Trust Model for File Sharing P2P Networks Using Fuzzy Logic

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***Abstract*--- Peer to peer (P2P) systems are autonomous and decentralized systems with a form of distributed computing. Many peer-to-peer networks are used to share different types of files. In order to choose the right peers, the requesting peer should assess the trustworthiness of the requested peer. In this paper it has been tried to evaluate the trustworthiness of each peer in the network using Fuzzy logic. To estimate the trust some of the parameters only considered, namely – File size, File Quality, Upload speed and Download speed.**

***Keywords*-- Peer to Peer Networks, Trust and Fuzzy logic.**

1. INTRODUCTION

Peer to Peer (P2P) systems are one of the popular distributed systems which are used in many areas of communication for many years. Peer-to-peer networks have many benefits over standard client-server approaches. Peer to peer (p2p) networks are widely used nowadays with as main application file sharing. Examples include file sharing systems like Bit Torrent, Napster and Gnutella.

When a peer joins a peer-to-peer (p2p) network, it becomes part of it. The P2P communities are often established dynamically by peers that are unrelated and unknown to one another. Peers should select a secure, powerful and steady partner in order to complete the transaction quickly and securely. As the peers cannot know the status of the other, it is difficult to select appropriate partner in P2P network,. The decentralized nature of P2P networks will affect the trustworthiness of these networks. Since peers are autonomous, they determine for themselves when to cooperate, when to cease cooperating, and how to conduct themselves.

Trust in information systems is usually the quantifiable or describable belief on a given entity. System trust can be subjective, objective, or by consensus. Because information systems emulate and enhance the physical systems, system trust, on one hand derives many characteristics from human trust, and on the other, introduces new characteristics unique to it. Trust representation and management has a long history of research work, and depending on the circumstances and applications, trust has many different representation and management principles in different systems.

The typical trust models in P2P include EigenRep, Poblano, Bayesian Network trust etc. But the subjective nature of trust in these models results in uncertainty and fuzziness in characters. Fuzzy logic offers better ability to handle this uncertainty and imprecision effectively. Fuzzy inference system uses linguistic terms and hedges to effectively represent trust. So by using Fuzzy logic, terms like trustworthy and honesty are quantified and can be more accurately used for analysis of trust in P2P networks.

2. RELATED WORK

Reputation-based trust models have been a hot topic and studied extensively in literature. EBay user feedback system [1], for example, is the simplest and the most common trust management system.

Agent trust scores are computed in P2P networks as in [2, 3] through repeated and iterative multiplication and aggregation of trust scores along transitive chains until the trust scores for all agent members of the P2P community converge to stable values. The PeerTrust model [4] is developed, which is based on a weighted sum of five peer feedback factors.

Now, artificial intelligence technologies have been applied to the trust managements, e.g. Bayesian network based trust models were proposed by [5, 6]. The basic idea of neural network-based reputation model is to aggregate a user's multiple local reputations through a neural network to approximate the user's global reputation [7]. In [8], Confirmation theory is used for assessing the trustworthiness of a peer.

The fuzzy theory is quite useful in manipulating imprecise or uncertain information. There are a few Fuzzy theory-based distributed reputation systems exist in literature [9, 10, 11, 12, 13], but only a few trust factors are introduced in these fuzzy trust systems. There is no sufficient information to access the trust accurately.

3. TRUST MODEL

3.1 GENERAL P2P TRUST MODEL

A System model was designed for evaluating the trust value of each peer in a P2P network. This is as shown in fig.1

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A peer to peer network simulator was employed to measure the attributes according to the desired standards. These values were then fuzzified and given to a FIS which was hierarchical i.e. output of one FIS was given as input to another FIS. The output of FIS which was the trust value of member peer was assigned to each member peer and this value measured for a specified number of interactions if a file sharing application is considered .So if a peer wants to interact with another peer it can see the trust value of that peer for the previous interaction and then decide whether to interact or not

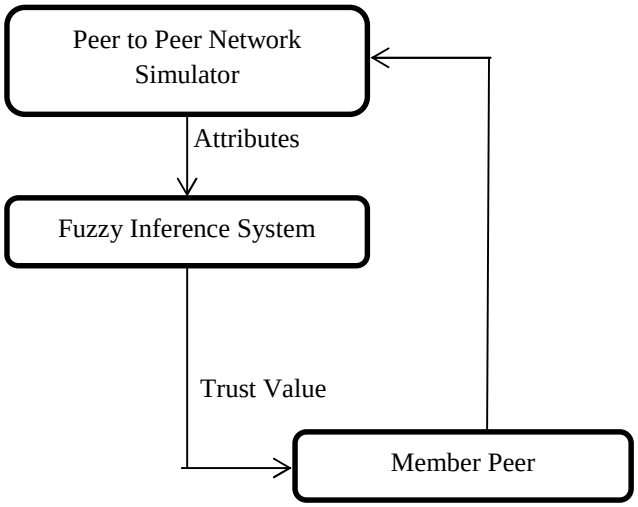

Figure 1: General Model

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3.2 Proposed P2P TRUST MODEL

Content storage and exchange is one of the areas where P2P technology has been most successful. Most existing trust models focused on malicious behaviors which does not fully capture the meaning of trust. A satisfying interaction has to be secure as well as quick. The file size to complete transaction is another criterion for choosing partners in addition to malicious behaviors.

In a peer-to-peer network, file provider's capabilities are different. We identified the factors to evaluate the trust of a peer and it is depicted in fig.2.

3.2.1 Upload Speed and Download Speed: Some peers may be connecting through a high-speed network, while others connect through a slow modem. This factor can be detected by the client software.

3.2.2 File Quality: This factor can tell you whether the peer is honest for his offering. Each peer *i* can store the number of usable files it has downloaded from peer *j, vf(i, j)* and the number of useless files it has downloaded from peer *j, ff(i, j)*. Then, *Fqij* is defined: $Fqij = vf(i, j) /(vf(i, j) + ff(i, j))$.

3.2.3 File Size: When downloading a large file, a peer with high upload speed and long online time will be given higher trust index. But for small files, upload speed or online time should matter less.

4. IMPLEMENTATION

In designing fuzzy inference system, it is easy to understand that membership functions are associated with term sets, which normally appears in the antecedent or consequent of rules. We have divided parameter file size into three categories according to its values in table 1:-

Class Name	File Size Range Value	Symbol
Low	100 - 450	Lfs
Medium	350 – 750	Mfs
High	650 - 1000	Hfs

Table 1: Ranges of File Size

Following the same way, we have divided parameters file quality, upload and download speed into three categories according to its values shown in table 2 and 3.

Class Name	File Quality Range Value	Symbol
Low	100 - 450	Lfq
Medium	350 – 750	Mfq
High	650 - 1000	Hfq

Table 2: Ranges of File Quality

Class Name	Upload and Download Speed Range Value	Symbol
Low	0 – 4.5	Lus & Lds
Medium	3.5 – 7.5	Mus & Mds
High	6.5 - 1	Hus & Hds

Table 3: Ranges of Upload and Download Speed

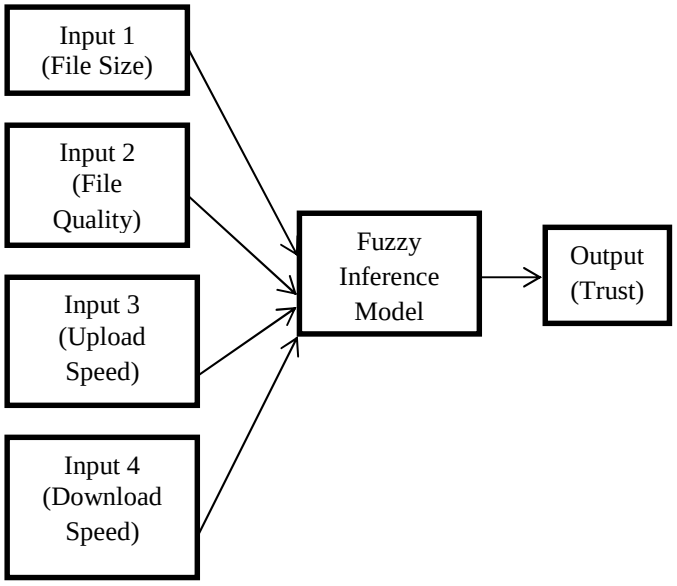

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Figure 2: Proposed Trust Model

Fuzzy inference is the process of formulating the mapping from a given input to an output using fuzzy logic. The mapping then provides a basis from which decisions can be made, or patterns discerned. According to our inputs, there are 81 rules designed for formulating the trust model. The definitions of some of the rules are as follows:

Rule 1: If File Size=low, Reliability=low, Upload Speed=low and Download Speed=low Then Trust=low

Rule 2: If File Size=low, Reliability=low, Upload Speed=low and Download Speed=medium Then Trust=low

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Rule 81: If File Size=high, Reliability=high, Upload Speed=high and Download Speed=high Then Trust=high

From the input fuzzy sets described above, passing those fuzzy sets through inference rules and fuzzy base rules, we get crisp values for our new parameter trust T. According to Triangular membership function equation, it can also be classified into three categories after finding out and plotting as shown in table 4.

Class Name	Trust Range Value	Symbols
Low	0% - 40%	LT
Medium	30% - 70%	MT
High	60% - 100%	HT

Table 4: Ranges of Output Trust in P2P

`Calculating T, we have applied FAM rule of fuzzy logic for creating a relation among file size, file quality, upload and download speed. Trust T represents this relation in percentage such a way that the quality of the product can easily be understood.

The four inputs provided to the fuzzy logic toolbox are as shown in Fig 3 and the formation of rules and trust value evaluation for a set of user defined input is shown in Fig 4.

5. COMPARISON

5.1 EXISTING MODEL

- Calculates trust values based on subjective logic, Bayesian logic, etc.
- Calculates the trust value of a system depending on recommendation of some experts, means on some certain values.
- This model is developed on the basis of human understanding.
- Taking different type of decisions about something with the help of subjective logic is much difficult for human beings to understand.
- It is difficult for the new users to understand and represent the concept of subjective logic, Bayesian logic, etc.

5.2 PROPOSED MODEL

- Calculates trust values based on fuzzy logic.
- Calculates the trust value of a system depending on the rules.
- This model is developed on the basis of machine understanding.
- It is much helpful for human beings to understand any situation and taking different type of decisions about something with the help of fuzzy logic.
- The representational model will become friendlier to the users and the developers and make it more appropriate than the previous models.

6. CONCLUSION

In this paper a fuzzy inference system for evaluating the trust of P2P systems is proposed. This is better than the previous methods because additional factors for analyzing the trust have been considered which improves the accuracy. Additionally, as fuzzy logic is used, it handles the uncertainties involved better, while considering the factors for evaluating trust. This method is less complex compared to other existing methods. We emphasize the fact that trust is a multi-faceted and context dependent variable and we use fuzzy logic to build a trust evaluation model.

7. FUTURE WORK

We are currently extending the model to consider some new parameters, and use them as another parameter when calculating trust values. We are also performing some more experiments to evaluate the work in other scenarios.

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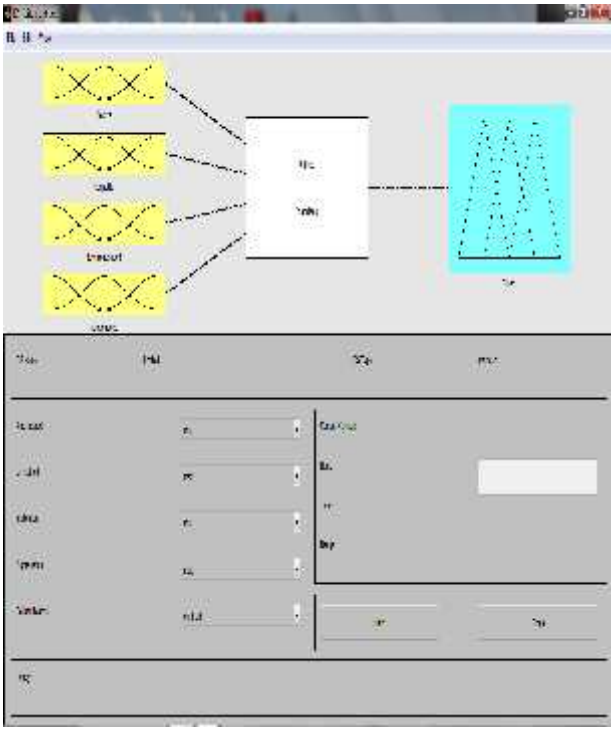

Figure 3: FIS EDITOR

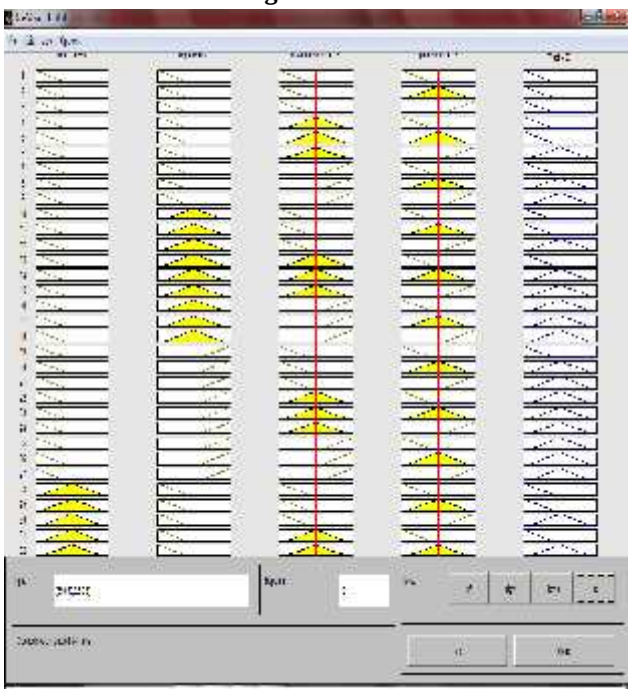

Figure 4: FIS Rule Viewer

REFERENCES

[1] Resnick, P., and Zeckhauser, R., "*Trust among Strangers in Internet Transactions: Empirical Analysis of eBay's Reputation System*," Advances in Applied Microeconomics, 11, pp. 127–157.

[2] Kamvar, S.D., and Schlosser, M.T., Hector Garcia-Molina, "*EigenRep: Reputation management in P2P networks*," In: Proceedings of the 12th international conference on World Wide Web, vol. 1, pp. 123~134.

[3] DOU, W., WANG, and H.M. etc. "*A recommendation based peer-to-peer trust model*," Journal of Software, 15, pp. 571-583.(in Chinese)

[4] Xiong, L., and Liu, L., "*PeerTrust: Supporting Reputation- Based Trust for Peer-to-Peer Electronic Communities*," IEEE transactions on Knowledge and Data Engineering. 16, pp. 843 – 857.

[5] Wang, Y., and Vassileva, J., "*Bayesian Network-Based Trust Model*," In: Proceedings of IEEE/WIC International Conference on Web Intelligence, Halifax, Canada, pp. 372- 378.

[6] Wang, Y., and Vassileva, J., "*Trust and Reputation Model in Peer-to-Peer Networks*," In: Proceedings of the Third IEEE International Conference on Peer-to-Peer Computing, Linköping, Sweden, pp. 150-158.

[7] Song, W.H., and Phoha, V.V., "*Neural network-based reputation model in a distributed system*," In: proceedings of IEEE 2004 CEC, Beijing, China, pp. 321-324.

[8] Hou, M.S., Lu, X.L., Zhou, X., and Zhan, C., "*A trust model of p2p system based on confirmation theory*," Operating Systems Review, 39, pp. 56-62.

[9] Aringhieri, R., Damiani, E., Vimercati, S.D.C.D., Paraboschi, S., and Samarati, P., "*Fuzzy techniques for trust and reputation management in anonymous peer-to-peer systems: Special Topic Section on Soft Approaches to Information Retrieval and Information Access on the Web*," Journal of the American Society for Information Science and Technology, 57, pp. 528-537.

[10] Bedi, P., and Kaur, H., "*Trust based Personalized Recommender System*," INFOCOM Journal of Computer Science, 5, pp. 19-26.

[11] Griffiths, N., Chao, K.M., and Younas, M. , "*Fuzzy Trust for Peer-to-Peer Systems*," In: Proceedings of the 26th IEEE International Conference Workshops on Distributed Computing Systems, Lisboa, Portugal , pp. 73.

[12] Song, S.S., Hwang, K., and Kwok, Y.K., "*Trusted Grid Computing with Security Binding and Trust Integration*", Journal of Grid Computing, 3, pp. 53-73.

[13] Song, S.S., Hwang, K., Zhou, R.F. and Kwok, Y.K., "*Trusted P2P Transactions with Fuzzy Reputation Aggregation*," IEEE an Internet Computing, 9, pp. 24-34.

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