International Journal of Advance Research in Science and Engineering
Vol. No. 5, Issue No. 08 , August 2016
www.ijarse.com
IJARSE
ISSN 2319 - 8354

LOSSLESS JOIN DECOMPOSITION AVOID INCONSISTENCY IN FUZZY RELATIONAL DATABASE FOR PERFECT OPERATION

[1]Soumitra De

[1] *CSE Department, College of Engineering and Management, Kolaghat, (India)*

ABSTRACT

Fuzzy relational database handle imprecise information on database to maintain integrity of operation. Already I handled different normal form to reduce redundancy of data in a database. Decomposition of a relation should not be arbitrary either by tuples or attributes of a relation. In this paper, I have focused on lossless decomposition of third or Boyce Codd normal form based relation so that I can get back original relation after joining all sub relations. Original relation can not retrieve from decomposed relation if the decomposition is not lossless. So any decomposed relation should follow lossless and dependency preservation for it's accurate normalized opration.

Keywords : *A -Ffd , Fuzzy Key, Fuzzy Relation, Dependency Preservation, Lossless Join.*

I. INTRODUCTION

I know that the classical relational data model introduced by Codd [1] in 1970 can use only precise and exact data. Database models using Fuzzy logic [2-11] is based on the fuzzy set theory proposed by Zadeh [12] in 1965 have been extensively studied to deal with such uncertain information in relational database.

One of the main moto of any databases is to minimise data redundancy which may lead to data consistency.

In this paper, my objective is to handle fuzzy relational database to keep the data in consistent form. Here I basically try to focus on lossless join operation on fuzzy data to make perfect operation for keeping consistent data into database.

II. BASIC DEFINITIONS

2.1 Definition

A fuzzy set FS in a universe of discourse U is characterized by a membership function $\mu_{FS}: U \rightarrow [0,1]$ and FS is defined as the set of ordered pairs $\{(u, \mu_{FS}(u)): u \epsilon U\}$, where $\mu_{FS}(u)$ for each $u \epsilon U$ denotes the grade of membership of u in the fuzzy set FS .

Note that a classical subset B of U can be viewed as a fuzzy subset with membership function μ_{FS} taken binary values, i.e.,

$\mu_B = 1$ if $u \epsilon B$

=0 otherwise

2.2. FUZZY FUNCTIONAL DEPENDENCY (ffd)

Let X, Y ϵ R= {A_1, A2 ,.....,A_n } . Choose a parameter αϵ[0,1] and propose a fuzzy tolerance relation R^1 . A fuzzy functional dependency (**ffd**), denoted by X→Y based *on α values of* R^1, is said to exist, if whenever t_1 [X]ϵ_α t_2[X] , it is also the case that t_1 [Y]ϵ_α t_2[Y] .

This **ffd** can be read as " X fuzzy functionally determines Y at α -level of choice" or "Y fuzzy functionally depends on X at α -level of choice" and is called an α **-ffd.** Clearly, by definition of α **-ffd**, it follows that for any subset X of R and for any αϵ[0,1] , $X \rightarrow Y$ *with α value.*

2.3 Fuzzy Key

Extending the idea of classical key in the fuzzy environment we have defined fuzzy key as follows:

2.3.1 Definition

Let K^1 is subset of R^1 and FS be a set of **ffd**s for R^1 . Then, K^1 is called a **fuzzy key** of R^1 at α -level of choice where αϵ[0,1] iff $K^1 \rightarrow R^1$ *with α value,* $\epsilon\, FS$ and $K^1 \rightarrow R^1$ *with α value* is not a partial **ffd**.

III. LOSSLESS JOIN DECOMPOSITION

Lossless join property guarantees that the problem of spurious tuple generation does not occur with respect to the relation schemas created after decomposition.

Method:

Step1: Set $\rho := \{R\}$

Step2: While there is a relational schema S in ρ that is not in FBCNF do

{

Find a fuzzy functional dependency $X \xrightarrow[\alpha]{} Y$ in S that violates FBCNF. i.e., $X \xrightarrow[\alpha]{} Y$ violates FBCNF if X is not a fuzzy key of R .

Replace S in ρ by S_1 and S_2, where S_1 contains the attributes in $X \cup Y$ and S_2 will contain the attributes in S except those in Y . i.e., $S_1 = \{X \cup Y\}$ and $S_2 = \{S - Y\}$.

}

Output: A set of decomposed relation schemas $R_1, R_2, \ldots\ldots, R_k$ with ffd sets $F_1, F_2, \ldots\ldots, F_k$ respectively, satisfying the desired Fuzzy Boyce Codd Normal form (FBCNF) and lossless join property i.e., $R = R_1 \rhd\lhd R_2 \rhd\lhd \ldots\ldots \rhd\lhd R_k$.

Example 4.1

Let us consider the $EMPDetail(Name, City, City\_Status, Experience, Salary)$ relation and ffd set

$$F = \{City \xrightarrow[0.99]{} CityStatus, Experience \xrightarrow[0.9]{} Salary, Name\ City \xrightarrow[1]{} Experience\}$$

Find a lossless join decomposition of the relational schema $EMPDetail$ into FBCNF.

Solution: Fuzzy key of $EMPDetail$ is $(Name\ City)$ at 0.9-level of choice.

Step1: Set $\rho := \{EMPDetail(Name, City, CityStatus, Experience, Salary)\}$

Step2: Here $EMPDetail$ is not in FBCNF, since in the ffd $City \xrightarrow[0.99]{} CityStatus$, $City$ is not a fuzzy key. Therefore, $EMPDetail$ is decomposed into the following two relations:

$E_1(City, CityStatus)$; $F_1 = \{City \xrightarrow[0.99]{} CityStatus\}$; fuzzy key: $City$ at 0.99-level of choice and

$E_2(Name, City, Experience, Salary)$;

$F_2 = \{Experience \xrightarrow[0.9]{} Salary, Name\ City \to Experience\}$;

fuzzy key: $(Name\ City)$ at 0.9-level of choice.

Here E_1 is in FBCNF, but E_2 is not in FBCNF since $Experience \xrightarrow[0.9]{} Salary$ violates the rule. So, we again decompose E_2 into the following two relations:

$E_{21}(Experience, Salary)$; $F_{21} = \{Experience \xrightarrow[0.9]{} Salary\}$;

fuzzy key: $Experience$ at 0.9-level of choice and

$E_{22}(Name, City, Experience)$; $F_{22} = \{Name\ City \xrightarrow[1]{} Experience\}$;

fuzzy key: $(Name\ City)$ at 1-level of choice.

Here both E_{21} and E_{22} are in FBCNF.

Therefore, finally $EMPDetail$ is decomposed into following three relation schemas $E_1(City, CityStatus)$, $E_{21}(Experience, Salary)$ and $E_{22}(Name, City, Experience)$ with the ffd set $F_1 = \{City \xrightarrow[0.99]{} CityStatus\}$, $F_{21} = \{Experience \xrightarrow[0.9]{} Salary\}$ and $F_{22} = \{Name\ City \xrightarrow[1]{} Experience\}$ respectively.

Also we get $EMPDetail = (E_1 \rhd\lhd E_{21} \rhd\lhd E_{22})$. Hence the lossless join property has been achieved in the above decomposed relations that satisfy the fuzzy Boyce Codd normal form. It may be noted that the above decomposition also satisfies the dependency preservation property since $F = \{F_1 \cup F_{21} \cup F_{22}\}$.

IV. CONCLUSION

Fuzzy relational database is being suffered from redundancy and different anomalies of data if it is not designed properly. Fuzzy normalization based on α -ffd to design a good fuzzy relational database. Fuzzy normal forms can be used to decompose an un-normalized fuzzy relation into a set of normalized relations. I have plan to applying some concepts of fuzzy relation for better utilizing of lossless join of fuzzy relational database and fuzzy join dependency. Finally, it has been illustrated with examples how these fuzzy normal forms can be used to decompose an unnormalized fuzzy relation into a set of normalized relations that satisfy the lossless join properties.

REFERENCES

[1] E.F. Codd , 1970,A Relational Model for Large Shared Data Banks", Comm. Of ACM, 13(6),1970, 377-87.

[2] J. Mishra and S. Ghosh (2011), A Multivalued Integrity Constraint in Fuzzy Relational Database, International Journal of Computational Cognition, 9(2), 2011, 72-78.

[3] Z.M. Ma. and L.Yan , Generalization of strategies for fuzzy query translation in classical relational databases, Information and Software Technology,49(2),2007,172-180.

[4] M.I.Sözat and A.Yazici, A complete axiomatization for fuzzy functional and multivalued dependencies in fuzzy database relations, Fuzzy Sets and Systems,117(2),2001,161-181.

[5] Z.M.Ma and W.J. Zhang, Multivalued dependencies in extended possibility-based fuzzy relational databases", IFSA World Congress and 20th NAFIPS International Conference,1,2001,352 – 356.

[6] M.Nakata and T. Murai , Updating under integrity constraints in fuzzy databases, Proc. of IEEE conference on Fuzzy Systems,1997, 713-719.

[7] B. Bhunia and P. Niyogi,Lossless join property in fuzzy relational databases", Data of Knowledge Engineering,11(2),1993,109-124.

[8] W.Y.Liu,Fuzzy Data Dependencies and Implication of Fuzzy Data Dependencies, Fuzzy Sets and Systems, . 92(3),1997, 341-348.

[9] G.Q.Chen, J.Vandenbulcke and E.E.Kerre, A general treatment of data redundancy in a fuzzy relational ata model", Journal of the American Society for Information Science,43(4),1992, 304-311.

[10] K.V.S.V.N. Raju and A. K Majumdar, Fuzzy functional dependencies and lossless join decomposition of fuzzy relational database system", ACM Transactions on Database Systems, 13(2),1998, 129-166.

[11] O.Bahar and A.Yazici (2004), Normalization and Lossless Join Decomposition of Similarity-Based Fuzzy Relational Databases, International Journal of Intelligent Systems, 19(10),2004, 885-917.

[12] L.A.Zadeh (1965), Fuzzy Sets, Information and Controls, 8(3),1965, 338-353.