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MULTICAST FORWARDING BASED GEOCAST REGION TRACKING (MFB-GRT) USING LOCATIONS IN WIRELESS AD HOC NETWORK

M. PRAKASH

Research Scholar, Department of Computer Science, Government Arts College, Ariyalur, Tamilnadu, India.

Dr. M.PRABAKARAN

Research Advisor, Assistant Professor, Department of Computer Science, Government Arts College, Ariyalur, Tamilnadu, India

ABSTRACT

This paper addresses the problem of Geocasting in mobile ad hoc network (MANET) environments. Geocasting is a variant of the conventional multicasting problem. However, for Geocasting, the group consists of the set of all nodes within a specified geographical region. Node within the specified region at a given time form the Geocast group at that time. A network consists of one or multiple data centers called a sink node and many low-cost and low-powered adhoc devices, called adhoc network. Each mobile node has the ability of sensing data, processing data, and communicating with others via radio transceivers. Because mobile nodes are operating with limited power source and sending/receiving packets are most energy consuming operations for mobile networks, Geocast algorithms should be energy efficient. In this paper we introduce a new Geocast protocol which minimizes energy usage and overhead by utilizing the knowledge on the neighbors and their energy levels. We evaluate the performance of the proposed protocol with simulation.

Keywords:

Geocast, Multicast, Flooding, Energy, MANET

1. INTRODUCTION:

When an application must send the same information to more than one destination, multicasting is often used, because it is much more advantageous than multiple unicasts in terms of the communication costs. Cost considerations are all the more important for a mobile ad hoc network (MANET) consisting of mobile hosts that communicate with each other over wireless links, in the absence of a fixed infrastructure. In MANET environments, the multicast problem is more complex because topology change of the network is extremely dynamic and relatively unpredictable. To do multicasting, some way is needed to define multicast groups.

In conventional multicasting algorithms, a multicast group is considered as a collection of hosts which register to that group. It means that, if a host wants to receive a multicast message, it has to join a particular group first. When any hosts want to send a message to such a group, they simply multicast it to the address of that group. Unlike the traditional multicast schemes, here, the multicast group (or Geocast group) is implicitly defined as the set of nodes within a specified area. We will refer to the specified area as the “multicast region”, and the set of nodes in the multicast region as the location-based multicast group.

If a host resides within the multicast region at a given time, it will automatically become a member of the corresponding multicast group at that time. A location-based multicast group may be used for sending a message that is likely to be of interest to everyone in a specified area. In wireless ad hoc environments, two approaches can be used for multicasting: multicast flooding or multicast tree based approach. Existing multicast protocols mainly based on the latter approach, may not work well in mobile ad hoc networks as dynamic movement of group members can cause the frequent tree reconfiguration with excessive channel overhead and loss of datagrams.

Since the task of keeping the tree structure up-to-date in the multicast tree-based approach is nontrivial, sometimes, multicast flooding may be considered as an alternative approach for multicasting in MANET. In this paper, we propose two location-based multicast schemes to decrease delivery overhead of Geocasting packets, as compared to multicast flooding. The schemes in this paper attempt to reduce the forwarding space for multicast packets. Limiting the forwarding space results in fewer Geocast messages, while maintaining “accuracy” of data delivery comparable with multicast flooding. a new Geocast protocol in sensor networks. We do not make any restrictions on the shape of the Geocast region. The proposed scheme reduces energy consumption during the phase of sending commands from the sink node to the sensor nodes in a geocast region and also facilitates in-network data aggregation and, therefore, saves energy during the phase of reporting sensor data to the sink node.

2. RELATED WORKS:

In general, Geocast protocols consist of two phases. In the first phase a packet is delivered from the source to one or more nodes in the Geocast region. Then the packet is broadcast to all the nodes in the Geocast region. Although a Geocast protocol consists of two phases, most of proposed Geocast protocols for MANETs (Mobile Ad-hoc Networks) focus on the protocol for the first phase and assume the use of flooding for the second phase [1, 2]. The classified Geocast protocols into three categories: flooding-based protocols, routing-based protocols, and cluster-based protocols.

A node receives a Geocast packet, it forwards the packet to its neighbors if it is within a forwarding zone: otherwise, it discards the packet. A forwarding zone can be the smallest rectangle that covers both the source and the Geocast region or the smallest cone covering the Geocast region with the sink as the vertex. In the LBM scheme, whether a Geocast packet should be forwarded is based on the position of the sender node at the transmission of the packet and the position of the Geocast region [3, 5].

That is, for some parameter, a node forwards a Geocast packet from a node A, if the node B is at least closer to the center of the Geocast region than the node A. The forwarding zone defined in LBM may be a partitioned network between the sink and the Geocast region, although there exists a path between the source and the destination. To solve this problem, in the definition of the forwarding zone of has been modified [6]. The neighbors of the node A that are located within the forwarding zone in are exactly those neighbors that are closest in the direction of the destination.

Routing-based protocols create routes from the source to the Geocast region via control packets. Protocols in this category include the Geocast Adaptive mesh environment for routing and Mesh-based Geocast Routing protocol [7, 8]. In a source node essentially performs any cast to any node in the Geocast region via TORA which is a unicast routing protocol for MANETs.

When a node in the Geocast region receives a packet, it floods the packet to the Geocast region. GAMER provides a mesh of paths between the sink and the Geocast region [9]. It is shown that if the Geocast overhearing range is three periods the relay nodes' broadcast range, the possibility of region in network. . To accomplish location secrecy, exact user locations are protracted to covered regions such that each region protections at least k users. It necessitates the area of cloaked region to be superior to a user-specified threshold [11, 12]. While the position k-anonymity defends the user identity, it may not be able to prevent the location disclosure.

3. PROPOSED SYSTEM:

IN our proposed system based upon a multicast flooding approach and the basic idea of the algorithms is derived from protocols we previously proposed for routing in mobile ad hoc networks. We presented an approach to utilize location information to improve performance of routing protocols in MANET. To decrease overhead of route discovery by limiting the search space for a desired route, the schemes use physical location information for mobile hosts, which may be obtained using the global positioning system. Two approaches may be used to implement location based multicast.

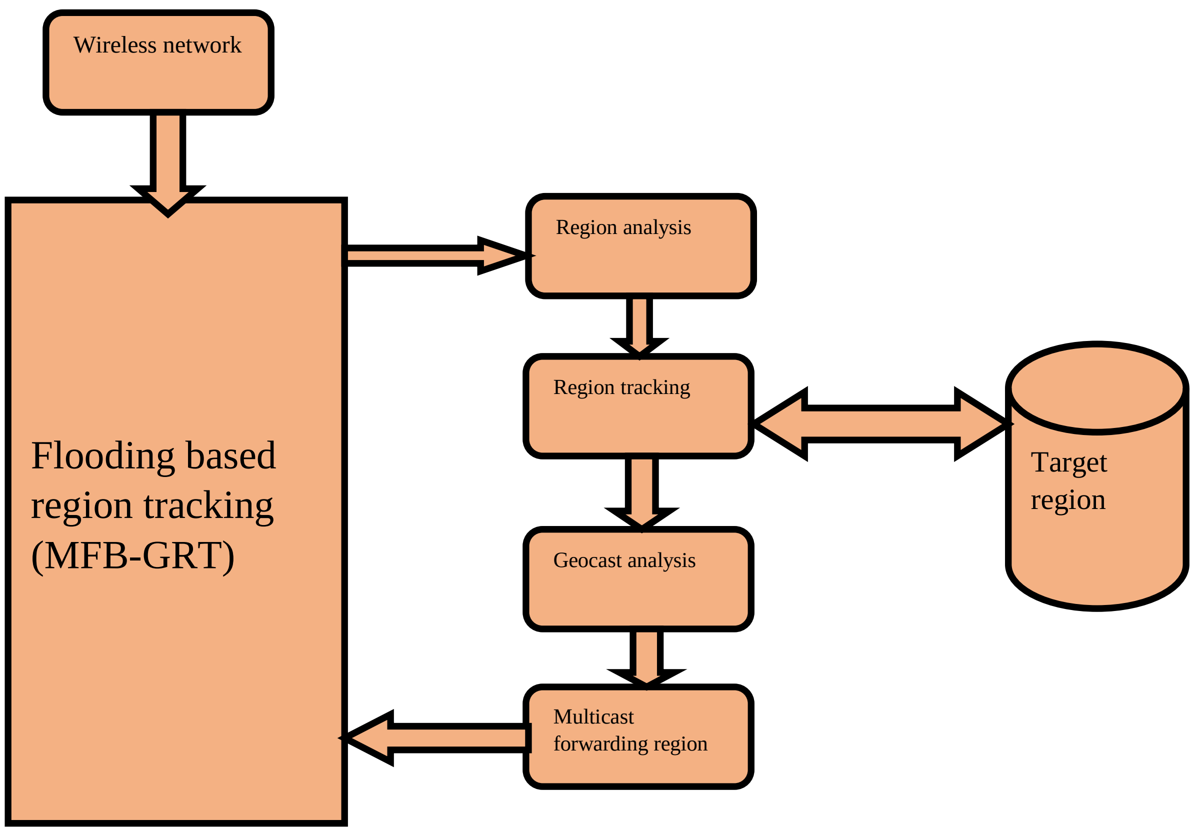


Figure 1: Proposed system architecture.

Do not maintain a multicast tree. In this case, the multicast may be performed using some sort of "flooding" scheme. As elaborated below, this is the approach taken in this paper. Maintain a multicast tree, such that all nodes within the multicast region at any time belong to the multicast tree. The tree would need to be updated whenever nodes enter or leave the multicast region.

3.1 Multicast Flooding based Region tracking:

Flooding is probably the simplest multicast routing algorithm. The flooding algorithm can be used to deliver packets to nodes within a location-based multicast group. The multicast flooding algorithm can be implemented as follows: Assume that a node S needs to send a packet to a specific multicast region. If the location of node is within the specified multicast region, node will accept the packet. Node will also broadcast the packet to its neighbors, if it has not received the packet previously repeated reception of a packet is detected using sequence numbers. If node is located outside the multicast region and the packet was not received previously, it just broadcasts the packet to its neighbors.

Algorithm:

Start

Target region, Timer T.

Read Geocast Table GTP, Route table Rt, Node location N,

For each node N_i from N

For each Geocast pattern Tp_i from Tp

Transition path Trp = $\Delta \times (TPi, Tp(\text{Geocast } Path))$

If Trp $\ni Ni$ then

Else

Add to Gs = $\sum N + Ni$

End

End

End.

For each N_i from Gs

Geocast Longest Region LP = $Max(\frac{N}{TP})$

Geocast LifeCycle Message Lcm.

LCM = {Seq.No, Destination Address, Traversal Path - LP}.

Forward packet LCM.

Start Timer T.

Receive LCMReply from GS_i.

If LCMReply Received then

Update Neighbor table $\forall(Ni)$ = N + N_i.

Update Route Table $\forall(RTi)$ = Rt + Rt_i.

Update Snapshot S.

Else

End

End

Stop

3.2 Geocast Based region forwarding using multicast:

As noted above, the proposed location-based multicast algorithms are essentially identical to multicast flooding, with the modification that a node which is not in the forwarding zone does not forward a multicast packet to its neighbors. Thus, implementing location-based multicast schemes requires that a node be able to determine if it is in the forwarding zone for a particular multicast packet two a scheme presented here differ in the manner in which this determination is made. These algorithms are based on similar algorithms proposed in for unicast routing.

Algorithm:

step1: start

step2: read Multicast Pattern Table Tp

step3: initialize forward set FS.

step4: compute common node from Tp.

AS-Adversary Set = FS (N) ∋ ∀(FSi)

step5: for each Tp from Tp

if $FS_i \ni ASi$ then

Ap= compute available target region from Route table Rt and

Validate the space of route used and routes from Ap.

if found guilty then

Create new target region TR={seq.No,Source Addr, Destination Addr, Sinkhole Addr}

send TR through different path .

End.

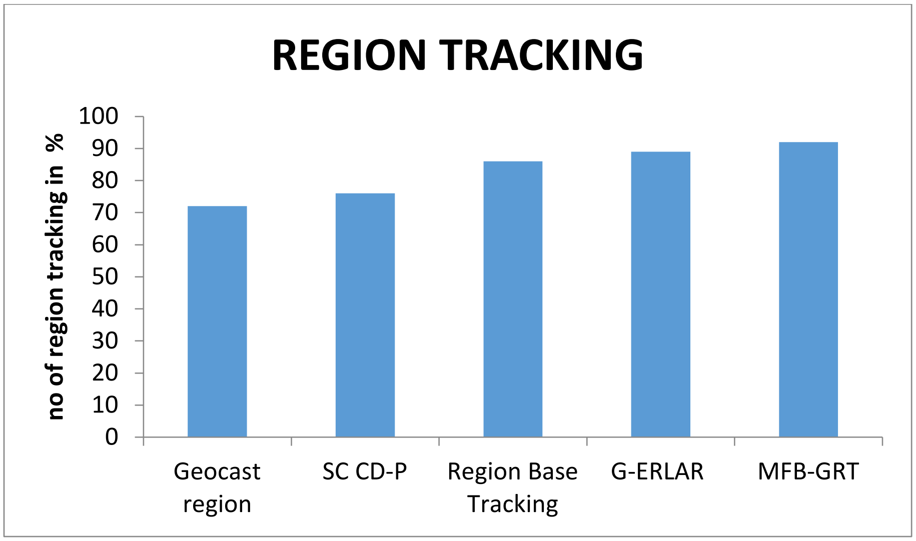
End

End

step5: stop.

4. RESULTS AND DISCUSSION:

The proposed MFB-GRT with node region tracking approach has been implemented and tested for its efficiency. The proposed method has produced efficient results in all the factors of ad boc routing. The method has produced higher resistance in adversary node identification and has produced higher rate of detection.



Graph1: Various types of region tracking

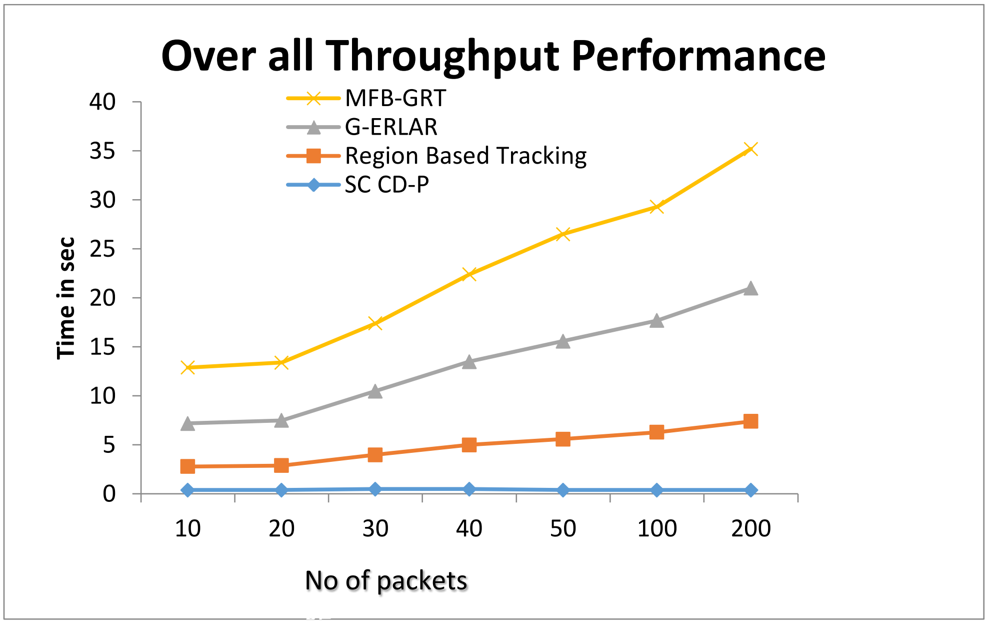


Figure 2: Performance of Throughput

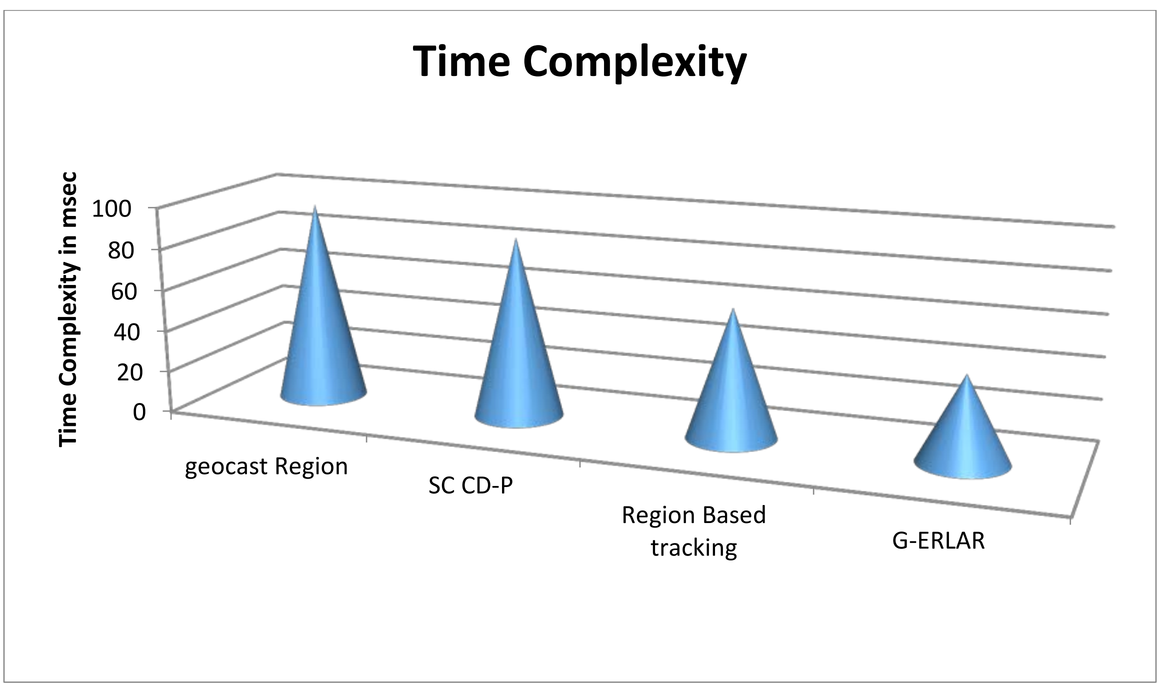


Figure3: Comparison of time complexity in region tracking

The graph3, shows the comparison of time complexity introduced by various methods in region tracking and it shows clearly that the proposed method has produced less time complexity than others.

5. CONCLUSION:

In our Geocasting broadcasting to every node in a specified geographical area in mobile ad hoc environments. In this paper, the specified geographical area is called the multicast region, and the set of nodes that reside within the specified multicast region is called a location-based multicast group. We propose two location-based multicast algorithms. The proposed algorithms limit the forwarding space for a multicast packet to the so-called forwarding zone. Simulation results indicate that proposed algorithms result in lower message delivery overhead, as compared to multicast flooding. As simulation results show, while reducing the message overhead significantly, it is possible to achieve accuracy of multicast delivery comparable with multicast flooding.

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