Enhanced Cluster Based Link State Secure Routing Algorithm in Flying Ad Hoc Networks

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Abstract. The rise of communication through Unmanned Air Vehicle, the major study issue in the last few years due to its unique properties, has been developed in the Flying Ad Hoc Network (FANET). It's widely used in civilian and military settings. FANET is an unmanned aerial vehicle (UAV) network that may be used to relay data in a number of situations. Routing algorithm is an important factor to achieve communication among UAVs with more reliable and robust nature. So, care should be given while designing the algorithm. The importance and utility of the UAV has attracted a large number of academics, and many routing strategies have been proposed to improve data transmission quality in FANETs. As a result, in this paper, we provide an overview of current routing methods.

Keywords: Flying Ad Hoc Network, Enhanced cluster-based Link State Secure Routing Algorithm, DIJKSTRA shortest distance algorithm, MATLAB Framework.

1 Introduction

Because of their flexibility, versatility, low operating costs, and ease of installation UAV can be used for disaster and fire management, border monitoring, and other important military and civilian purposes. Recent years, the development of FANET from single large UAV to many interlinked tiny UAVs network to achieve particular missions.

Efficiency. When opposed to deploying a single UAV, many UAVs can be wirelessly interconnected autonomously, boosting network connectivity through collaboration and cooperation and saving mission completion time.

Scalability. Network multi-UAV can cover a wide range of area for their necessary needs whereas Large UAVs have a restricted range.

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Survivability. In a single UAV system, if the UAV system fails, the entire system will collapse. But in case of a network UAV system, if one UAV system becomes malfunctioned, the process is not aborted and continued by another UAV traveling in another location.

2 Proposed system

Because of their high speed and rapid changes in direction FANETs routing tends to be a problem. To address the problem, the proposed system uses the Enhanced cluster-based Link State Secure Routing Method and the DIJKSTRA shortest distance algorithm to create a FANET routing. Routing approaches in FANET Static Proactive Reactive Hybrid Geographic model in the MATLAB Framework. With variable node speeds and different mobility models, the suggested routing protocol is implemented in FANETs and packet delivery ratio, throughput, and end-to-end delay is evaluated.The deployment of the wireless network is wase and speed. It doesn't depend upon the fixed infrastructure. So, this gives rise to an emerging networking system for future FANET communications. This proposed system works in the fastest and efficient way of delivering the information from source to destination.

3 Block diagram

The block diagram of the proposed approach is shown below. It consists of network and routing model.

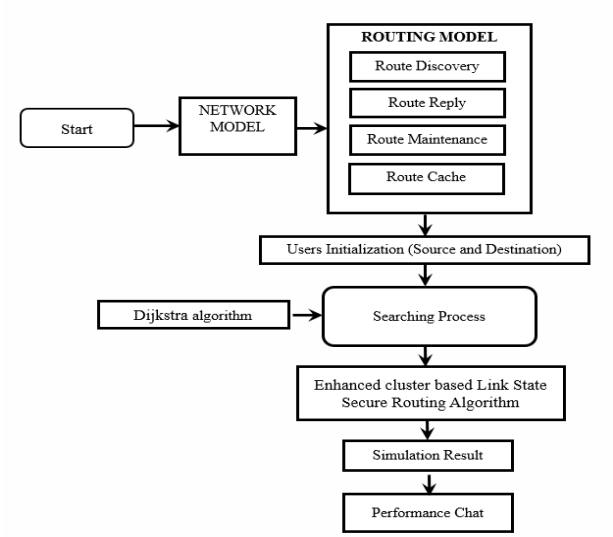

Fig. 1. Block Diagram of the Proposed System

4 Performance evolution prmeters

The following table shows the parameters used for simulation using MATLAB.

Table 1. Performance Evaluation Parameters and its values

Parameter	Example
Size of the network	3000 x 3000[m]
Flying nodes number	100-500
Protocol	ECLSSR
Messaging interval	100[ms]
Simulation time	100[s]
Transmission range	100-300[m]
Vehicle speed	10-30[m/s]
Protocol of MAC	IEEE802.11

5 Simultion

Simulation of the proposed approach is done using the MATLAB Simulink environment. The appropriate results are obtained by executing the code written in MATLAB. The following results show the effectiveness of the system with good performance measures.

5.1 Average end to end delay

The time taken by the information to travel from source to destination is average end to end delay. There are other delays related to route discovery, queuing, propagation delay, and transfer time.

$$D_{end-end} = \text{Number of links} * (d_{transmission} + d_{propagation} + d_{processing}) \quad (1)$$

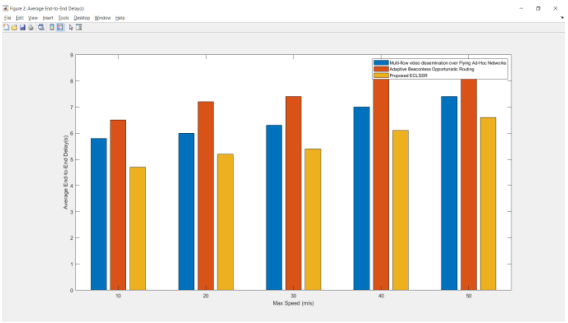

Fig. 2. Simulation of Average End-to-End Delay

5.2 Throughput

The proportion of messages arriving at a receiver's side from a source. Throughput is the amount of time it takes for the destination to receive the final message. Bits per second is the unit of measurement. Topology changes frequently, communication is unreliable, bandwidth is limited, and energy is limited, all of which influence throughput. A network with a high throughput is ideal. More than a communication control, throughput is the usual pace of thriving packet delivery. This message might be sent over a reasonable or objective link, or it could be sent through a positive network mobile node.

$$\text{Throughput} = \frac{\text{Number of messages delivered}}{\text{Total Time Duration}} \quad (2)$$

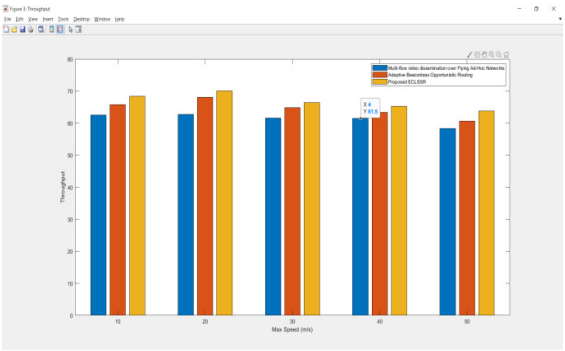

Fig. 3. Simulation of Throughput

5.3 Packet Delivery Ratio

It's the ratio of packets received from the destination to packets created by the source node. So it stores the count of the amount of messages transmitted and amount of messages delivered and it is simulated by using the MATLAB simulator.

$$\text{PDR} = \frac{\text{Amount of message delivered}}{\text{Amount of message transmitted}} \quad (3)$$

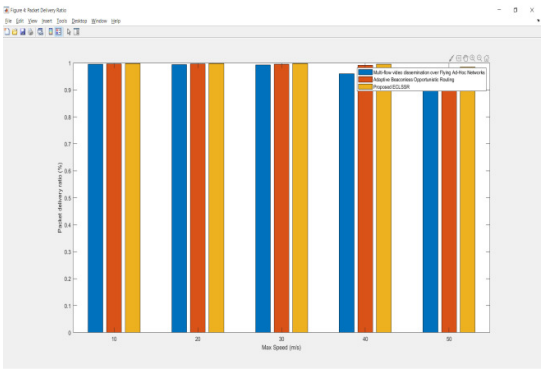

Fig. 4. Simulation of Packet Delivery Ratio

6 Conclusion

The paper titled "ENHANCED CLUSTER BASED LINK STATE SECURE ROUTING ALGORITHM IN FLYING AD HOC NETWORKS" is a MATLAB based application. This software uses a facility-traceable routing technique to ensure secure message transmission and receiving. This application was created with scalability in mind. When further modules are

required, they can be easily added. The software is built in a modular fashion. All of the system' modules have been thoroughly tested with both valid and invalid data, and all have passed. As a result, the system has achieved all of the defined goals and may be used to replace the current system. The document was successfully finished to the organization's total satisfaction. The limitations have been met and overcome. The system has been designed according to the decisions made during the design process. The paper gives a solid notion of how to create a full-fledged application that meets the needs of the users. The proposed system was tested and installed. Employing the DIJKSTRA shortest path distance algorithm in the MATLAB Framework, a FANET network using the Enhanced Cluster Based Link State Secure Routing Algorithm (ECLSSR) Algorithm. The ECLSSR protocol, which is used in the hybrid wireless application, has two key components: (i) Link State topology and (ii) Path Selection. The ECLSSR routing approach has the advantage of discovering additional routes throughout the route discovery process.

7 Future Work

In the future, performance tests of various routing protocols, such as protocol geographical forwarding, will be conducted. Ad hoc networks can be optimized, mobility prediction and battery power conservation strategies can be devised, and the effect of these routing protocols on a real-time application, such as the real-time wireless ad hoc messenger proposed in this research, may be tested.

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