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Comparison Analysis of Fuzzy Logic and Firefly Algorithm for Cooperative Attacks Detection in MANET: A Review

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ABSTRACT: In mobile ad hoc networks (MANETs), a primary requirement for the establishment of communication among nodes is that nodes should cooperate with each other. In the presence of malevolent nodes, this requirement may lead to serious security concerns; for instance, such nodes may disrupt the routing process. So this paper has discussed the comparative analysis of two methods for the prevention of cooperative attack in environment.

KEYWORDS:MANET, Cooperative Attacks, Fuzzy Logic, Firefly Algorithm.

I. INTRODUCTION

A Mobile Ad hoc Network (MANET) consists of a set of communicating wireless mobile nodes or devices that do not have any form of fixed infrastructure or centralized authority [1]. The security in MANET has become a significant and active topic within the research community. This is because of high demand in sharing streaming video and audio in various applications, one MANET could be setup quickly to facilitate communications in a hostile environment such as battlefield or emergency situation likes disaster rescue operation [2]. In spite of the several attacks aimed at specific nodes in MANET that have been uncovered, some attacks involving multiple nodes still receive little attention [3]. A reason behind this is because people make use of security mechanisms applicable to wired networks in MANET and overlook the security measures that apply to MANET. Furthermore, it may also have to do with the fact that no survey or taxonomy has been done to clarify the characteristics of different multiple node attacks. This paper compares the fuzzy logic and firefly algorithm for detection of collaborative attacks against MANET from the various multiple node attacks found [4].

Due to the fact that MANET is a group of nodes that form a temporary network without centralized administration, the nodes have to communicate with each other based on unconditional trust [5]. This characteristic leads to the consequence that MANET is more susceptible to be attacked by inside the network while comparing to other type of networks. Practically, MANET could be attacked by several ways using multiple methods; before going to deeper investigation, it is necessary to classify security attacks within the context of MANET [6, 7, 8]. The classification can be based on the behavior of the attack (Passive vs. Active), the source of the attacks (Internal vs. External), the processing capacity of the attackers (Wired vs. Mobile) and the number of the attackers (Single vs. Multiple) [9].

A collaborative attack in MANET is a homogeneous attack (i.e. black hole or wormhole attack), involving two or more colluding nodes; classified as internal active attack that can be processed using wired or wireless link and triggered by single or multiple attackers [10, 11]. It can also be referred to as the first level of attack, in which the adversary only interests in disrupting the foundation mechanism of the ad hoc network, for instance routing protocol, which is crucial for proper MANET operation

II. FUZZY LOGIC

Fuzzy logic is a rigorous mathematical field, and it provides an effective vehicle for modeling the uncertainty in human reasoning. In fuzzy logic, the knowledge of experts is modeled by linguistic rules represented in the form of IF-THEN logic. A fuzzy set is uniquely determined by its membership function (MF), and it is also associated with a linguistically meaningful term. Fuzzy logic provides a systematic tool to incorporate human experience. It is based on three core concepts, namely, fuzzy sets, linguistic variables, and possibility distributions [12].

The importance of fuzzy logic derives from the fact that most modes of human thinking and especially common sense reasoning are approximate in nature. The essential features of fuzzy logic are as follows:

- In fuzzy logic everything is a matter of degree.
- Any logical system can be fuzzified.
- In fuzzy logic, knowledge is interpreted as a collection of elastic or, equivalently, fuzzy constraint on a collection of variables.
- Inference is viewed as a process of propagation of elastic constraints.

Fundamentals of Fuzzy Logic:

- **Universe of Discourse:** The universal set C: C→ [0,1] is called the universe of discourse, or simply the universe. The implication C→[0,1] is the abbreviation for the IF-THEN rule: ―IF c is in C, THEN its MF μC(c) is in [0,1].‖, where μC(c) is the MF of c. The universe C may contain either discrete or continuous values.
- **Fuzzy Set:** A fuzzy set S in C is defined by S= c, c c∈ C, where μC c∈ [0, 1] is the MF of x in A. For μ, the value 1 stands for complete membership of the set S, while 0 represents that s does not belong to the set at all.
- **Support:** The elements on fuzzy set S whose membership is larger than zero are called the support of S ca S = c ∈ S μS c >0 . (3)
- **Height**: The height of a fuzzy set S is defined by hgt S =sup μS c c∈.
- **Normal Fuzzy Set and Non-normal Fuzzy Set**: A fuzzy set S is said to be *normal* if hgt(S)=1. If 0<hgt(S)<1, the fuzzy set S is said to be *non-normal*. The non-normal fuzzy set can be normalized by dividing the height of A, i.e., μ (c) = μ(c) hgt(C).
- **Fuzzy Subset**: A fuzzy set S=c, c c∈ C is said to be a fuzzy subset of N= c,N c c∈C if μS c ≤μN c , denoted by S⊆N.
- **Empty Set**: The subset of C having no element is called the *empty set*, denoted by ∅.
- **Complement:** The complement of S, written, ¬S or NOT S, is defined as μA (x) = 1−(x). Thus, X =∅ and ∅ =X.

III. FIREFLY

The Firefly algorithm is a freshly developed nature-inspired Meta heuristic algorithm. The Firefly algorithm is encouraged by the social presentation of fireflies. Fireflies may also be called lightning bugs. There are about 2000 firefly species in the globe. Most of the firefly species construct short and rhythmic flashes. The model of flashes is unique for a particular species. A firefly's twinkle mainly acts as a signal to attract mate partners and potential prey. Flashes also serve as a defensive warning instrument. The following three idealized rules are considered to explain the firefly algorithm [13, 14]:

1) All fireflies are unisex so that one firefly will be involved to other fireflies despite of their sex.

2) Attractiveness is relative to their brightness; thus, for any two flashing fireflies, the less bright one will move in the direction of the brighter one. The attractiveness is relative to the brightness and they both reduce as their distance increases. If there is no brighter one than a particular firefly, it will move arbitrarily.

3) The clarity of a firefly is affected or unwavering by the landscape of the idea function. For a maximization problem, the brightness may be comparative to the objective function value. For the minimization problem, the brightness may be the give-and-take of the objective function value. The make believe code of the firefly algorithmis given as below**:**

A. Attractiveness

The attractiveness of a firefly is determined by its light intensity. The attractiveness may be calculated by using the equation:

$$\beta(r) = \beta_o e^{-r^2}$$

B. Distance

The distance among any two firefly's k and l at Xk and Xl is the Cartesian distance as follows:

$$r_{ld} = \left\| x_k - x_l = \sqrt{\sum_{k=1}^{d} (x_{k,o} - x_{l,o}{}^2)}\right.$$

C. Movement

The movement of a firefly k that is attracted to another more attractive firefly l is determined by 0.

$$x_k = x_k + \beta_0 e^{-r^2}(X_l - X_k) + \propto (\text{rand} - \frac{1}{2})$$

IV. CONCLUSION AND FUTURE SCOPE

As routing protocols of MANET are unprotected and henceforth come about into the system with the noxious malicious nodes in the system. In this context, preventing or detecting malicious nodes launching collaborative attacks is a challenge and due to these attacks network has to face end delay while delivering packets to the destination. So this paper has discussed two methods i.e. fuzzy logic and firefly algorithm. And it has been concluded that fuzzy logic has better results w.r.t firefly method.

REFERENCES

1. J. Cai, P. Yi, et al, “An Adaptive Approach To Detecting Black And Gray Hole Attacks In Ad Hoc Network,” 24th IEEE International Conference on Advanced Information Networking and Applications, 2010.
2. D.Virmani, et al, “Exponential Trust Based Mechanism to Overcome Black hole Attack in Wireless Sensor Networks,” Proceedings of The International Conference on Computing, Informatics and Networks, pp.59-63, 2014.
3. Chang, J. M., “Defending against collaborative attacks by malicious nodes in MANETs: A cooperative bait detection approach”, Systems Journal, IEEE, Vol.9, pp. 65-75, 2015.
4. Arunmozhi, S. A. and Y. Venkataramani, "Black Hole Attack Detection and Performance Improvement in Mobile Ad-Hoc Network", Information Security Journal: A Global Perspective, Vol. 21, pp. 150-158, 2012.
5. Hazra, Swarnali, and S. K. Setua, "Black hole Attack Defending Trusted On-Demand Routing in Ad-Hoc Network", In Advanced Computing, Networking and Informatics, Vol. 2, pp. 59-66, 2014.
6. Shi, Fei, et al, “A cluster-based countermeasure against black hole attacks in MANETs”, Telecommunication Systems, Vol.57, 119-136, 2014.
7. Tanuja, R., "Elimination of black hole and false data injection attacks in wireless sensor networks", In Proceedings of the Third International Conference on Trends in Information, Telecommunication and Computing, pp. 475-482. Springer New York, 2013.
8. Sheenu Sharma and Roopam Gupta, “Simulation Study of Black hole Attack in Mobile Adhoc Networks”, In proceedings of Engineering Science and Technology, 2009.
9. Ahmed Sherif, et al, “A Novel Taxonomy of Black-Hole Attack Detection Techniques in Mobile Ad-hoc Network (MANET)”, IEEE, pp. 346-352, 2013.
10. Mohammad Wazid, et al, “Detection and Prevention Mechanism for Blackhole Attack in Wireless Sensor Network”, International conference on Communication and Signal Processing, IEEE, pp. 576- 581, 2013.
11. SoufieneDjahel, et al, “Mitigating Packet Dropping Problem in Mobile Ad-hoc Networks”, IEEE communications surveys & tutorials, Vol. 13, no. 4, pp. 658-672, 2011.
12. Shill, P.C.; Amin, M.F.; Murase, K., "Design of a self-tuning hierarchical fuzzy logic controller for nonlinear swing up and stabilizing control of inverted pendulum," in Fuzzy Systems (FUZZ-IEEE), 2012 IEEE International Conference on, pp.1-8, 10-15 June 2012.
13. K. Naidua, H. Mokhli, A. H. A. Bakar, “Application of Firefly Algorithm (FA) based optimization in load frequency control for interconnected reheat thermal power system”, 2013 IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT), IEEE, 2013.
14. Sabrina Merkel, Christian Werner Becker, HartmutSchmeck, “Firefly-Inspired Synchronization for Energy-Efficient Distance Estimation in Mobile Ad-hoc Networks”, IEEE, pp.205-212, 2012.

BIOGRAPHY

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