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HYBRID FLOODING SCHEME FOR REDUCING OVERHEAD IN WIRELESS NETWORKS

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ABSTRACT

Flooding is a method that disseminates packets to each node of the network. This method is frequently utilized in several functions of wireless networks. A Hybrid Flooding Scheme (HFS) for wireless networks is proposed in this letter. The main aim of this paper used to resolve the broadcast storm problem found by hybrid flooding scheme. Also, it checks the node connectivity and two-hop neighbors. Thus it reduces the broken links. This flooding algorithm achieves higher throughput and reduces the routing overhead in the network.
Keywords: Wireless Network, Flooding Scheme, relay node.

1. Introduction

Flooding is a technique that disseminates packet throughout the network. Owing to its property, there is a lot of flooding-based protocols in wireless networks. Since nodes are mobile, they use wireless connections to associate to various networks. Wireless networks organize unexpectedly without a need for a structure. This system generalizes that every node plays as an inter mediator. Multi-hop wireless networks, when a node needs to transmit the data to the remote destination, it relies on it transmit the data packets via intermediate nodes. This multi-hop data transmission can expand the network communication area utilizing enhance area spectral efficiency. In urban and rural areas, the network can be deployed more readily and at low cost. The wireless network consists of various types such as Mobile ad hoc network, Wireless Sensor Network, Wireless Mesh Network, and Vehicle ad hoc network. The mesh networks are also popularly known since the network topology of communications corresponds a mesh. This transmission routes provided by drastically improve fault tolerance. Mobile applications introduce additional disputes for mesh networks as exchanges to the network topology are swift and widespread. Thus, utilizing Mobile Ad hoc Network to assure transmission routes are updated quickly and accurately. MANETs are self-configuring, stability, mobility and self-healing.

In this network, the nodes are free to motion randomly and form themselves; as a result the topology may change rapidly. Mobile ad hoc networks mostly used for emergency situations like military, natural, conflicts, emergency medical situations, human-induced disasters, etc.

Recently, an increasing number of wireless local area network (LAN) allowing travelers with portable computers to surf the Internet from airports, hot spots emerging, hotels, railways, and public locations. Broadband Internet access is driving wireless LAN solutions in the home for sharing access between computers. Sensor networks are used in numerous application domains,
such as cyber-physical infrastructure systems, environmental monitoring, power grids, etc. Data are produced at a large number of sensor node sources and processed in-network at intermediate hops on their way to a Base Station (BS) that performs decision-making.

2. Related Work

Wireless Network offers significant control and route establishment operations for various routing protocols. In the network, the communication needs to standardize method that proficiently delivers a packet from one node to other nodes. Flooding in mobile networks has poor scalability creates redundancy and collision. The flooding protocols are categorized by simple flooding, probability-based flooding, counter based flooding, location or distance based flooding in a network [1]. A gossiping-based approach that every node forwards a message based bimodal behavior on to reduce the overhead of the routing protocols. In the networks using probability between 0.6 and 0.8 suffices. This gossiping protocol uses up to 35% fewer messages than flooding, with improved performance [2].

This paper introduced an efficient approach to reduce the broadcast redundancy. In this scheme, local topology information and the statistical information are used to avoid unwanted rebroadcasts. This method minimized both the redundant messages and bandwidth and energy. It broadcast the reliable flooding message [3]. Location propagation scheme exploited to propagate the location information of a mobile sink to a source [4]. The Received Signal Strength (RSS) is proposed to improve the reliability. This approach estimates the node's arrival angle using RSS variations to improve the network lifetime and convenience of a neighboring node [5]. Trust-Based Cross-Layer Security Protocol used to detects both inside and outside of the network. In the large-scale network, the malicious node tracking is more difficult. In this scheme, the trust system checks every node thus it identifying the attacker node. If the trust value decreases below a trust threshold, the corresponding node is marked as malicious [6].
Probabilistic key pre-distribution Scheme [7] to ensure the probability that each sensor shares at least one key with a neighbor sensor should be high. In this pre-distribution scheme, every sensor randomly selects its key ring from a key pool. While the key pool size is high, every sensor needs to pre-load a large number of keys to achieve a high key-sharing probability. However, these key management schemes need large storage space for key pre-distribution hence it not suitable for a large-scale network. A Reliability Aware Flooding Algorithm (RAFA) [8] reduced overhead for fewer mobility networks, but it is not suited for highest mobility networks. Most neighbor knowledge schemes also insert a list of neighbor's identity that increases the routing overhead.

3. Hybrid Flooding Scheme in Wireless Network

Wireless networking is a telecommunication network that avoids the costly process of cables. Wireless telecommunications networks are usually utilized radio communication. Figure.1 shows example diagram of Wireless Networks.

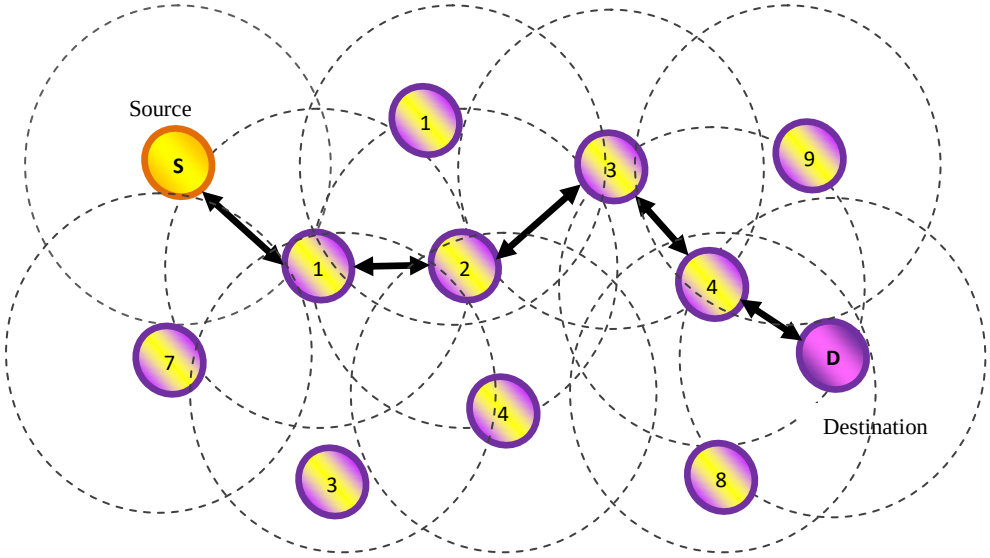

Figure.1 Example Diagram of Wireless Network

Generally, Flooding means a source node broadcasting a packet to all neighbors. Then every receiving node has rebroadcast those neighbors, and this process continues until whole network nodes receiving the packet. However, flooding exploits hop-by-hop broadcasting that suffers from the unreliable transmission and achieves the reliability in flooding. In this paper, we propose a Hybrid Flooding Scheme for Wireless Networks that estimates the expected reliability using two-hop topology knowledge. Figure.2 demonstrates the Flooding packet in the network.

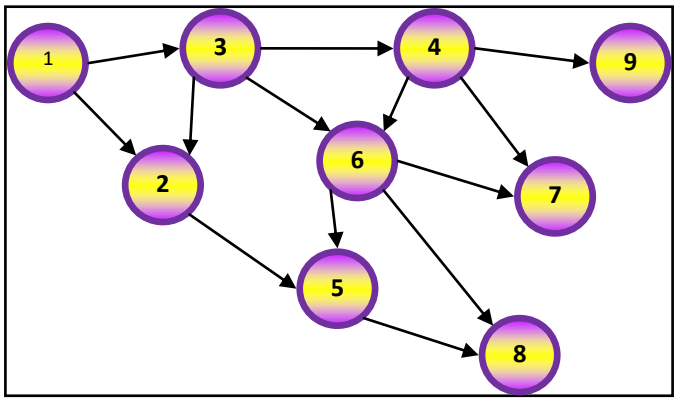

Figure.2 Flooding of a Packet

Hybrid Flooding Scheme is proposed with the aim of reducing the overheads in wireless networks based on knowledge of neighbor and a forwarding area criterion. Also, a forwarding area criterion has been defined to control the communicating probability. This scheme main objectives are to minimize the control messages owing to broken links, and detect the distance between the communicating nodes in the network.

Suppose, if any node presents the address in the cache it eliminates the flooding operations. Also, it counts the number of 1-hop and 2-hops neighbors to estimate the Spreading Metric (SM), and the request packets send only spreading metric nodes. Thus it reduces the data transmission delay in the network.

The node spreading metric is calculated by Node Connectivity (NC) and the 2-hops node's Degree (D2H). The node connectivity represents the neighbor of a given node. It is computed as follows.

$$SpreadingMetric = \frac{D2H}{NC} \quad (1)$$

This spreading metric is to avoid the unnecessary flooding and routing overhead in the wireless sensor network.

4. Performance Evaluation:

The proposed HFS and existing RAFA methods evaluated by using the network simulator, which measures network throughput and routing overhead. Throughput is one factor similar to that of the packet delivery rate.

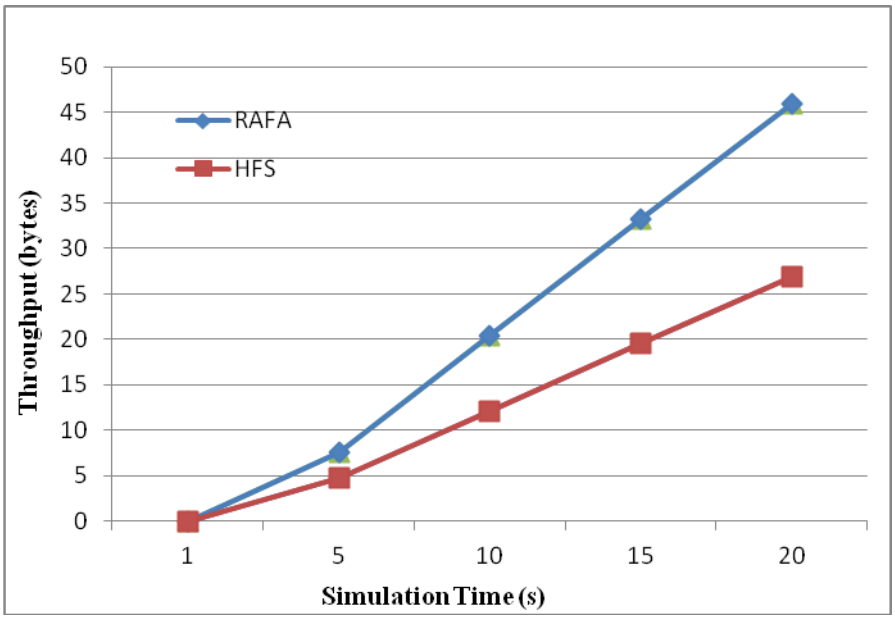

Fig.3 Throughput of HFS and RAFA

Figure 3 shows the throughput received are comparatively high for HFS to that of RAFA. The HFS mechanism is to reduce the number of hops in a wireless network.

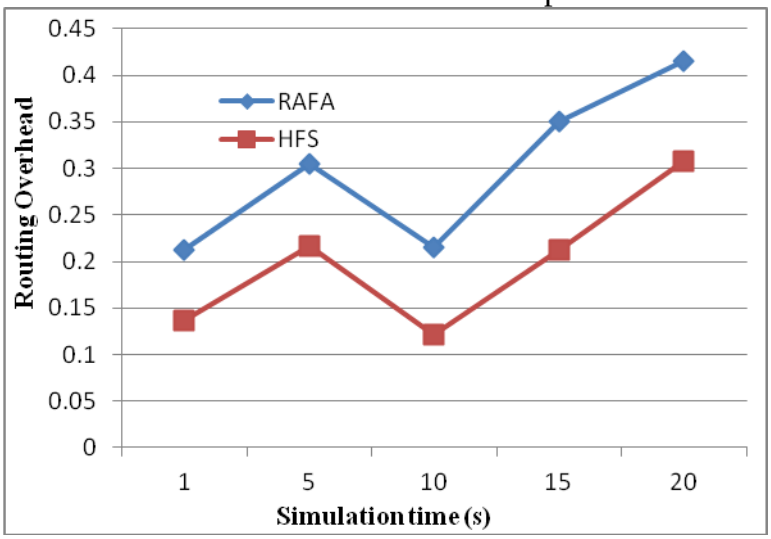

Fig.4 Routing Overhead of HFS and RAFA

Figure 4 shows the normalized routing load of HFS and RAFA. The normalized routing loads show that the proposed mechanism HFS performs better than the existing system RAFA.

CONCLUSION

In this scheme, we have done the density of nodes is taken into account using a density metric called spreading metric. Node connectivity and two-hop neighbors calculate the spreading metric. This scheme used to enhance the network throughput and reduced the overhead in the network. So, the proposed hybrid flooding scheme will improve the network performance.

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