another node.

2.3 Power-efficient gathering in sensor information system (PEGASIS)

PEGASIS does not form a cluster like LEACH [5]. At a time only one node communicates with the sink. Aggregated and combined data transfers to sink node, by node to node by adding delay. The nodes which are in the path drain more energy but, in improved Hierarchical-PEGASIS, it is recovered.

2.4 A Stateless Protocol for real-time communication in sensor network (SPEED)

SEED stores and maintains neighbour's information in the respective node [6]. Geographic Forwarding technique is used to forward the packets. It also uses feedback control to provide end to end real-time communication. It is more scalable and energy efficient protocol than DSR and AODV.

2.5 Secure Real-Time Routing Protocol with Load Distribution (SRTLD)

Recently SRTLD protocol is introduced which is compared with LQER, RTPC & RPAR [7]. It is experimentally tested on real WSN environment. It takes decision on every hop to find optimal path. It is a routing protocol which uses Geo-directional technique. SRTLD broadcasts message to get route from hop to hop. It has some limitations-

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