LOSSLESS JOIN DECOMPOSITION

Mr. C.B. Singh
Assistant Professor
Computer Science & Engineering Department
University of Lucknow
Lucknow

Lossless Join Decomposition

In order to acheive appropriate Normal form decomposition of a relation R into two or more relations ($R_1, R_2 --- R_n$) is done.

If a relation R is decomposed into $R_1, R_2 --- R_n$ then the decomposition is said to be lossless if

$$R_1 \cap R_2 \cap --- R_n \longrightarrow R_1$$

or

$$R_1 \cap R_2 --- \cap R_n \longrightarrow R_2$$

or

⋮

$$R_1 \cap R_2 --- \cap R_n \longrightarrow R_n$$

that is if interaction of sub relations forms a superkey of any of subrelation then this decomposition is known as lossless join decomposition.

or

Joining back all the subrelation results same as the main (first) relation then the decomposition is lossless.

Example :-

Consider a relational schema R as :-

$R = (A, B, C, D, E)$ with FD's

$E \rightarrow A$, $B \rightarrow D$, $A \rightarrow BC$

is the decomposition of R into R_1 & R_2

i.e $R_1 = (A, B, C)$

$R_2 = (A, D, E)$ is lossless?

Sol^n Let compute $R_1 \cap R_2$

we must have

$$R_1 \cap R_2 \longrightarrow R_1$$

or

$$R_1 \cap R_2 \longrightarrow R_2$$ for lossless.

Here

$$A \longrightarrow ABC$$

or

$$A \longrightarrow ADE$$

FD $A \rightarrow BC$ clearly shows that

$A \rightarrow ABC$ hold

thus lossless Join decomposition holds.

Q Consider again the same relation R

$$R = (A, B, C, D, E)$$

FD's $\{A \rightarrow BC,\ B \rightarrow D,\ E \rightarrow A\}$

is the decomposition of R into

$R_1 = (A, B, C)$

$R_2 = (C, D, E)$ is lossless?

Sol^n

Here

$R_1 \cap R_2$ will be C

So.

$C \longrightarrow R_1$

or

$C \longrightarrow R_2$

i.e C must work as superkey for R_1 or R_2

Here on the basis of FD's C does not satisfies the condition thus this decomposition is lossy.

Dependency Preserving decomposition:

A decomposition is said to be dependency preserving if all dependencies of Relation R must be part of either R_1 or $R2$ or they are derived from combination of functional dependencies of R_1 and $R2$.

Disclaimer:- The e-content is exclusively meant for academic purposes and for enhancing teaching and learning. Any other use for economic/commercial purposes is strictly prohibited. The users of the content shall not distribute, disseminate or share it with anyone else and its use is restricted to advancement of individual knowledge. The information provided in this e-content is developed from authentic references, to the best practice of my knowledge.

References:

- Korth, Silbertz, Sudarshan,” Database Concepts”, McGraw Hill.
- Date C J, “ An Introduction to Database Systems”, Addision Wesley.
- Bipin C. Desai, “ An Introduction to Database Systems”, Gagotia Publications.
- P.K. Yadav,”Database Management System”, kataria & sons.