

A Survey on QoS in SPEED Routing Protocol for MANET

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Abstract—A lot of research is being done on Quality-of-Service (QoS) routing protocols to enhance their efficiency. Most of the work depends on finding the feasible route from a source to a destination without considering MANET network traffic or security requirements. In this paper, firstly, we have given an overview of the QoS in MANETs, different metrics are used to evaluate the performance and briefly discussed about SPEED protocol along with various classification techniques with which it can be used to enhance over-all network performance.

Keywords— MANET, SPEED Protocol, QoS, Routing Protocol.

INTRODUCTION

Ad-hoc network is a collection of mobile nodes that can be deployed without the need of any centralized infrastructure. Ad hoc network is very flexible and can configure itself automatically. As there is a distributed infrastructure, so, no preinstalled routers exist which can forward packets from one host to another, therefore, this task has to be taken over by the distributed mobile nodes of the network. Each of the node in the network takes equal roles, which means that all of them can operate as a

host and as a router [1]. Such network is dependent on the cooperation of their nodes to provide communication routes.

In MANET, each node acts both as a router and as a host & even the topology of network may also change rapidly. Routing protocols for MANETs [1] have been explored extensively in recent years. The work depends on finding a feasible route from a source to a destination without considering current network traffic or security requirements. The distributed systems are prone to several security risks. When some nodes behave maliciously or in a selfish manner; the operation of the whole network gets severely affected the results in the degradation of the performance of the network or even disruption of its operation altogether [3].

A lot of research has been done on Quality-of-Service (QoS) routing protocols to enhance the efficiency. Requirements of limited resource constrains like limited power energy, limited communication capability, limited processing and storage capacity make it difficult to design a MANET QoS routing protocols are SAR (Sequential Assignment Routing) [4], SPEED Stateless Protocol for End-to-End Delay [5], MMSPEED (Multipath Multi SPEED) [6], QEMPAR [7], TBRR (Tree Based Reliable Routing), REAR (Reliable Energy Aware Routing) [8], MBRR (Majority Based Re-Routing) [9], etc.

The protocol discussed in this paper is SPEED. SPEED is a real-time QoS routing protocol, but it has some drawbacks like node failure or congestion. SPEED is a real -instance QoS routing protocol which needs to deliver a data packet to the destination within a certain time period, if the packet cannot be reached within the time period, the packet is dropped back that decreases the performance of speed protocol. Node failure or congestion leads to, large amounts of dropping of the data packets, which may lead to devastating consequences [9].

EVALUATION METRICS FOR QOS ROUTING PROTOCOLS

As different applications have different requirements, the services required by them and the associated QoS parameters differ from application to application. For example, in case of multimedia applications, bandwidth, delay and delay-jitter are the key QoS

parameters, whereas military applications have stringent security requirements. The following is a sample of the metrics commonly used

- i. **Throughput :** Throughput is the total number of data packets received by the central receiver .The throughput is nowhere related to accuracy of the data packets
- ii. **Bit Error Rate:** The bit error rate is the rate of error which is being shown after the successful transmission of the entire data packets to the receiving station.
- iii. **Energy:** It is the amount of energy dissipated during packet transmission.
- iv. **Speed:** Speed is the maximum speed that is required for delivery of data packet from source to destination.

RELATED WORKS

Emad Felemban et.al, 2006, [10] presented a novel packet delivery machine called Multi Path and Multi SPEED Routing Protocol for probabilistic QoS guarantee in wireless sensor networks. **Gaganpreetkauretal, 2014, [11]** has defined spatiotemporal communication protocol, called SPEED, which is a real-time Quos protocol. SPEED supports spatio-temporal communication service by ensuring a preferred delivery speed across the sensor network, and making end-to-end delay relative to the distance between the source and destination. **Tian Hea et al. [12]** has shown a real-time statement protocol for sensor networks, called SPEED. The protocols provide three types of real-time communication services, namely, real-time unicast, real-time area-multicast and real-time area-any cast. **Amandeep Kaur et.al, 2013, [13]** has presented a survey of QoS aware routing protocols for mobile ADHOC networks. Different protocols discussed in the research are very effective and useful for new researchers to identify topics for further research. **Dhilip Kumar, et.al, 2013, [14]** has discussed some types of routing protocol which provides performance in mobile ad-hoc network by different types of Routing mechanism. Some routing protocols provide better performance compare then other routing protocol to discover the neighbor's node and shortest path destination without any delay but our conclusion prefer the few routing protocol like AOMDV DSR and OLSR. **Nitika, et.al, 2015, [15]** has presented the state of the research by summarizing the work on QoS based routing protocols by highlighting the QoS issues being addressed. They have presented a spatiotemporal communication protocol for sensor networks, called SPEED for optimization purpose. **Sangeeta Vhatkar, 2015, [16]** has presented an overview of the requirements for QoS based routing protocols, and factors that are the challenges in implementing protocols in a WSN Each routing protocol is discussed along with their solution to meet QoS requirements. Comparison between SPEED and MMSPEED is performed and QoS is improvised.

VARIOUS OPTIMIZATION TECHNIQUES

Genetic Algorithm

Genetic Algorithms are adaptive heuristic search algorithm based on the evolutionary ideas of normal range and inheritance. As such they signify an intelligent operation of an arbitrary search used to solve optimization problems.

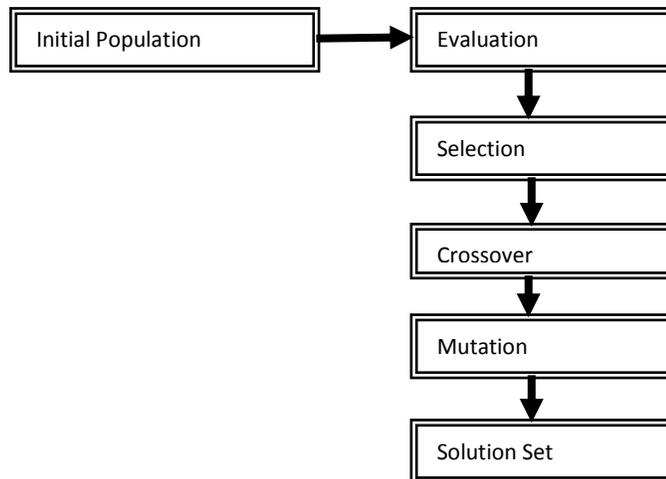


Figure 3 Genetic algorithm flowchart

Bacterial Foraging Optimization Algorithm

Bacteria Foraging Optimization algorithm is a new class of geographically confident stochastic international search technique based on mimic the foraging behavior of E. coli bacteria. This method is used for locate, handling, and ingesting the food. During foraging there can be risks due to predators, the prey may be mobile so it must be chased and the physiological characteristics of the forager constrain its capabilities and ultimate success. Bacterial Foraging optimization theory is explained by following steps.

- Chemotaxis
- Swarming
- Reproduction and

SPEED PROTOCOL IN MANET

SPEED maintains some sort of desired delivery speed across sensor networks by simply re-routing targeted traffic on the networking layer and locally managing packets provided for the particular MAC layer.

This involves the next components:

- An API
- A neighbor beacon exchange scheme
- A delay estimation scheme
- The Stateless Non-deterministic Geographic Forwarding algorithm (SNGF)
- A Neighborhood Feedback Loop (NFL)
- Backpressure Rerouting
- Last mile processing

The architecture of SPEED Protocol is revealed through this figure.

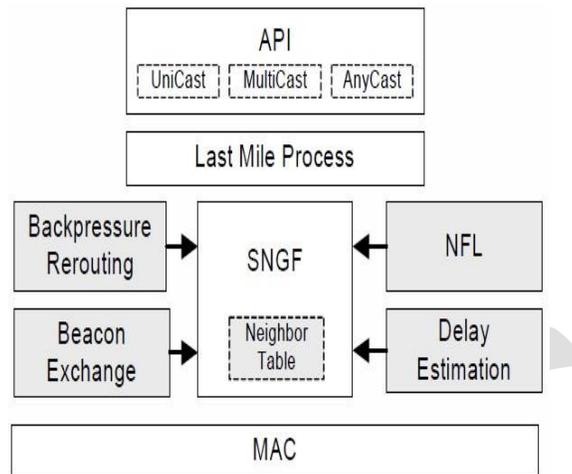


Figure1 Architecture of SPEED Protocol

As shown in above figure, SNGF is the routing component liable for choosing another hop prospect that could help the required delivery speed. The last mile process is furnished to support particularly a few connection semantics. Delay appraisal is the system where some sort of node ascertains to check whether or not traffic jam features took place. In addition to this, beacon exchange provides geographic position from the neighborhood neighbors' to ensure that SNGF can do geographic based routing. The facts of such ingredients are reviewed from the subsequent pieces, respectively.

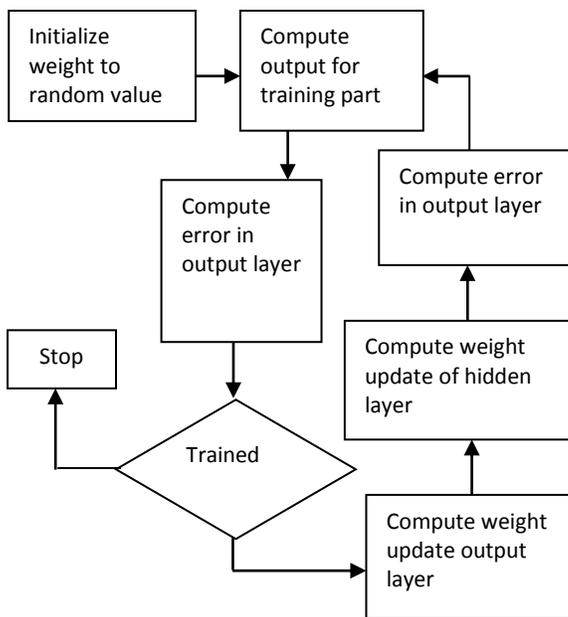
VARIOUS CLASSIFICATION TECHNIQUES

Neural Network

Machine learning algorithms facilitate a lot in decision making and neural network has performed well in categorization purpose in medical field [8]. Most popular techniques among them are neural network. Neural networks are those networks that have a collection of simple elements which functions equivalent. A neural network can be trained to perform a particular function by adjusting the values of the weights between elements [9]. Network function is determined by the connections between elements. There are several activation functions that are used to produce relevant output.

Figure 2 Flowchart of Neural Network

Above given figure shows the flow of working of neural network algorithm.



Genetic Algorithm

Genetic Algorithms are adaptive heuristic search algorithm based on the evolutionary ideas of normal range and inheritance. As such they signify an intelligent operation of an arbitrary search which is used to solve optimization problems. The basic techniques of GA is to calculate processes in natural systems required for growth.

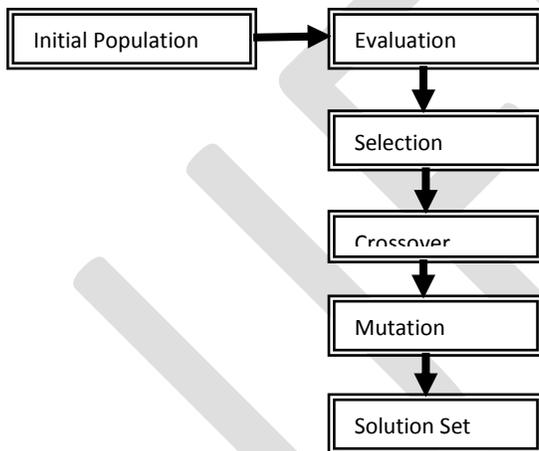


Figure 3 Genetic Algorithm Flowchart

Support Vector Machine

A support vector machine (SVMs) is a binary classification algorithm developed by Vapnik. The main features of SVM are shown below, due to which its applications are quite important:

- i. Robust to large number of variables.
- ii. It can learn complex and simple learning models.
- iii. It avoid overfitting.

Support vector machines (SVMs) have the hyperplane that classifies the various variables as shown below;

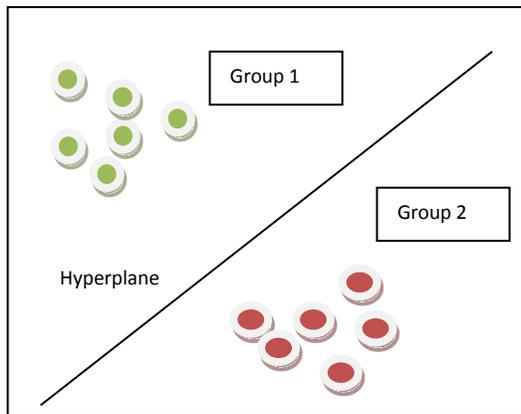


Figure 4 Support Vector Machine

- Elimination-Dispersal

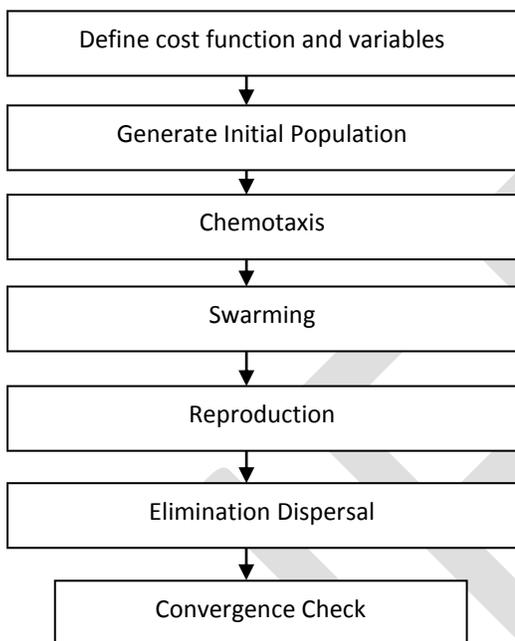


Figure 4 BFO Flowchart

CONCLUSION

In this work, we presented an overview of the requirements for QoS based routing protocols, and also discussed a spatiotemporal communication protocol for sensor networks, called SPEED for optimization purpose. SPEED is specifically tailored to be a localized algorithm with minimal control overhead along with various classification algorithm which can be implemented to enhance network performance in a MANET.

A lot of research has been done in this field and new techniques have been developed. In future work, we can use a crossbreed approach using SPEED protocol along with any specific classification algorithm such as neural network, Support Vector Machine etc.

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