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# Greedy Routing with Anti-Void Traversal for Wireless Sensor Networks

**Najme Ghanbari**
Department of Electrical Engineering,
Faculty of Engineering, University of Zabol, Zabol, Iran
Email: najme.ghanbari@gmail.com

**Mohammad Reza Pourmir**
Department of Computer Engineering,
Faculty of Engineering, University of Zabol, Zabol, Iran
Email: pormir10@yahoo.com

***Abstract* – The unreachability problem (i.e., the so-called void problem) that exists in the greedy routing algorithms has been studied for the wireless sensor networks. Some of the current research work cannot fully resolve the void problem, while there exist other schemes that can guarantee the delivery of packets with the excessive consumption of control overheads.**

**Moreover, the hop count reduction (HCR) scheme is utilized as a short-cutting technique to reduce the routing hops by listening to the neighbor's traffic, while the intersection navigation (IN) mechanism is proposed to obtain the best rolling direction for boundary traversal with the adoption of shortest path criterion.**

**In order to maintain the network requirement of the proposed RUT scheme under the non-UDG networks, the partial UDG construction (PUC) mechanism is proposed to transform the non-UDG into UDG setting for a portion of nodes that facilitate boundary traversal. These three schemes are incorporated within the GAR protocol to further enhance the routing performance with reduced communication overhead. The proofs of correctness for the GAR scheme are also given in this paper.**

***Keywords* – Wireless Sensor Networks, Greedy Routing Algorithms, Hop Count Reduction (HCR), Intersection Navigation (IN).**

## I. Introduction

The greedy routing algorithm has been studied for the unreachability problem (i.e void problem) in the wireless sensor networks. Some of the current research work cannot fully resolve the void problem, while there exist other schemes that can guarantee the delivery of packets with the excessive consumption of control overheads. In this project, a greedy anti void routing (GAR) protocol is proposed to solve the void problem with increased routing efficiency by exploiting the boundary finding technique for the unit disk graph (UDG).

The proposed rolling-ball UDG boundary traversal (RUT) is employed to completely guarantee the delivery of packets from the source to the destination node under the UDG network. The boundary map (BM) and the indirect map searching (IMS) scheme are proposed as efficient algorithms for the realization of the RUT technique. Moreover, the hop count reduction (HCR) scheme is utilized as a short-cutting technique to reduce the routing hops by listening to the neighbor's traffic, while the intersection navigation (IN) mechanism is proposed to obtain the best rolling direction for boundary traversal with the adoption of shortest path criterion. In order to maintain the network requirement of the proposed RUT scheme under the non-UDG networks, the partial UDG construction (PUC) mechanism is proposed to transform the non-UDG into UDG setting for a portion of nodes that facilitate boundary traversal.

These three schemes are incorporated within the GAR protocol to further enhance the routing performance with reduced communication overhead. The proofs of correctness for the GAR scheme are also given in this project. Comparing with the existing localized routing algorithms, the simulation results show that the proposed GAR-based protocols can provide better routing efficiency.

*Existing System:*

As mobile computing requires more computation as well as communication activities, energy efficiency becomes the most critical issue for battery-operated mobile devices. Specifically, in ad hoc networks where each node is responsible for forwarding neighbor nodes' data packets, care has to be taken not only to reduce the overall energy consumption of all relevant nodes but also to balance individual battery levels. Unbalanced energy usage will result in earlier node failure in overloaded nodes, and in turn may lead to network partitioning and reduced network lifetime. Localized routing algorithms which achieves a trade-off between balanced energy consumption and shortest routing delay, and at the same time avoids the blocking and route cache problems.

*Proposed System:*

In this project, a greedy anti-void routing (GAR) protocol is proposed to solve the void problem with increased routing efficiency by exploiting the boundary finding technique for the unit disk graph (UDG). The proposed rolling-ball UDG boundary traversal (RUT) is employed to completely guarantee the delivery of packets from the source to the destination node under the UDG network. The boundary map (BM) and the indirect map searching (IMS) scheme are proposed as efficient algorithms for the realization of the RUT technique.

*Module Description:*

*1. Networking Module.*

Client-server computing or networking is a distributed application architecture that partitions tasks or workloads between service providers (servers) and service requesters, called clients. Often clients and servers operate over a computer network on separate hardware. A server machine is a high-performance host that is running one or more server programs which share its resources with clients. A client also shares any of its resources; Clients therefore initiate communication sessions with servers which await (listen to) incoming requests.

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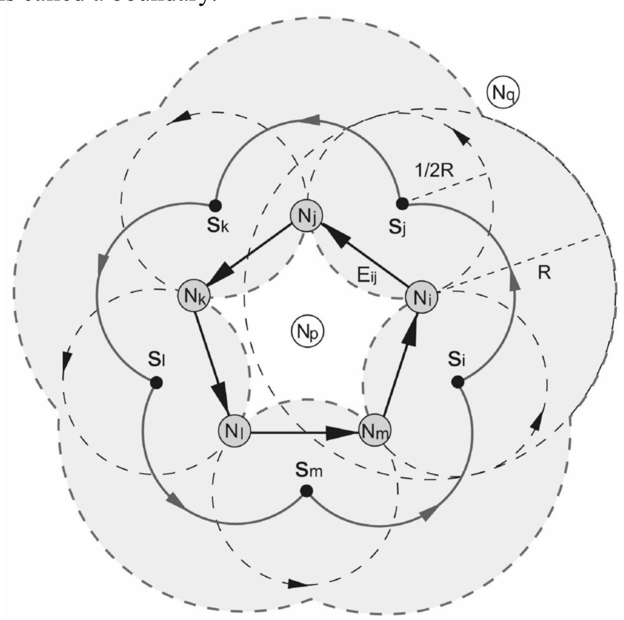
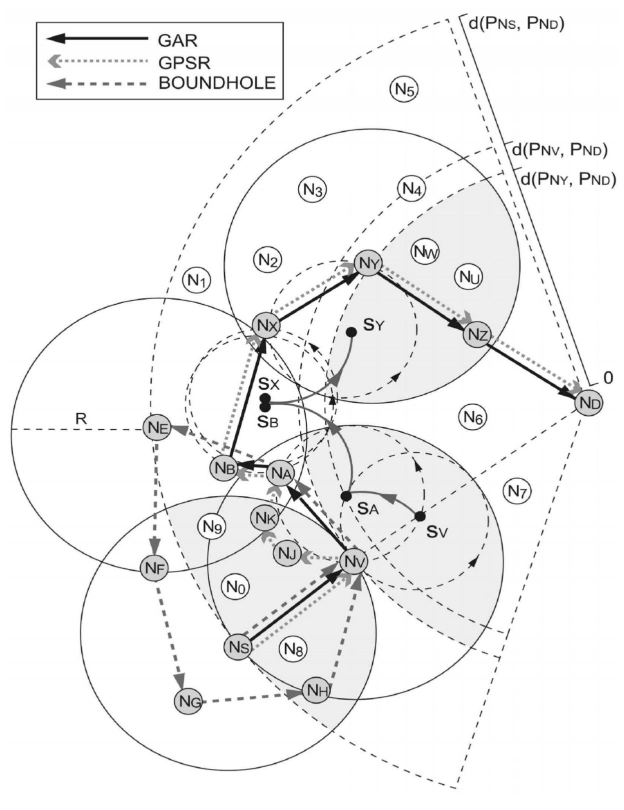
*2. Boundary evaluation Module:*

The RUT scheme is adopted to solve the boundary finding problem, and the combination of the GF and the RUT scheme (i.e., the GAR protocol) can resolve the void problem, leading to the guaranteed packet delivery. The definition of boundary and the problem statement are described as follows: Definition 1 (boundary). If there exists a set B such that 1) the nodes in B form a simple unidirectional ring and 2) the nodes located on and inside the ring are disconnected with those outside of the ring, B is denoted as the boundary set and the unidirectional ring is called a boundary.




*DFD:*

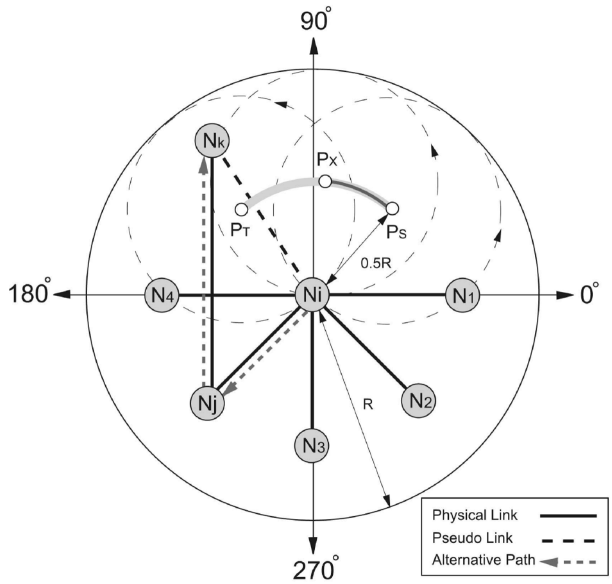



*3. Greed Anti-void Traversal module.*

The objective of the GAR protocol is to resolve the void problem such that the packet delivery from NS to ND can be guaranteed. Before diving into the detail formulation of the proposed GAR algorithm, an introductory example is described in order to facilitate the understanding of the GAR protocol, the data packets initiated from the source node NS to the destination node ND will arrive in NV based on the GF algorithm. The void problem occurs as NV receives the packets, which leads to the adoption of the RUT scheme as the forwarding strategy of the GAR protocol. A circle is formed by centering at SV with its radius being equal to half of the transmission range R/2.

*4. Partial UDG Construction (PUC) Mechanism:*

The PUC mechanism is targeted to recover the UDG linkage of the boundary node Ni within a non-UDG network. The boundary nodes within the proposed GAR protocol are defined as the SNs that are utilized to handle the packet delivery after encountering the void problem. Therefore, conducting the PUC mechanism only by the boundary nodes can conserve network resources than most. The PUC mechanism of the existing flooding-based schemes that require information from all the network nodes.




*5. Performance evaluation module*

The performance of the proposed GAR algorithm is evaluated and compared with other existing localized schemes via simulations, including the reference GF algorithm, the planar graph-based GPSR and GOAFR++ schemes, and the UDG-based BOUNDHOLE algorithm. It is noted that the GPSR and GOAFR++ schemes that adopt the GG planarization technique to planarize the network graph are represented as the GPSR(GG) and GOAFR++(GG) algorithms, while the variants of these two schemes with the CLDP planarization algorithm are denoted as the GPSR(CLDP) and GOAFR++(CLDP) protocols.

*Work Done:*

We have completed first two modules of the project that is Networking Module and Boundary evaluation Module.

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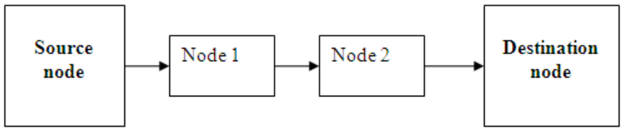
*System Architecture:*




*Application:*

Because of the low energy consumption and less amount of packet loss greed routing algorithm is used for the transfer of packets. Main advantage of greedy routing algorithm is effective routing when compare to other algorithms.

## II. Conclusion

In this paper, a UDG-based GAR protocol is proposed to resolve the void problem incurred by the conventional GF algorithm. The RUT scheme is adopted within the GAR protocol to solve the boundary finding problem, which results in guaranteed delivery of data packets under the UDG networks. The BM and the IMS are also proposed to conquer the computational problem of the rolling mechanism in the RUT scheme, forming the direct mappings between the input/output nodes. The proposed GAR algorithms can guarantee the delivery of data packets under the UDG network.

## References

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