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Agent Based QoS Routing using DSR in Mobile Ad hoc Networks

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Abstract- This paper modifies the existing DSR routing protocol by using the neuro-fuzzy agent. The proposed system uses the neural as well as the fuzzy agents to improve the QOS of DSR routing protocol. Neural and fuzzy agents are used to select the optimal path on the basis of the attributes of the nodes. The proposed system firstly determines the preferred path from the multiple paths between the source and the destination by using the fuzzy rules. The fuzzy rules use the bandwidth, path cost, packet loss, energy consumed as the input parameter and the probability of selection as the output parameter. If the probability of all the nodes is same then the neural agents are used to get the final path. The neural uses the total cost of each as input to get the total cost of the resultant path

Keywords-MANET, DSR, Routing Protocols

I. INTRODUCTION

Mobile Ad-Hoc Networks (MANETs) are comprised of mobile nodes (MNs) that are self-organizing and cooperative to ensure efficient and accurate packet routing between nodes (and, potentially, base stations).Figure1 shows the structure of MANETS. There are no specific routers, servers, access points for MANETs. Because of its fast and easy of deployment, robustness, and low cost, Typical MANETs applications could be find in the following areas like Military applications (i.e. a temporary network in the battlefield), Search and rescue operations, Temporary networks within meeting rooms, airports, Vehicle-to-vehicle communication in smart transportation, Personal Area Networks connecting mobile devices like mobile phones, laptops, smart watches, and other wearable computers etc. Design issue for developing a routing protocol for wireless environment with mobility is very different and more complex than those for wired network with static nodes [1].

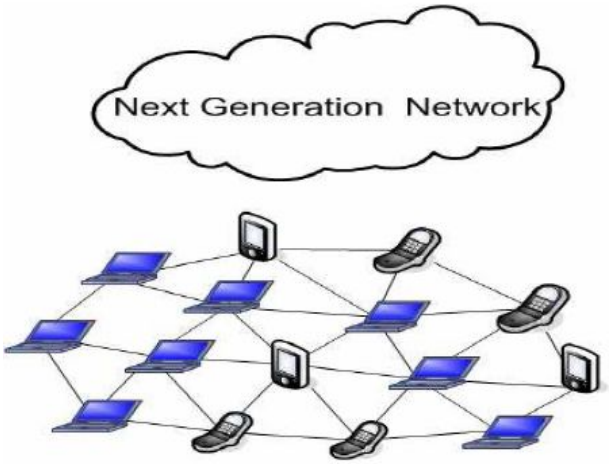

Figure 1: Mobile Ad Hoc Networks-MANETs. [3]

Due to its dynamic nature it has many challenges. One of the important challenges is the routing, because of its need to guarantee a given level of Quality of Service to determine the

path of a data flow based on knowledge of network resources availability. For real-time multimedia communication, on demand source routing algorithm is more suitable, because of its bandwidth and power constrained [2].

II. ROUTING IN MANET

An ad hoc network might consist of several home-computing devices, including laptops, cellular phones, and so on. Each node will be able to communicate directly with any other node that resides within its transmission range [4]. For communicating with nodes that reside beyond this range, the node needs to use intermediate nodes to relay the messages hop by hop. There are different types of routing protocols which are as follows:

A. Table-driven or Proactive Protocols:

Proactive routing protocols attempt to maintain consistent, up-to-date routing information between every pair of nodes in the network by propagating, proactively, route updates at fixed intervals. Representative proactive protocols include: Destination-Sequenced Distance- Vector (DSDV) routing, Clustered Gateway Switch Routing (CGSR), Wireless Routing Protocol (WRP), Optimized Link State Routing (OLSR)and The Fisheye State Routing (FSR).

B. On-demand or Reactive Protocols:

A different approach from table-driven routing is reactive or on-demand routing. Reactive protocols, unlike table-driven ones, establish a route to a destination when there is a demand for it, usually initiated by the source node through discovery process within the network. Reactive protocols, unlike table-driven ones, establish a route to a destination when there is a demand for it, usually initiated by the source node through discovery process within the network. Representative reactive routing protocols include: Dynamic Source Routing (DSR), Ad hoc On Demand Distance Vector (AODV) routing, Temporally Ordered Routing Algorithm (TORA) and Associativity Based Routing (ABR).

C. Hybrid Routing Protocols:

Purely proactive or purely reactive protocols perform well in a limited region of network setting. However, the diverse applications of ad hoc networks across a wide range of operational conditions and network configuration pose a challenge for a single protocol to operate efficiently. Researcher's advocate that the issue of efficient operation over a wide range of conditions can be addressed best match these operational conditions [5]. Representative hybrid routing protocols include: Zone Routing Protocol (ZRP) and Zone-based Hierarchal Link state routing protocol (ZHLS) [4].

1) DSR:

Reactive Protocol has lower overhead since routes are determined on demand. It employs flooding (global search) concept. Constantly updation of route tables with the latest route topology is not required in on demand concept. Reactive protocol searches for the route in an on-demand manner and set the link in order to send out and accept the packet from a source node to destination node. Route discovery process is used in on demand routing by flooding the route request (RREQ) packets throughout the network [5]. Examples of reactive routing protocols are the dynamic source Routing (DSR), ad hoc on-demand distance vector routing (AODV) .

Dynamic Source Routing (DSR) is an Ad Hoc routing protocol which is based on the theory of source-based routing rather than table-based [6,7]. This protocol is source-initiated rather than hop-by-hop. This is particularly designed for use in multi hop wireless ad hoc networks of mobile nodes.

Basically, DSR protocol does not need any existing network infrastructure or administration and this allows the Network to be completely self-organizing and self-configuring. This Protocol is composed of two essential parts of route discovery and route maintenance. Every node maintains a cache to store recently discovered paths. When a node desires to send a packet to some node, it first checks its entry in the cache. If it is there, then it uses that path to transmit the packet and also attach its source address on the packet. If it is not there in the cache or the entry in cache is expired (because of long time idle), the sender broadcasts a route request packet to all of its neighbors asking for a path to the destination. The sender will be waiting till the route is discovered. During waiting time, the sender can perform other tasks such as sending/forwarding other packets. As the route request packet arrives to any of the nodes, they check from their neighbor or from their caches whether the destination asked is known or unknown. If route information is known, they send back a route reply packet to the destination otherwise they broadcast the same route request packet. When the route is discovered, the required packets will be transmitted by the sender on the discovered route. Also an entry in the cache will be inserted for the future use. The node will also maintain the age information of the entry so as to know whether the cache is fresh or not. When a data packet is received by any intermediate

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node, it first checks whether the packet is meant for itself or not. If it is meant for itself (i.e. the intermediate node is the destination), the packet is received otherwise the same will be forwarded using the path attached on the data packet. Since in Ad hoc network, any link might fail anytime.

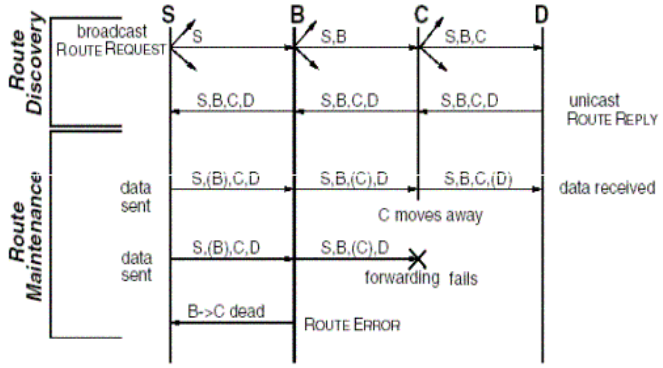

Figure 2: Basic Operation of DSR

Therefore, route maintenance process will constantly monitors and will also notify the nodes if there is any failure in the path [6].

III. PROPOSED WORK

The proposed work modifies the existing DSR routing protocol by using the neuro-fuzzy agent. The proposed system uses the neural as well as the fuzzy agents to improve the QOS of DSR routing protocol. Neural and fuzzy agents are used to select the optimal path on the basis of the attributes of the nodes. The proposed system firstly determines the preferred path from the multiple paths between the source and the destination by using the fuzzy rules. The fuzzy rules use the bandwidth, path cost, packet loss, energy consumed as the input parameter and the probability of selection as the output parameter.

The membership functions of the input and output variables are shown below:

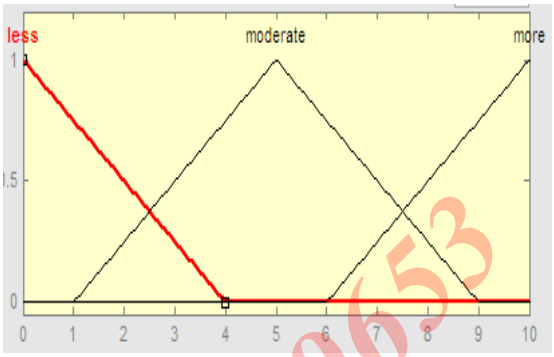

Figure 3: Membership function of packet loss rate

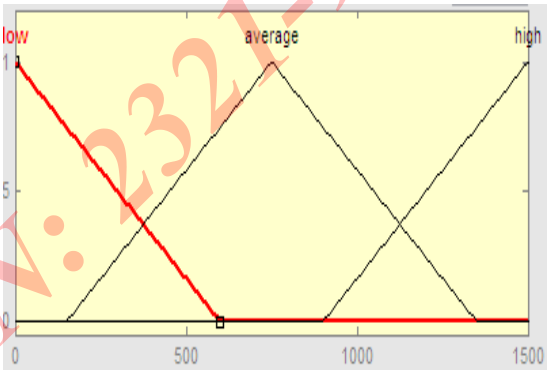

Figure 4 : Membership function of Distance(cost)

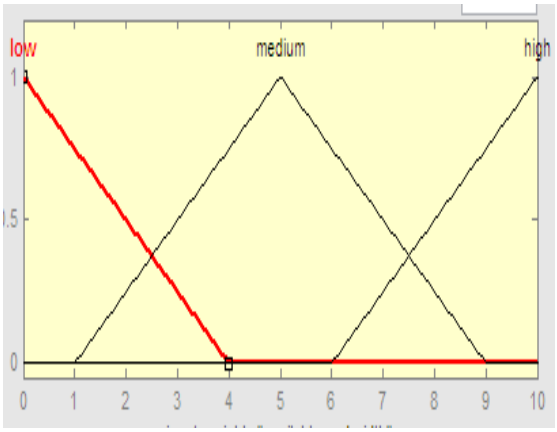

Figure 5 : Membership function of Bandwidth

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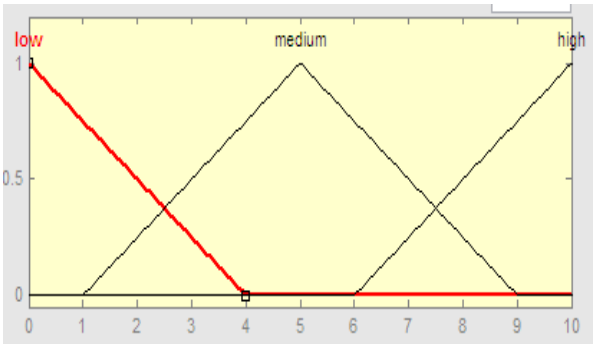

Figure 6 : Membership function of Energy Level

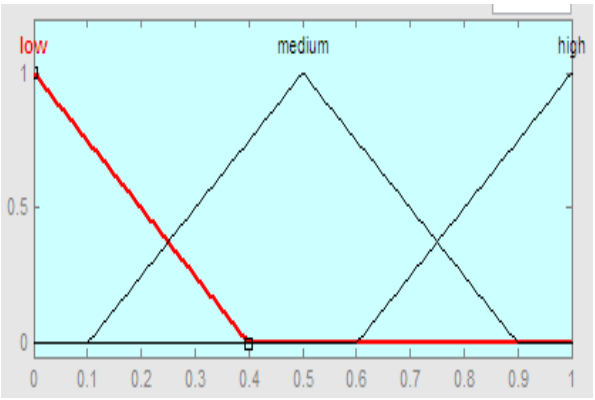

Figure 7: Membership function of Selection Probability

Figure 8 : Rules Viewer Table

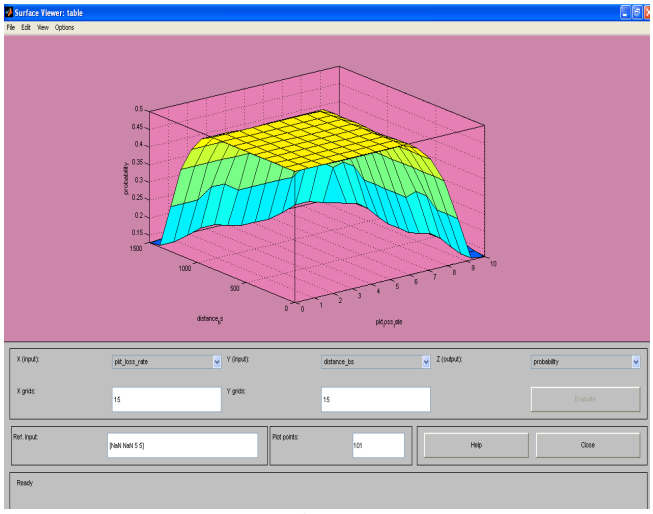

Figure 9 : Surface Viewer Table

Run	Elapsed time	PDR	Throughput
1	**0.5051**	**0.50**	**3.9596**
2	**0.5029**	**0.50**	**3.9785**
3	**0.5028**	**0.50**	**3.9779**
4	**0.5026**	**0.50**	**3.9791**
5	**0.5027**	**0.50**	**3.9783**

IV PROPOSEDALGORITHM

The whole process of routing can be easily understood by the following steps.

1. Select source and destination from N nodes
2. I=1;
3. Total cost=0;
4. Energy level=0;
5. Bandwidth=0;
6. Packet loss=0;
7. For each alternate path between source and destination
8. For each hop in the path say j
9. Cost of hop(j)=find cost of the hop in the path
10. Total cost(i)=total cost(i)+cost of hop(j)
11. Energy level=energy level + current energy(j)
12. bandwidth=bandwidth+ current bandwidth(j)
13. packet loss=packet loss +current packet loss(j)
14. end
15. probability of path = fuzzy (total cost, energy level, bandwidth, packet loss)
16. End
17. Selected path= Max(probability)
18. If length(Selected path) >1
19. Input for NN= total cost of selected path
20. Train the SOM neural network
21. Output total cost=sim(input)
22. Select the path with total cost near to the output of NN
23. If data not reached to destination
24. Select the other available path
25. End

The proposed algorithm can be implemented using the MATLAB

Table 1: Result Analysis of Existing Algorithm

Run	Elapsed time	PDR	Throughput
1	4.0941	0.25	0.7328
2	4.0785	0.25	0.7356
3	4.0962	0.23	0.7324
4	4.0939	0.18	0.4885
5	4.0938	0.18	0.4883

Table 2: Result Analysis of Proposed Algorithm

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Figure 10: Comparison of PDR

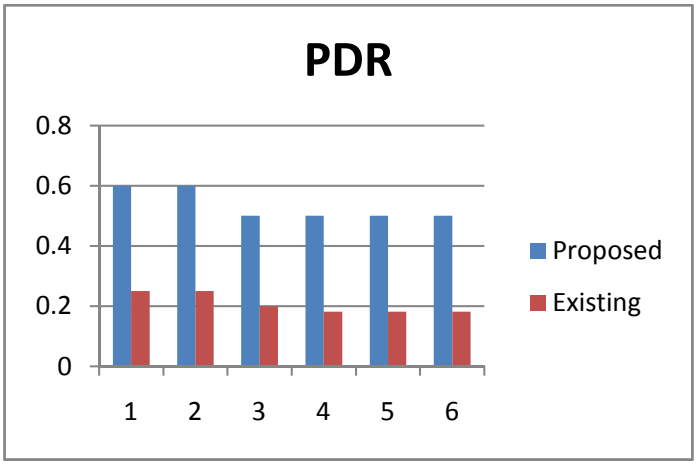
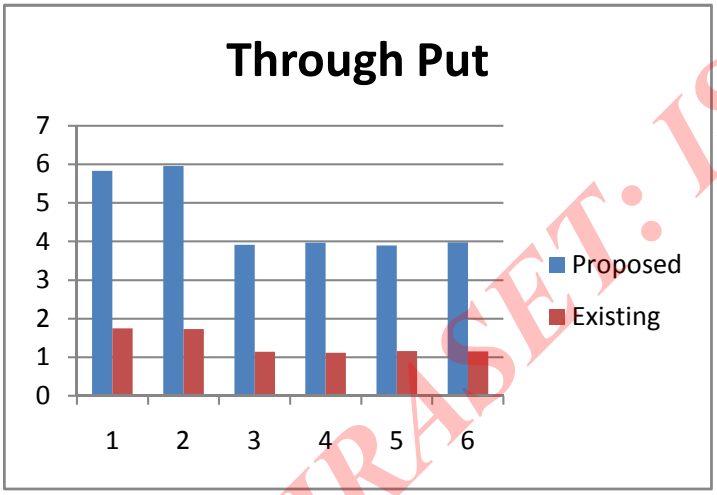


Figure 11: Comparison of Through Put



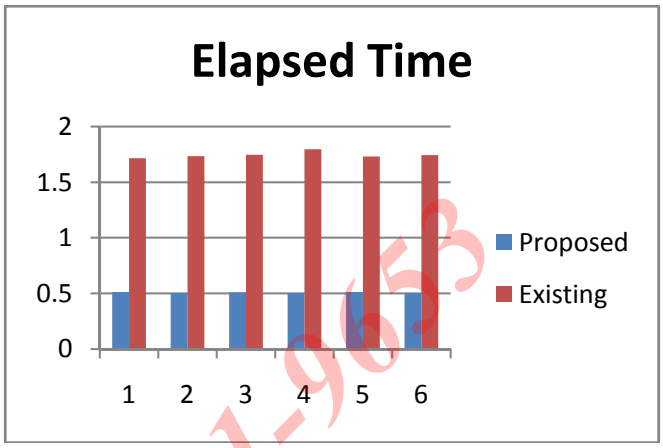


Figure 12: Comparison of Elapsed Time

V CONCLUSION

The paper compares the result of proposed system with existing DSR protocol by using throughput, packet delivery ratio and the end 2 end delay as parameters. The results show that the packet delivery ratio is improved and the end2 end delay is decreased. The improved throughput confirms the better QOS of the proposed system as compared to the existing system. In future the proposed system can be extended by using swarm intelligence, and the proposed system can be compared with other existing protocols.

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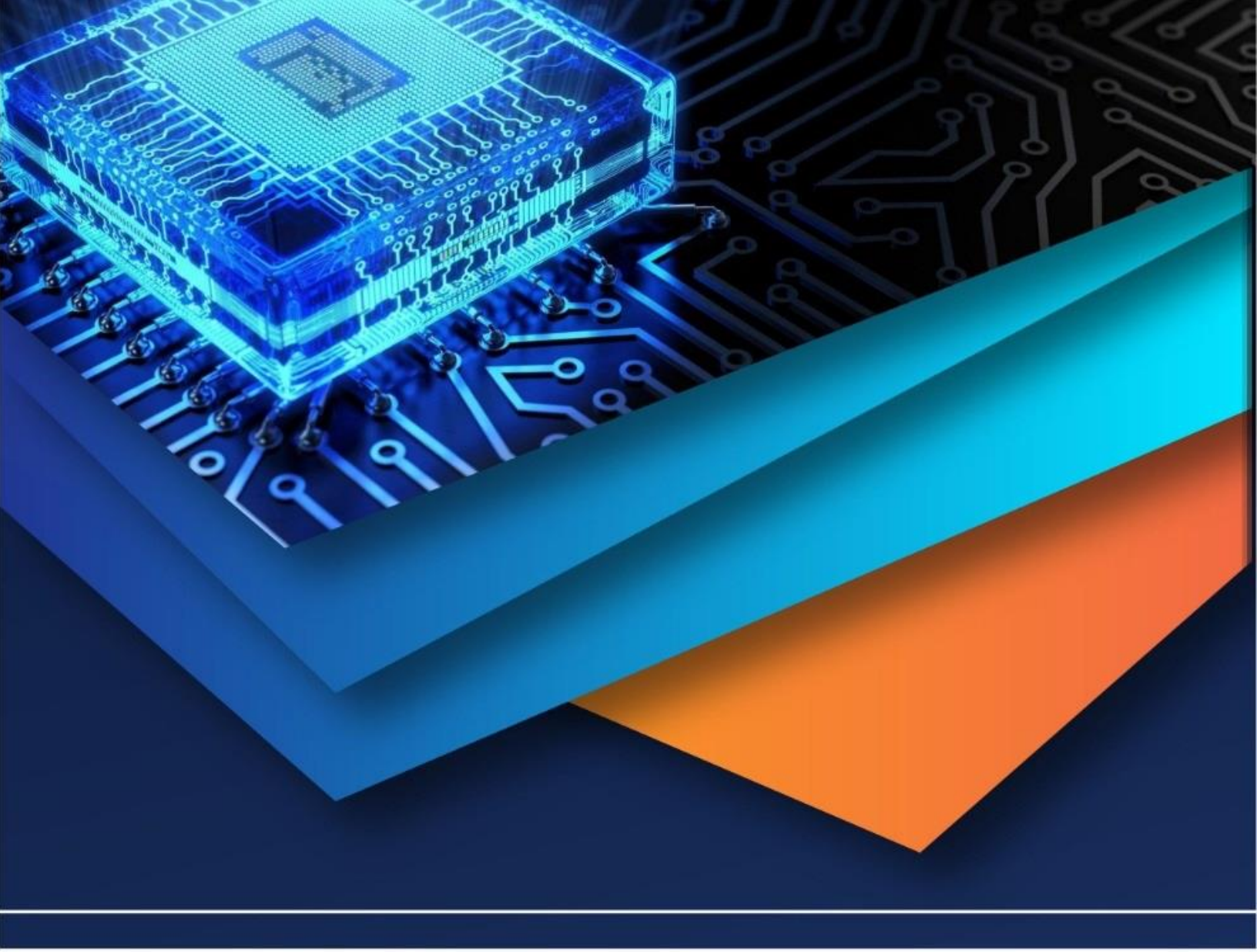

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