

Redundant information in tuples and update anomalies

EMPLOYEE

ENAME	SSN	BDATE	ADDRESS	DNUMBER
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DEPARTMENT

DNAME	DNUMBER	PMGR_SSN
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EMP_DEPT

ENAME	SSN	BDATE	ADDRESS	DNUMBER	DNAME	PMGR_SSN
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Update anomaly

1) Insertion anomaly

2) Deletion anomaly

3) Modification anomaly

If we are changing
dept of a set of employees
if we make a mistake in modifying
some part of a row, others,
it can cause inconsistency.

If we make a new dept with no employees
then first few fields will be null! → Problem
if we insert a manager at first, dept
will have its own value of SSN.

If we sack all employees from
a dept & delete their data,

if we select to delete, we will
end up deleting the whole dept

Functional dependency

Closure (F^+)

$R(A, B, C) \quad A \rightarrow B$

- We need to deduce some extra functional dependency which is not available → logically implied.
- F^+ → the task of all the func^l dependencies we can calculate is called closure. No further dependency can be created.

$R = (A, B, C, G, H, I)$

F^+

$A \rightarrow B$

$A \rightarrow C$

$CG \rightarrow H$

$CG \rightarrow I$

$B \rightarrow H$

$A \rightarrow H$

$A \rightarrow B$

t_1, t_2

$t_1[A] = t_2[A]$

$t_1[B] = t_2[B]$

$t_1[H] = t_2[H]$

$A \rightarrow H$

→ lengthy process

Armstrong's axioms

1) Reflexivity rule

If α is a set of attributes, and $\beta \subseteq \alpha$ then $\alpha \rightarrow \beta$ holds.

2) Augmentation rule

If $\alpha \rightarrow \beta$ holds & γ is a set of attributes, then $\gamma\alpha \rightarrow \gamma\beta$ holds

3) Transitivity rule

If $\alpha \rightarrow \beta$ holds, and $\beta \rightarrow \gamma$ holds, then $\alpha \rightarrow \gamma$ holds.

* Union rule

If $\alpha \rightarrow \beta$ holds and $\alpha \rightarrow \gamma$ holds then $\alpha \rightarrow \beta\gamma$ holds.

* Decomposition rule

If $\alpha \rightarrow \beta\gamma$ holds, then $\alpha \rightarrow \beta$ holds & $\alpha \rightarrow \gamma$ holds.

* Pseudotransitivity rule

If $\alpha \rightarrow \beta$ holds and $\gamma\beta \rightarrow \delta$ holds, then $\alpha\gamma \rightarrow \delta$ holds.

Now, .

$$R = (A, B, C, D, H, I)$$

$$\left. \begin{array}{l} A \rightarrow B \\ A \rightarrow C \\ CH \rightarrow H \\ CH \rightarrow I \\ B \rightarrow H \end{array} \right\} F$$

$$F^+ \left[\begin{array}{l} A \rightarrow B \\ B \rightarrow H \\ A \rightarrow H \\ CH \rightarrow HI \\ ACH \rightarrow I \end{array} \right. \begin{array}{l} \} \text{Transitivity} \\ \\ \rightarrow \text{Union} \\ \rightarrow \text{Pseudotransitivity} \end{array}$$