

# Routing In Wireless Sensor Network Using Fuzzy Based Trust Model

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**Abstract**— Wireless sensor network is a collection of a number of sensor nodes that are deployed in large number to monitor the environment. There is a great advancement in WSN during last few years. Due to low-cost, small-size, nature of WSNs, it allows them to sense the information in various hostile environments (e.g. military surveillance, battlefield). So, to fully achieve the capacity of WSNs, sensor nodes need to cooperate in the collection and must disseminate topology information. These sensor nodes operate in a multi-hop routing. Sensor network in multi-hop routing faces many risks due to the complex operating environments. In this paper, a fuzzy' based approach is used which enhances the security of routing and reliability in WSNs.

**Index Terms**— MAODV, Routing, Trust, Fuzzy Logic, Wireless Sensor Network.

## INTRODUCTION

MANET stands for "Mobile AD HOC Network". MANET is a type of ad hoc network that changes location and configures itself. MANET is self -configuring network connected by wireless links. Some MANETs are limited to a small or a local area of wireless devices, while others may be connected to the internet. AODV routing protocol is used for securing the transmission in MANET. AODV creates routes between nodes only when the routes are requested by the source nodes. Routes stay dynamic just as long as information parcels are going along the ways from the source to the goal. When the source will stop sending packets, the path will time out and close. For selecting a reliable route from source to destination fuzzy logic is used. Fuzzy logic ensures that no packet is dropped while transmission. Fuzzy logic is an extension of Boolean logic. Fuzzy logic gives exceptionally profitable adaptability to thinking, which makes it conceivable to consider errors and vulnerabilities. In fuzzy logic, fuzzy reasoning is based on fuzzy rules that are expressed in natural language using linguistic variables which we have given the definition above. A fuzzy rule has the form: If  $x \in A$  and  $y \in B$  then  $z \in C$ , with  $A, B, C$  fuzzy set.

## LITERATURE SURVEY

Radhika A. Raje et al. proposed a trust model approach to improve the security of Wireless Sensor network. Trust Model based on Fuzzy Logic Provides better security under a harsh and hostile environment. This model keeps track of trustworthiness of its neighbour and to select a reliable route path fuzzy rules is used.[1]

Ian D. Chakeres et al. worked on routing using AODV protocol. All the necessary information, event triggers, design possibilities and the decisions for AODV routing protocol were described properly to enable smooth routing through out the system. Routes are determined only when needed which saves time and complexity. The Design

structure and features assist users in deciding which implementation best fits their needs.[2]

Vikas Thakur et al. worked on: fuzzy logic controller to, reduce Congestion in Mobile ad-hoc network. Congestion degrades the performance of an overall network by choking the packets. Congestion control limits the congestion amount which ensures the system runs in, an optimal level. Fuzzy logic controller is used to limit the congestion. It increases the node density which increases the throughput and average packet delivery ratio remains almost unchanged, which reduces congestion successfully decreasing the delays caused in the system. [4]

R.Sakthi et al. worked on an architecture that describes a drop based congestion control method for differentiated services networks. Approach for congestion control used fuzzy logic. The fuzzy logic controller calculates the dropping probability based on the queue size, the current buffer usage rate and a set of fuzzy rule. Active Queue Management can be achieved efficiently by fuzzy logic instead of the probability based packet dropping mechanism, thus improving the performance of the system. [2]

## III. PROBLEM DEFINITION AND OBJECTIVE

Sometimes malicious node drops the packets or it might also happen that the energy of some nodes gets low due to which they have to drop the packet. So AODV provides shortest path but the path may not be reliable all the time.

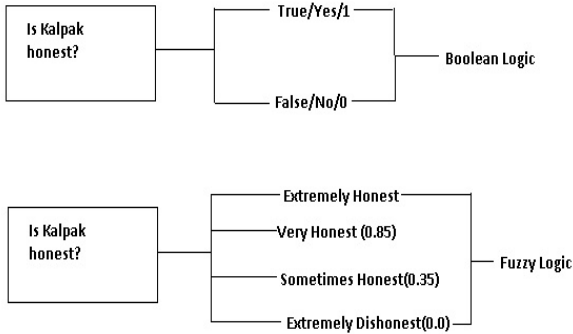
## IV. PROPOSED WORK

### 1. FUZZY LOGIC

In Boolean algebra or traditional logic, there is only two states i.e. True and False or 1 and 0. It is a flexible machine learning technique. It mimics the logic of human thought. In Fuzzy logic, we have multiple values based on "degrees or truth" or degree to which certain value is true or false. Fuzzy logic is useful when value between 0 and 1 is required, which is called fuzzy value. For instance values of fuzzy logic can range from extremely true, partially true, true, partially false or extremely false.

Rather than fixed and exact it deals with reasoning, that is approximate. In a narrow sense, fuzzy logic is a logical system and in wide sense, it is coextensive with set theory.

2.FUZZIFICATION



The applications of fuzzy logic are:

- Animation system
- Industrial Automation
- Artificial Intelligence
- Robotics
- Aerospace
- Transportation and many more.

The essential characteristics of fuzzy logic are as follows.

- Under incomplete or uncertain information fuzzy logic allows decision making with some estimated values.
- Fuzzy system can do uncertain reasoning, mainly for the system with a mathematical model that is tough to derive.
- In fuzzy logic, precise reasoning is viewed as a delimit case of proximate reasoning.
- In fuzzy logic each and everything is a matter of degree.
- Any system that is logical it can be fuzzified.
- In fuzzy logic, information or knowledge is analyzed as a group of elastic equivalently, fuzzy

INPUT			OUTPUT
SPEED	HOP COUNT	ENERGY	TRUST VALUE
LOW	SHORT	LOW	MEDIUM
LOW	MEDIUM	LOW	MEDIUM
LOW	LONG	LOW	LOW
MEDIUM	SHORT	LOW	LOW
LOW	MEDIUM	LONG	V.LOW

constraint on a collection of variables.

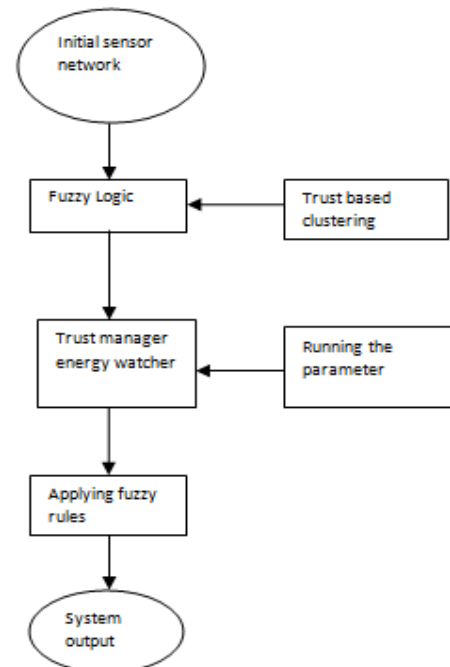
- Inference is viewed as a process of propagation .

Fuzzification is the initial phase in the fuzzy inferencing process. This includes a space change where fresh sources of info are changed into fuzzy information sources. Fresh data sources are correct information sources estimated by sensors and go into the control framework for handling, for example, temperature, weight, rpm's, and so forth. Fuzzification is the way toward making a fresh amount fuzzy. We do this by essentially perceiving that a significant number of the amounts that we consider to be fresh and deterministic are really not deterministic by any means: They convey extensive vulnerability. On the off chance that the type of vulnerability happens to emerge in light of imprecision, uncertainty, or dubiousness, at that point the variable is most likely fluffy and can be spoken to by a participation work. In reality, equipment, for example, a computerized voltmeter produces fresh information, however these information are liable to trial blunder.

Membership function speaks to likenesses of objects to equivocal properties. All the data spoken to by a fluffy set is contained inside the participation work.

A fuzzy set is a class of items with a continuum of evaluations of participation. Such a set is portrayed by an enrollment (characteristic) work which allocates to each protest a review of participation extending somewhere in the range of zero and one.

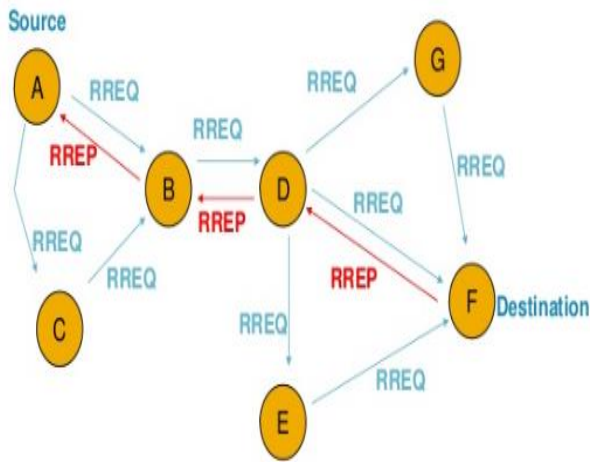
The assessments of the fluffy standards and the mix of the aftereffects of the individual principles are performed utilizing fuzzy set activities. In the wake of assessing the consequence of each lead, these outcomes ought to be consolidated to get last outcome. This procedure is called inference.



4. MAODV

The multicast task of the Ad hoc On-Demand Distance Vector (AODV) routing protocol (MAODV) is planned for use by versatile hubs in an ad hoc network. It offers speedy

adjustment to dynamic connection conditions, low preparing and memory overhead, and low system use. It makes bi-directional shared multicast trees associating multicast sources and receivers. These multicast trees are kept up insofar as gathering individuals exist inside the associated segment of the network. Each multicast gather has a gathering pioneer whose obligation is keeping up the gathering grouping number, which is utilized to guarantee freshness of routing data.



When one node needs to send a message to another node for which it doesn't have a course it broadcasts a Route Request (RREQ) message. By sending RREQ the node is requesting that the system how get to the goal. At the point when RREQ message lands at its goal, a "Route Reply" (RREP) message will promptly get go back to the starting point, showing that a course to the goal was found. The RREQ message contains a few key bits of data like the source, the goal, the life expectancy of the message, communicate ID and so on. Route Reply (RREP) additionally contains the quantity of hops that are required to achieve the goal. The intermediate nodes that participate in sending, answer to the source node and make a forward course to goal. This course made from every hub from source to goal is a hop-by-hop state and not the whole course as in source routing.

The working of routing greatly relies on successful transmission of packets to the goal. This requires fitting determination of Routing path and algorithm.

AODV results are substantially more better when nodes are less however as the nodes expanded to 25 and 50 the difference in the performance of AODV and MAODV additionally expanded.

One disadvantage of AODV that has been broadly engaged is the single route abstraction. At the point when a connection failure is experienced in the essential current route, single route deliberation requires a source node to build up another route discovery process.

MAODV topology depends on multicast tree adopting broadcast routing discovery mechanism to search multicast routing, which sends information packets to each group nodes from information source.

## V.CONCLUSION

The main objective of this paper to improve is to reliability of communication in Wireless Sensor Nodes. The main problem of packet dropping in WSNs is solved

efficiently using fuzzy algorithm. Fuzzy logic ensures that packet sent from source reaches the destination without any loss of data or packets. Thus using this approach reliable routing in WSNs can be achieved.

## VI.FUTURE SCOPE

Mobile Ad-hoc Network is infra -structure less network supported by no fixed trusted infrastructure. The packet has a chance to get hacked by eavesdropper during transmission. So,in future encryption method can be implemented for sending and receiving packets in secret manner. Packet should be encrypted while sending the packet and should be decrypted at the destination to receive the original message. This can be achieved by increasing the block size as well as the key size by 256 bits for the secure packet transmission.

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