Fuzzy Metagraph and Hierarchical Modeling

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Abstract— **In this paper , we show the transformation of a fuzzy metagraph from one form to another based on the projection operator that identifies only the necessary sets of elements for computing. This paper also show some important views that can be constructed by projection operation of a fuzzy metagraph. Aggregare Modeling is used for the combination of two fuzzy metagraphs to produce a new fuzzy metagraph.**

The projection of fuzzy metagraph could be used to provide high level view that reduces the unnecessary details.The projection of fuzzy metagraph is more dominant because there is less number of edeges.

Key words: Electronic money, Electronic banking, Fuzzy metagraph

I. INTRODUCTION

Deicission support system is used to take decision quickly in complicated situations. Fuzzy metagraph is very remarkable and powerful tool. The main purpose of DSS is to provide support to analse any system to user with effective manner hence it helps user to concentrate their efforts to solve the problem.

Electronic banking (finance definition) is a form of banking in which funds are transferred electronically between financial institutions instead of cash, checks, or other negotiable instruments being physically exchanged. The ownership of funds and transfers of funds between financial institutions are recorded on computer systems connected by telephone lines. Customers of the financial institutions can access their records using a password or personal identification number (PIN).

Electronic money (also known as e-money, electronic cash, electronic currency, digital money, digital cash or digital currency) refers to money or scrip which is exchanged only electronically. Technically electronic or digital money is a representation, or a system of debits and credits. The rapid development of e-banking capabilities carries risks as well as benefits.

It is already accepted that e-banking can be separated into two streams one is e-money products, mainly in the form of stored value products, the other is electronic delivery channel products or access products. The latter are products that allow consumers to use electronic means of communication to access conventional payment services. As we know the e-money is money that moves electronically and it can be carried on the person to person in the form of a smart card or stored value card or electronic wallets. It can be used at the point of sale and can be moved around or spent through telephone lines to banks or other provides or issuers.

Fuzzy logic was initiated in 1965 by Lotfi A. Zadeh and it was first invented as a representation scheme and calculus for uncertain or vague notions. It is basically a multi-valued logic that allows more human-like interpretation and reasoning in machines. It allows intermediate categories between notations such as true/false, hot/cold, black/white etc. as used in Boolean logic. In fuzzy system values are indicated by a number in the range of 0 to 1. Where 0 represents absolute falseness and 1 represents absolute true. Fuzzy rule based expert system could be used in business, robotics, manufacturing, online servicing and many other field of decision making with imprecise and uncertain knowledge.We use this fuzzy rule based system for risk management.

II. FUZZY METAGRAPH

A. Metagraph

A metagraph is a graphical structure that represent directed relationships between sets of elements.

For given finite generating set X={ x_i, i=1………I}, a metagraph is an ordered pair S=<X,E> .In which E is a set of edges E={ $ě_{k , k=1......K}$}.

B. Fuzzy Metagraph

The Fuzzy metagraph is a new method of constructing fuzzy knowledge base. Based on the analysis of existing fuzzy graph a new graph theoretic construct. This construction combines and expands fuzzy hypergraph and fuzzy directed graph.

A fuzzy metagraph is a triple Š ={X,x̄, Ě } where X is a finite set and æ is a fuzzy set on X and Ě is a fuzzy edge set { $ě_{k, k=1......K}$}. Where each component $ě_k$ in Ě is characterized by an ordered pair. In which E is a set of edges E={ $ě_{k , k=1......K}$}, and each eage is an ordered pair.

III.   AGREEGATE MODELLING

DEFINATION : Aggregare Modeling is used for the combination of two fuzzy metagraphs to produce a new fuzzy metagraph.

If $Š_1$ =<X_1, $\bar{x_1}$, $Ě_1$> and $Š_2$ =<X_2, $\bar{x_2}$, $Ě_2$> then new fuzzy metagraph , which we say sum of $Š_1$ and $Š_2$ like $Š_{12}$ = $Š_1$ + $Š_2$= <X_1 ∪ X_2, $\bar{x_1}$ ∪ $\bar{x_2}$, $Ě_1$ ∪ $Ě_2$ > .

Fig A shows following fuzzy rules:

1 If user want money then enter ATM card $\check{S}_1$ Password.
2 If user enter ATM card and password then ATM read card and verify   password.
3 If ATM read card and verify password then reject request or ask for   Enquiry/Deposit/Withdrawal.
4 If ATM ask for Enquiry/Deposit/Withdrawal then process or update request.
5. If process request ia for Withdrawal of meney then Enter amount.
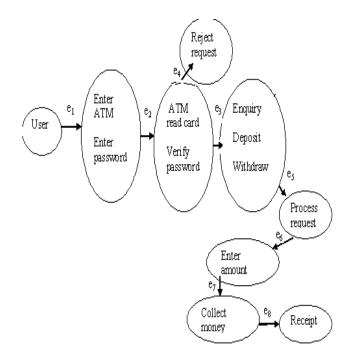6. If amount is enter then collect.

Fig.1(A) Fuzzzy Metagraph for user cash withdrawal process.

Fig. (b) shows following fuzzy rules:

1.   If user ATM card and password enter to ATM Then Bank ATM controller and Bank portfolio will verify the password.
2.   If bank ATM controller and bank portfolio verify the password Then user is not identified or Ask for transaction.
3.   If user is identified and Then ask for Enquiry/ Deposit / Withdrawal.
4.   If ATM ask for Enquiry/ Deposit / Withdrawal Then process/update request.
5.   If user enter the request amount withdrawal Then bank give money.
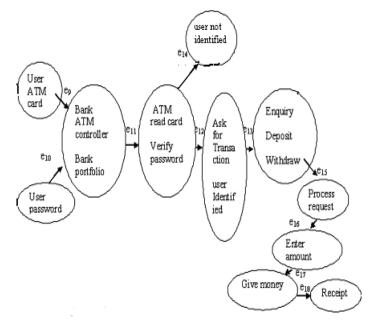6.   If bank give money Then generate the receipt.

Fig1(B) Fuzzy Metagraph for ATM process of money withdrawal

Fuzzy Aggregate modeling for fig.1(A) and fig.1(B) is shown in fig.(2). Then two fuzzy metagraph combine to prepare a new fuzzy Metagraph. The properties of therse twofuzzy metagraph is inherit in this aggregate modeling fuzzy metagraph. The sum of two fuzzy metagraphs in fig.2 dominates $Š_{12} = Š_1 + Š_2$.

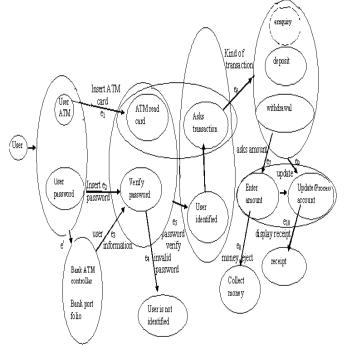Fig.2: Aggregation Fuzzy Metagraph for the ATM online banking process   [fig. (A) ∪ fig.(B)]

IV.   PROJECTIONS OF METAGRAPH

The projections shows only the necessary elements for computing. The Projection of fuzzy metagraph is also possible, which identifies only the necessary sets of elements for computing. $Š' = \{X', \tilde{x}', Ě' \}$ for every $ě'_k = < V'_k , W'_k > Є E'$

DEFINATION : If given fuzzy metagraph Š =$\{X, \bar{x}, \check{E}\}$ and X' $\subseteq$ X, then Fuzzy metagraph Š' =$\{X', \bar{x}', \check{E}'\}$ is a projection of S if

1. Š' $\subseteq$ Š is again a fuzzy metagraph.
2. $\check{e}'_k$=< V'$_k$, W'$_k$ > $\in$ Ě' and $\forall \bar{x}' \in$ W' there is a dominant path   M(V', $\{x\bar{\}}$) in S.
3. $\forall \bar{x}' \in$ X' there will be an dominant metapath M(V, x') in S and $\exists$ an edge $\check{e}'_k$=< V'$_k$, W'$_k$ > $\in$ Ě' .

Fig .2 has the following projection mfuzzy metagraph

Table 1: Compositions of the Projected Edges.

$$C(e'_1) = \{< e_1, e_2, e_5, e_6, >\}$$
$$C(e'_2) = \{< e' >\}$$
$$C(e'_3) = \{< e_4 >\}$$
$$C(e_4') = \{< e_7, e_9 >\}$$
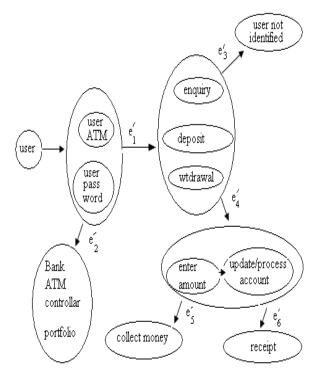$$C(e_5') = \{< e_8 >\}$$
$$C(e_6') = \{< e_{10} >\}$$

Fig.3 Projection of Fuzzy Metagraph (fig.2) for the ATM online banking process

V.   CONCLUSION

Dicission support systemi(DSS) is used to provide several views of the available information in to easily understandable way.The projection of fuzzy metagraph and Aggregation cover overall decision problem. The fuzzy metagraph would also be important for analysis an model would also be used to provide support to the users for easy understanding and to d design part of a system analysis.

VI.   REFERENCES

[1]   Zadeh L.A., "Knowledge Representation in Fuzzy Logic," IEEE Trans. Knowledge and Data Eng., vol. 1, pp. 89-100, 1989.
[2]   Dashore P., "Uncertainty Knowledge Representation Through Fuzzy Metagraph" International Journal of computer Application (IJCA), vol 2, pp149-154, 2007.

[3] Basu A. and Blanning R.W., "Workflow Analyasis Using Attributed   Metagraphs," Proc.   34th Hawaii Int'l Conf. System Sciences, pp. 3735-3743,   2001.
[4] Chandwani M. and Chaudhari N.S., "Knowledge Representation Using Fuzzy Deduction Graphs," IEEE Trans. Systems, Man, and Cybernetics, vol. 26, pp 848- 854, 1996
[5]   Basu A. Blanning R.W., and Shtub A. "Metagraphs in Hirarchical Modelling,"Management Science; May 1997;43,5;pg. 623-639.
[6] P.Dashore and S. Jain, "Fuzzy Rule based System and Metagraph   for risk Management in Electronic Banking Activities."IJET,vol.1no.1 april 2009.

AUTHORS PROFILE

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 Dr. Suresh Jain is a professor and Head of computer engineering department, IET DAVV. 22year experience of teaching and also guided research students. He is BE , ME , and PhD in Computer science and having good research interest and published more than 25 research paper in international journal and conferences.