Improvement of reliability in semantic web network using fuzzy technique

Forouzan Soudaei

Department of computer, Islamic Azad University of Najafabad, Esfahan, IRAN

Abstract
To discover suitable semantic web services is a key technology to web service program for the given requirement to user. Recently, semantic web services have been converted into growing application through internet. At the same time, security and reliability become crucially important and significant. However, there is no effective technique to control access to semantic web services, which can provide reliable web services for the users.
A strategy has been proposed in this essay to improve reliability in semantic web network using fuzzy technique and three criteria of users' profile including numbers of visits of a web page by user; period of visit of a web page by user; and level of experience and skill of user in the field of pages s/he visits where implementation of above technique has been done in MATLAB simulator.

Key-words:
Reliability, Fuzzy technique, Semantic web, reliability, network

1. Introduction

The age at which we live is the age of potential for selection of the best information at right time. Wide World Web (WWW) is a place that has been designated for data where all people can easily access to the data and information. Briefly, semantic web is intended to organize and store data in such a way that searching and retrieval of information can be processed and even perceivable by computer. In other words, semantic web is a type of technique for encoding and retrieval of data so that machines can process and perceive the given information [1].

Category of Web3.0 or semantic web, which is today assumed as new and attractive subjects in the field of computer and communications, causes searching on internet to be faster and more easily for users. Most of studies which have been so far carried out on semantic web were designated for determination of the relevant standards to the communication rules and facts. Resource Description Framework (RDF), RDF schemata, and Ontology Web Language (OWL) etc. may provide the needed ground for semantic web structure. However, after these standards were widely used so far it should be identified that to what extent any data source is reliable. One solution is that all of embedded data in semantic web should be with high quality and with no conflict. However, this is almost impossible due to intensity and diversification of sources to the extent that although advancement has occurred in WWW, no effort has been made for central control over quality of data. It is believed that this task is also not feasible in semantic web [2].

Subject of reliability is one of the main challenges in semantic web environment. Many studies have been conducted about reliability in different fields such as internet, business systems, and wide networks. Internet is a platform for low-cost connection and communication of people together at any time and most of such communications often take place between strangers. Reliability is a vital element in any transaction in online business [2].

2. A review on related works

According to the conducted studies in the field of semantic web, reliability is an important subject which has drawn attention by the people. Reliability plays crucial role in performance and management of virtual teams. This issue is supposed as basis of cooperation between team members as well.

Hojat Miandehi et al [3] expressed an approach in line with computation of rate of reliability in semantic web agent. The major part of contents in today web has been designated for use by human while machines are only capable for mastery and manipulation of data at word level. This issue is the paramount barrier against better support from web users. The solution for this problem is to display web content so that it can be easily processed for machine. At this mode, Artificial Intelligence (AI) techniques facilitate perceiving concepts for machines by benefitting from this type of display. This type of solution has been started and it will be led to enormous transformation on web that is called semantic web. Trust is considered as one of the essential bases used in everyday life interactions, transactions, and communications. This issue becomes more important in the web that provides indirect and unknown communication therefore calculation of trust level on the web has drawn attention by many researchers. The present paper is intended to express the existing

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challenge in semantic web agent and to propose solution to overcome this problem.

Zahra Rastgoo Khalari et al [4] explored metrics of reliability algorithms in semantic web. In order to use efficiently smart spaces and mutual effect among user and environment, reliability is assumed as a very important element which should include the minimum intrusion for user and it should be capable for extension by considering non-uniformity of infrastructure. Similarly, following to move toward semantic web, the reliability should be automatically calculated and displayed on this system. Despite of various proposed techniques in articles, selection of appropriate method as well as considering suitable criterion, has been turned into a challenge in filtering and security for deletion of daily data and so forth. It has been tried in this paper to express trend of execution of trust and its rate hoping that it can be employed for protection from security of social networks.

Artz and Gil [5] examined the trust in computer sciences and semantic web. Assessment of reliability is considered as an important point in performance of a virtual team for identifying reliability of each of members and positions of cooperation among the members. This task is done in order to suggest decision-making supporting method to assess reliability level. Reliability assessment framework is created by two dimensions of trust and cooperation. Accordingly, Multiple Attribute Decision- making Analysis (MADA) technique is proposed according to linguistic binary display model for measurement and evaluation of efficiencies on trust and cooperation.

Y. Gil and artz [6] suggested a strategy toward reliability of content in web sources. Trust level may be identified for any virtual member and team by measurement of efficiencies so that to improve management of virtual team. Moreover, Web Test Evaluation System (WTES) was designed and developed to support from reliability assessment activities by a virtual team. Finally, the application is provided for proposing potential for execution of the suggested decision-making support technique. Trust is an interesting subject. This subject has been noticed by many researchers from different points of view e.g. psychology, sociology, economics, philosophy, computer sciences, and management. Several definitions have been mentioned about trust in present research.

J.A. Golbeak [7] examined computations and use of trust in web-based social networks. They indicated that trust was mainly more effective on perceptional elements (e.g. competence, credibility, professional issues) than on other efficient components (such as protection and emotional relations with each other) through empirical analysis.

Gregory Albiston et al [8] modeled trust in semantic web environment. In this investigation, they identified some barriers against termed carpooling and conditional accompaniment (i.e. the car is shared with others under some conditions for traveling in case of existing blank space in the given automobile) in USA and developed a structure for derivation of reliable recommendations based on social network data. This structure has been founded for a semantic modeling technique that discusses about its competence to remove barriers against carpooling while it highlights the features relating to reliability and data which can be used in social network. Identification of terms is composed of ontologies and public social networks that can be used as a basis for direct and indirect derivation of reliability values in implementation and they are composed of the focus point for the future works.

Owen Sacco et al [9] suggested assessment of claims for management of privacy in sematic web of social network. The programs of social network have been engineered regarding the users who share their own private information with their connecting cohorts. They create total privacy conditions in which the users determine with whom they may share their information. However, it does not model real world situation when someone may trust in a person with specific private data. Thus, trust should be addressed when the privacy conditions are implemented.

3. Presentation of suggested technique

The trust has been improved in semantic web in this article using parameters of users' profile based on reputation trust (reliability) by means of fuzzy technique. Three parameters have been employed for assessment of trust based on profile of users in this survey as follows:

1. Number of visits: Number of times a user visits a certain page among web pages
2. 2. Duration: The time period a user observes a page
3. Experience: The level experience and skill of user when s/he evaluates that page

Dataset of University of Stanford was utilized in this article.

3.1 Reliability factor in suggested method

A series of steps should be taken respectively to assess trust using fuzzy technique in order to achieve our final answer.

3-1-1- Parameter of number of visits by user

We assumed values of this parameter at 3 levels.

- Low values

● High values

● Medium values

3-1-2- Parameter of visit of a certain web page

We considered values of these parameters at three levels (low, medium, and high).

3-1-3- Parameter of skill and experience of user in the visited web page

We assumed values of these parameters at three levels (low, medium, and high).

3.2 Parameter used in a fuzzy system

We define the following items in order to have a perfect fuzzy system:

1. T-norm: AND Operator
2. S-norm: OR Operator
3. Implication
4. Aggregation
5. Defuzzification

Here we will display these 5 items for every 4 fuzzy systems where they include from left to right respectively: name of fuzzy system, type of fuzzy, T-norm, S-norm, Implication, Aggregation, and Defuzzification. We used four fuzzy systems instead of one fuzzy system with different inputs as follows:

1. Trust0,'mamdani','min','max','min','max','centroid.
2. Trust1,'mamdani','prod','max','prod','max','centroid.
3. Trust2,'mamdani','min','max','min','max','bisector.
4. Trust3,'mamdani"prod','max','prod','max', 'bisector.

3.3 Simulation and implementation of fuzzy technique

Mamdani fuzzy technique and trapezoid function have been utilized in this study. The related membership function is shown in Fig 1.

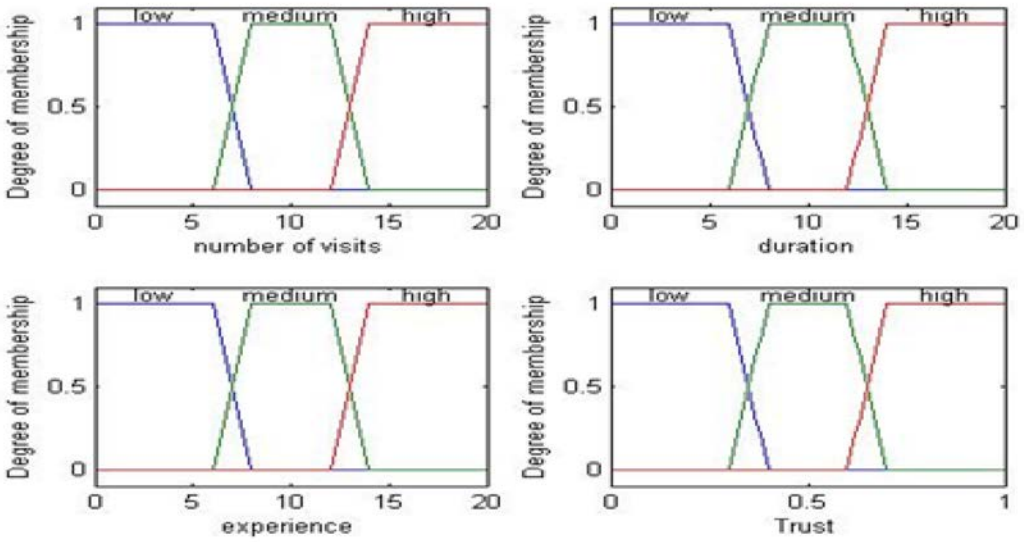

Fig. 1 The related membership function to the suggested fuzzy technique

3.4 Fuzzy rules for the suggested technique

As we know, fuzzy rules are considered as the foremost topic in fuzzy system in which the rules are written according to the principles based on which total number of rules is assumed as sum of product of numbers of status variables to inputs multiplied to number of output status variables. This value includes all modes and also number of Rules may be less than this quantity because some of modes may not occur at all with respect to dataset values so we subtract these modes from total modes. According to variables we defined and based on membership

functions and variable linguistic levels, 56 rules have been written for fuzzy systems by our suggested technique. We have displayed some of these rules in Fig 2.

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1. (number of visits==low) & (duration==low) & (experience==low) => (Trust=low) (1)
2. (number of visits==low) & (duration==low) & (experience==medium) => (Trust=low) (0.66)
3. (number of visits==low) & (duration==low) & (experience==medium) => (Trust=medium) (0.34)
4. (number of visits==low) & (duration==low) & (experience==high) => (Trust=high) (0.34)
5. (number of visits==low) & (duration==low) & (experience==high) => (Trust=low) (0.66)
6. (number of visits==low) & (duration==medium) & (experience==low) => (Trust=low) (0.66)
7. (number of visits==low) & (duration==medium) & (experience==low) => (Trust=medium) (0.34)
8. (number of visits==low) & (duration==medium) & (experience==medium) => (Trust=low) (0.34)
9. (number of visits==low) & (duration==medium) & (experience==medium) => (Trust=medium) (0.66)
10. (number of visits==low) & (duration==medium) & (experience==high) => (Trust=high) (0.34)
11. (number of visits==low) & (duration==medium) & (experience==high) => (Trust=low) (0.33)
12. (number of visits==low) & (duration==medium) & (experience==high) => (Trust=medium) (0.33)
13. (number of visits==low) & (duration==high) & (experience==low) => (Trust=low) (0.66)
14. (number of visits==low) & (duration==high) & (experience==low) => (Trust=high) (0.34)
15. (number of visits==low) & (duration==high) & (experience==medium) => (Trust=high) (0.34)
16. (number of visits==low) & (duration==high) & (experience==medium) => (Trust=medium) (0.33)
17. (number of visits==low) & (duration==high) & (experience==medium) => (Trust=low) (0.33)
18. (number of visits==low) & (duration==high) & (experience==high) => (Trust=high) (0.67)
19. (number of visits==low) & (duration==high) & (experience==high) => (Trust=low) (0.33)
20. (number of visits==medium) & (duration==low) & (experience==low) => (Trust=low) (0.66)
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Fig. 2 The related membership functions to the suggested fuzzy technique

3.5 Design of fuzzy system

We should design a fuzzy system using definitions and membership functions we defined. The rules of fuzzy technique we used in our suggested method are fuzzy rule based on Mamdani deduction. The fuzzy system has shown with three attributes of sematic web reliability after definition of their rules in Fig 3.

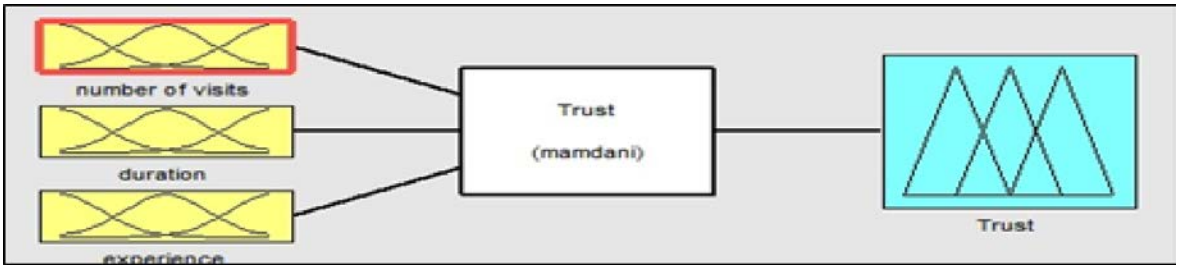

Fig. 3 Mamdani fuzzy system plus 56 fuzzy rules

Membership function and also values for mode of variables and rules are the same for all 4 fuzzy systems. The only difference is related to type of input and type of centroid where all modes have been considered for these fuzzy systems.

3.6 Results simulation for the suggested technique

We will observe output and the results of the suggested method after design of 4 fuzzy systems in this part of research. The final output has been specified for 3 parameters in Fig 4 in which the presented method has been displayed with the values of the same parameters inside data.

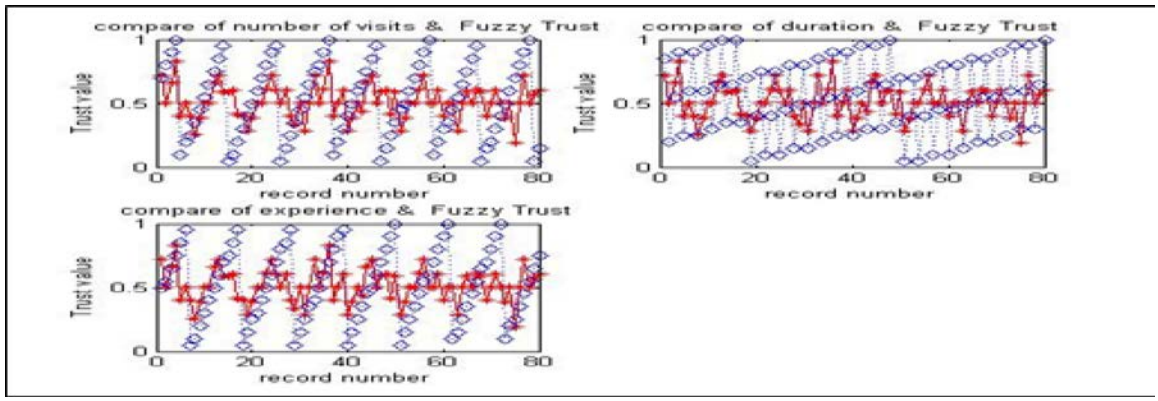

Fig. 4 The final output resulting from 3 specified parameters on dataset

The values of reliability given for 4 designed fuzzy systems are shown with values of trust inside dataset in Fig 5 in the following.

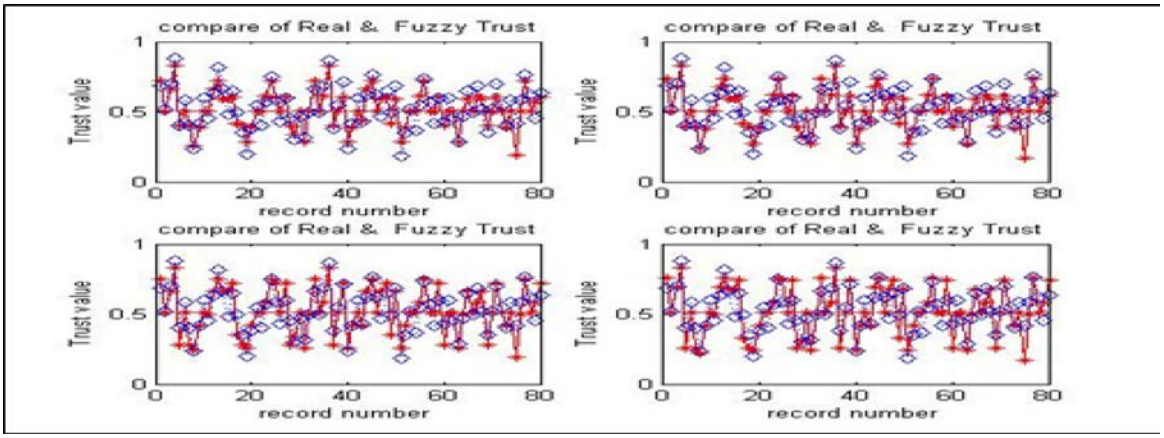

Fig. 5 The reliability resulting from 4 designed fuzzy systems with dataset trust

At the end, we should compare output of dataset record from the fuzzy technique with the real output so that relative error is derived from their comparison. We should add all these error together and finally divide it by the specified Value by dataset. We indicate the value of given output error in these 4 designed fuzzy systems in Fig 6 in which each of these error values is smaller it showed that system is better.

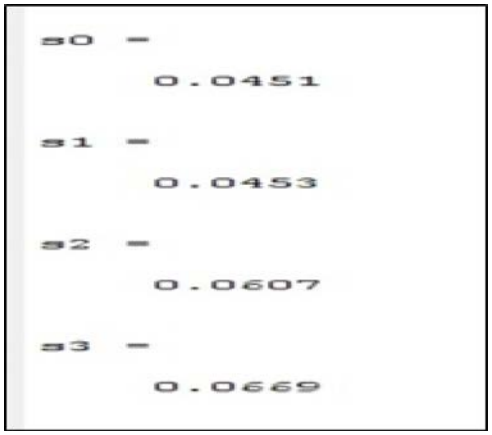

Fig. 6 The output error of 4 fuzzy systems

According to the specified results from the output of first fuzzy system are assumed as better choice for the above-said operation.

4. Conclusion

It requires solving problem of reliability and security issues to progress in semantic web and acceptance by users. The related challenges should be assessed to present solution in this regard. We posited a strategy for assessment of reliability in semantic web in this article using profile of users and the specified sub-features where this strategy is more accurate with more suitable responding speed than the technique presented in the field of reliability in semantic web and social networks and this is due to use of proper classification, selection of suitable membership function, use of reliable dataset in line with research requirements and above all use of total fuzzy rules for number of given modes by means of fuzzy technique. However, in this method of categorization, we considered sub-features of users in three parameters that cause it not to respond to more fields of web and this is assumed as a defect for this technique. Similarly, this technique is relatively followed by less error than other similar methods.

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