Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 01, January-2021

Design and Implementation of Fuzzy based Hello Interval Time of OSPF Routing Protocol for Manets

Dr. A.V.N. Chandra Sekhar
Professor: Department of Information Technology
Sasi Institute of Technology & Engineering
Tadepalligudem, India

S. Phani Kumar
Assistant Professor:
Department of Information Technology
Sasi Institute of Technology & Engineering
Tadepalligudem, India

P. Naveen Kireeti
Student: Department of Information Technology
Sasi Institute of Technology & Engineering
Tadepalligudem, India

***Abstract*—Routing is a challenging issue which should be handled in a timely manner without unnecessary time delays in MANETs. The choice of the constants affects timeliness of protocol. OSPF suggests that the HELLO INTERVAL Time should be a constant value but does not mention how this value to be adjusted with network size. The proposed method" Fuzzy Based Hello interval Time OSPF (FBHIOSPF)" suggests that the Hello interval Time should be a suitable value with the network size and the results shows that it performs better than OSPF.**

Keywords—Ad Hoc Network, Fuzzy Logic, OSPF, FBHIOSPF.

I. INTRODUCTION

Mobile Ad Hoc Networks (MANETs) [1][2][3][4][5] are collection of mobile devices that communicate with each other without the need of centralized infrastructure. One of the challenging issues [6] in MANETs is routing [7]. The routing protocols [8][9][10] can be proactive, reactive, and hybrid. The rest of the paper is organized as follows:

Proactive routing protocol "OSPF" is summarized in section 2, Methodology is illustrated in section 3, Simulation Environment is presented in section 4, and results is presented in section 5 and finally concluded with section 6.

II. OPEN SHORTEST PATH FIRST (OSPF)

Open Shortest Path First (OSPF)Protocol [12] allows users to find and maintain routes in the network in an on predefined manner. If a sender wants to find a route to the destination, it broadcasts a RREQ message and then waits for HELLO INTERVAL TIME (HIT) to receive RREP message. Once the source node received the RREP message, the route has been established and data packets may be forwarded to the destination. Route Maintenance is to provide feedback to the sender in case of router or link failure through RERR message.

III. METHODOLOGY

OSPF considers the defaults constants suggested in the draft [11] standard. The proposed method concentrates on the Hello Interval Time (HIT) value which plays an important role in calculating Net Traversal Time, the value the sender waits for RREP to determine route lifetime and time-out values. The OSPF suggests that the HIT value should be constant but does not mention how this value should be adjusted with network size. The proposed method" Fuzzy Based Hello Interval Time (FBHITOSPF)" suggests that the HIT should be a suitable value with the Network size.

The following are the some of the default constants in the standard.

HELLO INTERVAL TIME= 02ms

IV. FUZZY LOGIC BASED HELLO INTERVAL TIME OSPF (FBHITOSPF)

Human experiences can be implemented through membership functions and fuzzy rules in fuzzy logic [13][14][15]. This method calculates Hello Interval Time value associated with the network size and speed. The Input variables are number of nodes (n-nodes) and speed. Hello Interval Time is treated as an output variable. The linguistic variable associated with input variables are Low (L), Medium (M) and High (H) for number of nodes, Low (L) and High (H) for speed and for the output variable these are Low (L), Medium (M) and High(H).

Figure (l) shows the architecture used in the model. Figure (2), Figure (3), Figure (4) shows the membership functions and Table 1 shows fuzzy conditional rules respectively. Triangular shaped membership functions [16] are preferred for output variable. Figure 5(a) and 5(b) shows rule view for nodes 20 with NT 14.5 and for nodes 70 with NT 20.4 respectively. Figure 5(c) shows the surface view of the model.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 01, January-2021

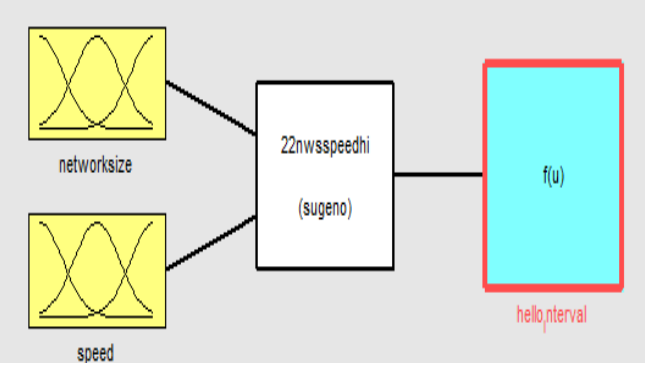
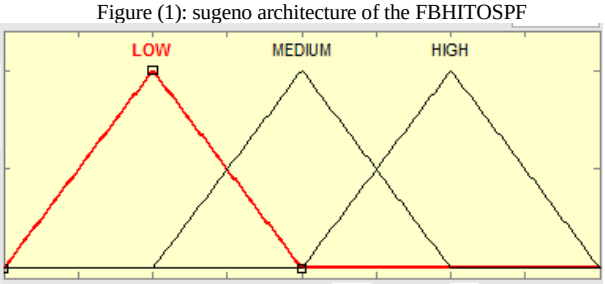
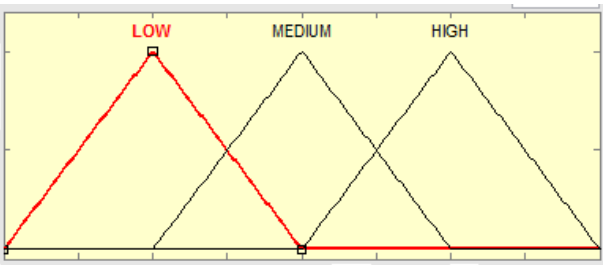


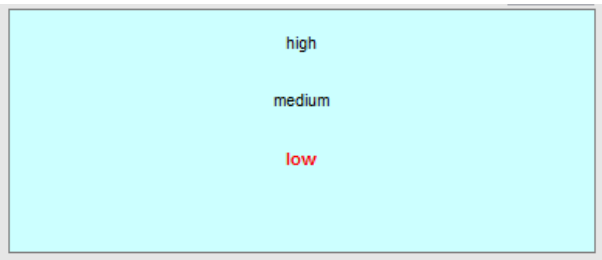
Figure (1): sugeno architecture of the FBHITOSPF



Figure(2): Membership function for Input variable n-nodes



Figure(3) :Membership function for Input variable speed



Figure(4): Membership function for output variable ‘’hi’

INPUT VARIABLES		OUTPUT VARIABLE
Number of nodes (n nodes)	Speed	HELLO INTERVAL
L	L	H
L	M	M
L	H	L
M	L	M
M	M	M
M	H	L
H	L	L
H	M	L
H	H	L

V. SIMULATION ENVIRONMENT

Simulators like OPNET, NS2 [24], Glomosim [25] and Qualnet [26] etc., were developed to evaluate the performance [17][18][19][20][21][22][23] of routing protocols. The experiments for evaluating the FBHITOSPF model were implemented within the opnet Library. The simulation parameters used in the method was given in table 2.

Table 2: Scenario Parameters varying number of nodes.

Area	1000m x 1000m
Nodes	20,30,40,50,60,70,80,100
Nodes Placement	Random
Mobility Model	Random Way Point
Node Transmission Power	0.005
Operational mode	802.11b
Data rate	11Mbps
Simulation time	1000 sec

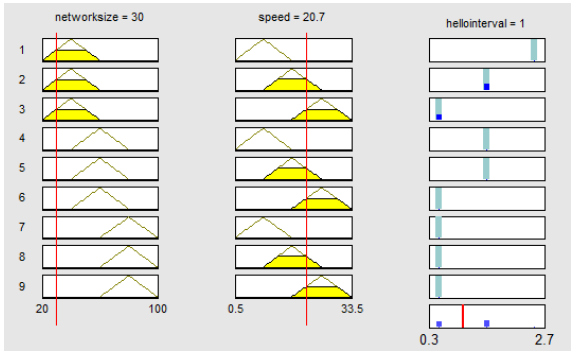


Figure 5(a): Rule view for 30 nodes, speed 20.7 & HI 1

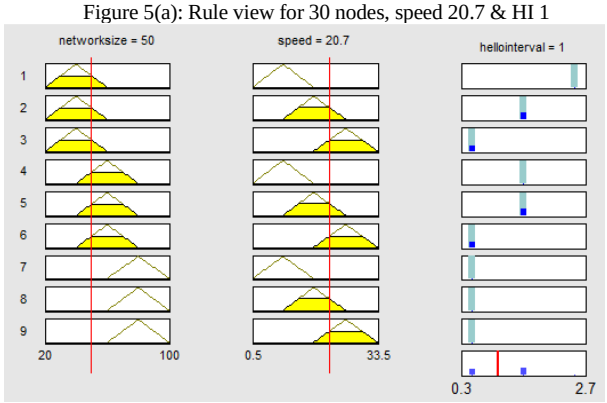


Figure 5(b): Rule view for 50 nodes, speed 20.7 & HI 1

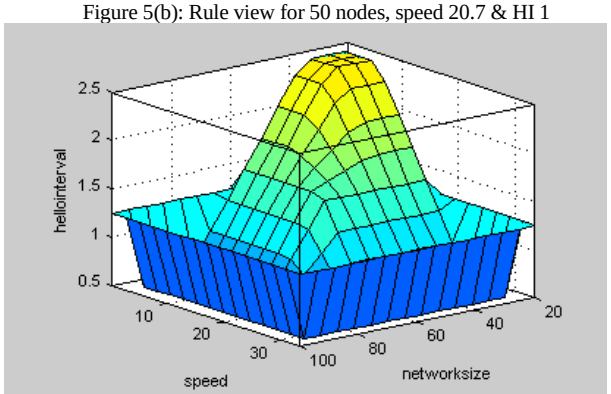


Figure 5(c): Surface view showing speed, n-nodes and HI

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
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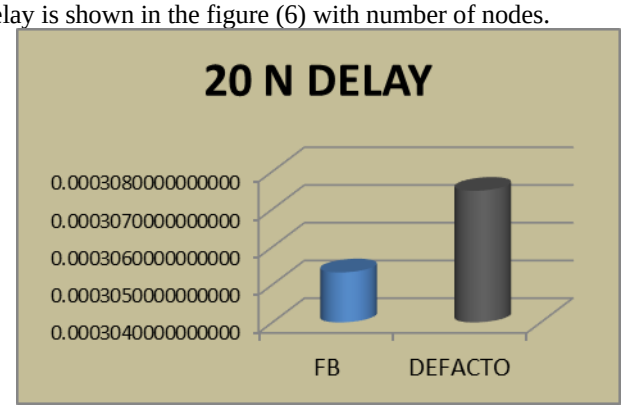
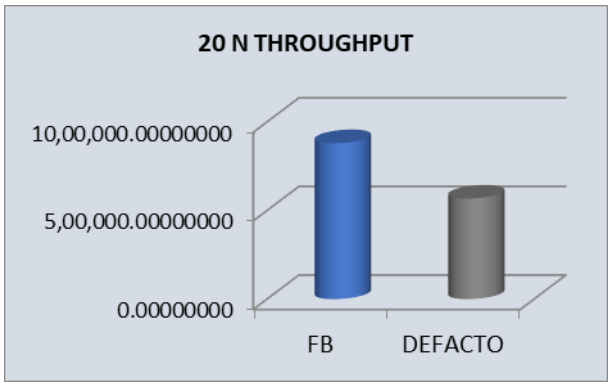
VI. RESULTS AND ANALYSIS

The performance metrics namely Average end-end delay and Throughput were considered to analyze FBHIOSPF PROACTIVE routing protocol.

Average end-end delay: The time taken for a packet to travel from a source to destination. The Average end-end delay is shown in the figure (6) with number of nodes.



Throughput: The total amount of data received by the receiver from the sender divided by the time takes for the receiver to get the last packet. The Throughput is shown in the figure (7) with number of nodes.



VII. CONCLUSION AND FUTURE SCOPE

Varying node Hello interval time with the network size and speed plays a major role for improving the performance. From the simulation results, it was observed that at 20 nodes, the average delay for OSPF HI and FBHI was 0.0003074 and 0.000305 respectively. From the results, it is evident that FBHI OSPF performs better than de-facto OSPF in the above QOS metrics. The given model with various mobility models can further be studied.

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