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A Hypothesis for Ad-Hoc Routing Algorithm Improvement

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ABSTRACT:

In this article, a new approach to reducing the complexity of routing algorithms is discussed to improve routing in ad hoc networks. To avoid duplicating the routing process for each data transfer, nodes create binary matrices for each base station and update them when the routing is complete. Routing may be made much simpler using the method given here.
Keywords: Routing Train, Protocol, Algorithm Protocol, Algorithm and Routing Train in Ad-hoc Networks.

1. INTRODUCTION:

AD-HOC networks are growing in popularity because they are simple to set up, don't rely on infrastructure, and are the only practical way to connect several nodes.

(a) Terminology:

Anywhere and at any time, with just a few plug-in wireless nodes, an Ad-hoc network can be set up without any prior network architecture [1, 2, 3, 4, 5]. Ad hoc networks include dynamic topologies, bandwidth constraints, energy consumption restrictions, and physical security restrictions [6, 7].

(b) The most commonly used protocols:

The following are a few of the most common routing protocols:
Each node uses the Bellman-Ford Algorithm [10] to select the most efficient path based on the information stored in their tables in this table-driven/proactive protocol. [1].
An election is used to pick the cluster-heads in Clusterhead-Gateway Switch Routing (CGSR). DSDV Protocol [1] often uses cluster-heads to locate the shortest path.
To route traffic, each OLSR node uses the Dijkstra Algorithm [10] based on its tables [11, 12]. This methodology is table-driven and proactive.
The WRP table-driven/proactive protocol continues as each node sends a hello message to its neighbors and views them as successors [13].
ZRP is a hybrid protocol in which each node specifies a route request from its neighbors. ZRP is a hybrid protocol. A route reply is a node that contains the destination node in its zone.
Routing is based on packet movement in the Dynamic Source Routing Protocol (DSR) [1, 2, 4, 12, 14, 15, 16, 17, 18]. Packet broadcasting may be found in greater detail in [18].
Ad-hoc A protocol called On-demand Distance Vector Routing (AODV) works only when necessary. It's just like DSR. Unlike DSR, AODV responds more quickly to hello messages when there is no means to reach the target [4, 12, 14, 16, 17, 18]. [4, 12, 14, 16, 17, 18]
For those times when you need it, there's the Temporally-Ordered Routing Algorithm (TORA). A query packet, an update packet, and a clear packet are all sent. As a result, after the questions are answered, the entire graph is updated for each node.
LAMAR is a cluster-based or hierarchical routing protocol. Nodes are used as landmarks and are followed to the target.
Core-Extraction [20] CEDAR is a protocol that uses a cluster-based or hierarchical structure. When a node needs aid from a leader, it reaches out to that leader. After that, they send instructions to each node regarding the best course of action.

(c) The Issue:

Table-driven and proactive routing algorithms are the most common, while hybrid, on-demand, and reactive protocols are standard in ad hoc networks [8]. Several routing strategies are available to each group, each with advantages and disadvantages. One or more of the most often used approaches have been evaluated and improved, resulting in new ways. Because these algorithms were built for a single protocol, most cannot be utilized on other protocols.

(d) Strategy:

Network training can improve routing protocols, as we show in this paper. Eventually, the complexity of the routing protocol will fall into the most efficient range after using this method. Running the routing protocols n times is not a good idea. We try to find the quickest way to accomplish our goals in every procedure. If we repeat the optimization process n times, it becomes a burden. A new technique has been developed to reduce the number of times routing protocols are repeated. Even though the proposed method is still simply a theory and has yet to be implemented, we feel it will be incredibly advantageous.

(e) The Petition:

We believe that a middle ground has been reached. A binary matrix is created for each network node, and then the routing protocol is used to find a path to the destination. Finally, the matrices update the path to reflect the new route. See [9] for more details on protocol rerouting.

(d) Purpose:

A novel solution has been proposed to reduce the complexity of multipath routing. This idea allows us to get to the point where nodes don't need to request a route anymore and instead learn how to send their data. As a result, data is only accessed and sent through the nodes along the way.

(e) Outline of the paper:

There are four sections to this article. In Section 1, we introduced the problem, provided a solution, and claimed that the answer was the best one available. Some of the challenges in route design are addressed in Section 2. There are many advantages to the Training Algorithm, discussed in Section 3. For ad-hoc networks, a novel method is proposed in Section 4.

II PRIOR WORK:

Even though some research and surveys have already been done, it's still possible to improve routing and security in ad-hoc networks. Several studies outlining efforts to optimize routes are explored and offered below as predecessors for our idea in this investigation.

A lifetime route optimization model for ad-hoc wireless networks was examined in [22]. The route lifetime value is an essential factor when constructing ad-hoc routing methods. This option determines the routing database's active path/route duration, ensuring reliable packet transmission. The purpose is to prevent the routing table from discovering a new route or deleting an active route already in existence. Updates to routing databases may be delayed, even though some paths are no longer operational since the route lifetime is too long [22].

A fuzzy logic system is proposed in the cited work to estimate the adaptive route's life span. Fuzzy logic was developed in response to the limitations of mathematical models and the inherent ambiguity in calculating node mobility. The new fuzzy ART approach should be characterized by membership functions and a set of rules, according to some experts (rule base). We employed the AODV routing protocol to test this new strategy and believed it might be applied to other ad hoc routing systems.

A self-repairing and optimized routing technique is demonstrated using fuzzy logic concepts [23]. Since there are a lack of global topology and mobility of nodes, standard dynamic source routing protocols yield paths that are far from ideal. Optimizing routing when the network is stressed can substantially affect performance. Greater distance increases bandwidth and power consumption and increases the likelihood of a system failure. When a shortcut is available, SHORT (Self Healing and Optimizing Routing Technique) will shorten the journey. We'll use GloMoSim [23] to examine and compare the proposed fuzzy logic method to the conventional one.

Securitization of routing protocols, which are still infants, is the primary emphasis of [24]. Ad-hoc routing protocols are more challenging to design because of the previously stated high dynamics and other limits. It usually requires a good trade-off between multiple criteria, including boosting routing optimally, decreasing traffic volume, and regulating power consumption. We believe that security considerations are rarely taken into account while developing new protocols.

Control channels are made available to each node in the network via [25] time slots, which allows any node to broadcast the control packet to any one-hop neighbor in just a single cycle. [25] The objective is to minimize the number of time slots available during the scheduling cycle. As a result, a predetermined channel access schedule is generated. The broadcasting on the defined timeslots will reach its neighbors correctly since each node is granted one or more chances to access the control channel (timeslot in TDMA systems) (s). The length of the scheduling cycle limits the maximum delay on the control channels. A single time slot can be reused if two nodes do not communicate. [25] The purpose of the challenge in access scheduling is to keep the scheduling cycle as short as feasible.

Three fundamental optimization solutions for the well-known AODV routing protocol are provided in [26] to utilize some of the proactive protocol characteristics. Routes

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can be built up in three ways: backward, forwards, or randomly. The key goals are shortest-path routing and traffic-independent control.

Using criteria such as path length, energy consumption along the way, and energy-conscious load balancing among nodes, the SHORT framework (Self-Healing and Optimising Routing Techniques) for mobile ad hoc networks [27] specifies routing optimality. Neighboring nodes watch and improve the route if a better local sub-path becomes available when using SHORT. The upshot is that SHORT lowers latency and bandwidth consumption without increasing overall costs. SHORT can be used to find routes with low energy usage or the best use of the battery's remaining power.

III THE PROPOSED ALGORITHM:

(a) Representation of the Algorithm:

Prioritizing route optimization over routing complexity reduction is the primary goal of all routing algorithms. Routing should be repeated whenever data needs to be transferred. In DSR, various optimizations are made, but the fundamental shortcoming of these optimization efforts is that they are protocol-dependent. In the DSR protocol optimization mechanism, the passed route is saved in a cache and repeated as many times as necessary.

The training time was also considered, but we also used a binary matrix, which reduces storage requirements while simultaneously speeding up the training process.

The network's presuppositions are specified before developing the algorithm:

1. Nodes and edges make up the network's structure.
2. Numbers are used to representing nodes.
3. The numbering of the edges that connect one node to its neighbors is done similarly. The ordering of edges is made simpler by assigning a number to each node. Is there any necessity for a sequential order in the number of nodes associated with one node?
4. Training and bandwidth management are both available on each node. For control, not training, the bandwidth array increases transfer quality. The method may be set up by saving data in a table.
5. The entire graph is based on a single adjacent matrix.
6. There are four different types of symbols used in this graph: a source, a destination, and a routing array, all represented by the letters "G," which stand for "w" or "weight."

The code of the algorithm is as follows:

```
Training_Algorithm (G,w,s,d)
If ! R[d]
 Ro = get_route_from_a_routing_algorithm(G,w,s,d)
send_update(G,Ro,0,d)
-----------------------------------
Send_data(data,s,d)
Training_ Algorithm (G,w,s,d)
Transfer_data(data,s,d)
-----------------------------------
Transfer_data(data,s,d)
If s <> d
J=index_vertex(s, lg R[d])
Transfer(data,j,d)
-----------------------------------
Send_update(G,Ro,start,d)
If Ro[start] <> d
K=index_Edge(Ro[start], Ro[start+1])
R[d]=2^k
Send_update(G,Ro,start+1,d)
-----------------------------------
Index_Edge(i,j) As integer
K=0
Flag = false
While (flag)
Do
If A[i][k]
Counter=counter+1
K=k+1
If (counter=j)
Flag=false
Return counter
-----------------------------------
Index_vertex(i,k) As integer
K=0
Flag = false
While (flag)
Do
If A[i][k]
Counter=counter+1
L=L+1
If (counter=k)
Flag=false
Return L
```

As demonstrated, the algorithm initially checks to see if the graph has been trained. It sends data only if it has been educated or if a routing protocol sends it as an array. Nodes are then trained by receiving updates via a defined route. Training is performed via updating.

Each node has a one-dimensional binary matrix. Numeric labels for each node are displayed in the rows or indexes of that matrix. The bits are arranged in rows to determine the edge through which a node can transmit data. Logarithm and the method make filling in a binary matrix so simple. To do training and routing more efficiently, the binary matrix requires less memory, and access takes only O(1) time.

(b) The Advantages of This Technique:

Even though this strategy does not optimize the routing protocol, it teaches and leads the network to learn and utilize the protocol once and use the route given thousands of times. During the update, all the nodes on a path are updated. Several nodes must be updated when a destination is far away and travels through most nodes; this reduces routing protocol repetition.

Because it is protocol-free, this approach could theoretically be used in any mobile or wireless ad hoc network without restriction.

Traffic increases when packets or messages for requesting and responding are sent via the network. On the other hand, we never employ such packets or messages after the initial routing stage.

Time complexity is now an "L," indicating that the data has been transmitted correctly due to training. When a binary matrix is used for each node, the memory complexity for n nodes is n bytes. When it comes to fast and efficiently transporting significant amounts of data, this method is excellent.

IV CONCLUSION:

Routing protocols must be repeated for each node, which takes time. As explained in Section 2, the temporal complexity of currently relevant algorithms makes them unsuitable for this application. The number of times routing protocols are repeated can be reduced by training the network, according to a new technique described in Section 3. After a few routing attempts, the nodes themselves figure out where to send data.

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