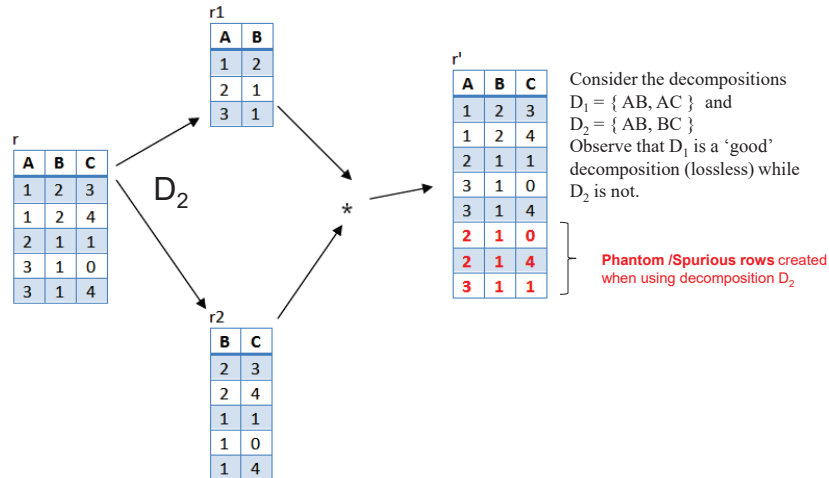


Nonadditive Lossless-Join Decomposition

Example 3

Schema $\langle R=ABC, F = \{ A \rightarrow B \} \rangle$ and partition $D_2 = \{ AB, BC \}$



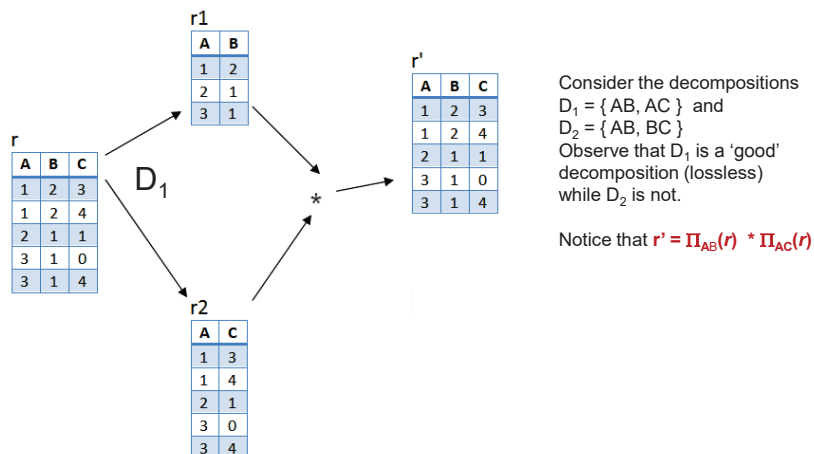
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Nonadditive Lossless-Join Decomposition

Example 3 *cont.*

Schema $\langle R=ABC, F = \{ A \rightarrow B \} \rangle$ and partition $D_1 = \{ AB, AC \}$



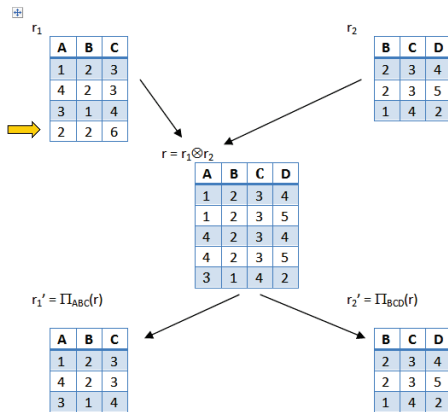
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Nonadditive Lossless-Join Decomposition

Example 3 *cont.*

Schemas $\langle R_1 = ABC, F_1 = \{ A \rightarrow BC, C \rightarrow B \} \rangle$ and
 $\langle R_2 = BCD, F_2 = \{ C \rightarrow B, B \rightarrow C, D \rightarrow B \} \rangle$



Observe that $r_1 \neq r'_1$

r_1 tuple $\langle 2, 2, 6 \rangle$ is lost in the JOIN and does not appear in r'_1

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Testing Lossless-Join (or Non-Additive) Decomposition

Definition *(good only on binary partition)*

If $D = \{ R_1, R_2 \}$ is a decomposition of R and F is a set of FDs on R , then D has a lossless-join with respect to F if

$$F \Rightarrow (R_1 \cap R_2) \rightarrow (R_1 - R_2) \quad \text{or} \quad F \Rightarrow (R_1 \cap R_2) \rightarrow (R_2 - R_1)$$

Example 4

Consider the previous problem where $R = ABC$ and $F = \{ A \rightarrow B \}$.

Let's assess the partition $D_1 = \{ AB, AC \}$. Here $R_1 = AB$ and $R_2 = AC$ therefore

$$R_1 \cap R_2 = A$$

$$R_1 - R_2 = B$$

$$R_2 - R_1 = C$$

The question $F \Rightarrow (R_1 \cap R_2) \rightarrow (R_1 - R_2)$ is equivalent to $F \Rightarrow A \rightarrow B$ and we know this is true because F contains exactly this dependency.

We must conclude the decomposition D_1 is lossless with respect to F .

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