CSC343 Worksheet 13 Solution

July 4, 2020

1. a)

A	B	C	D	E
a	b	c	d_1	e_1
a_1	b	c	d_1	e_2
a	b_1	c	d_1	e

Step 1 ($B \rightarrow E$):

A	B	C	D	E
a	b	c	d_1	e_1
a_1	b	c	d_1	e_1
a	b_1	c	d_1	e

Notes:

- Decomposition: The good bad and ugly
  1) **Elimination of Anomalies** by decomposition as in Section 3
  2) **Recoverability of Information** Can we recover the original relation from the tuples in its decomposition?
  3) **Preservation of Dependences (lossless join):** Can we be sure that after reconstructing the original relation from the decompositions, the original FD's satisfy?

  BCNF: $\rightarrow$ satisfies 1) and 2) Not good. NONO
- The Chase Test for Lossless Join
  - Tests whether the decomposition is lossless

  Input:
  - A relation R
  - A decomposition of R
  - A set of functional dependencies

  Output:

- Whether the decomposition is loseless or not
- $\Pi_{S_1}(R) \bowtie \Pi_{S_2}(R) \bowtie \cdots \Pi_{S_i}(R) = R$

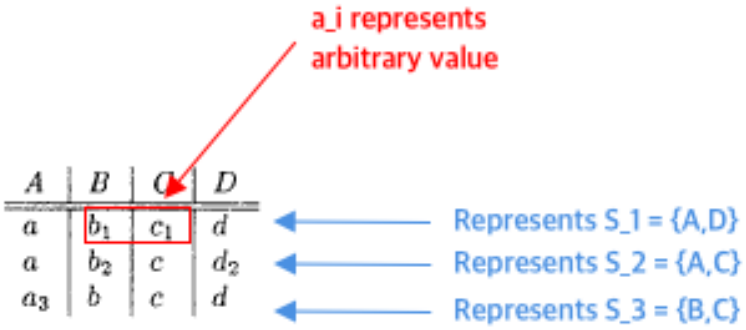
Three things to remember:

1. The natural join is associate and commutative
2. Any tuple t in R is surely in $\pi_{S_1}(R) \bowtie \pi_{S_2}(R) \bowtie \cdots \bowtie \pi_{S_k}(R)$.
3. We have to check to see any tuple in the $\pi_{S_1}(R) \bowtie \pi_{S_2}(R) \bowtie \cdots \bowtie \pi_{S_k}(R)$.

Example:

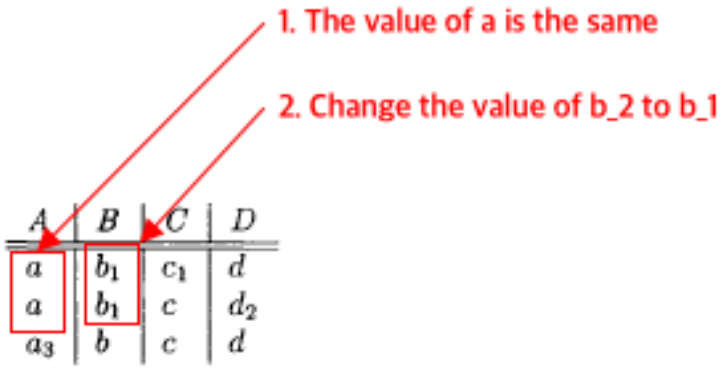
$S_1 = \{A, D\}$, $S_2 = \{B, C\}$, $S_3 = \{A, C\}$

$A \to B$, $B \to C$, $CD \to A$



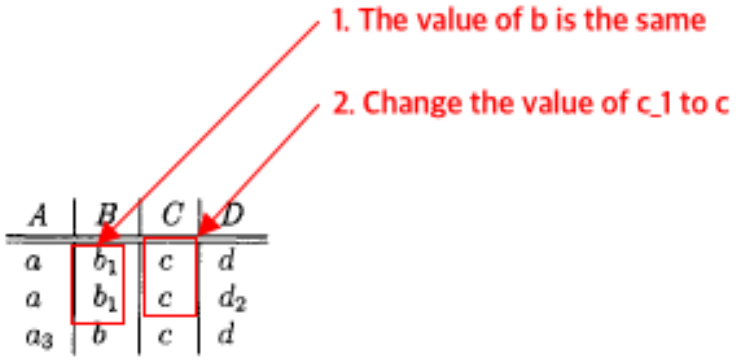
Step 1: $A \to B$

Set the value b with the same value of a to be the same. (e.g. $b_2 \to b_1$)



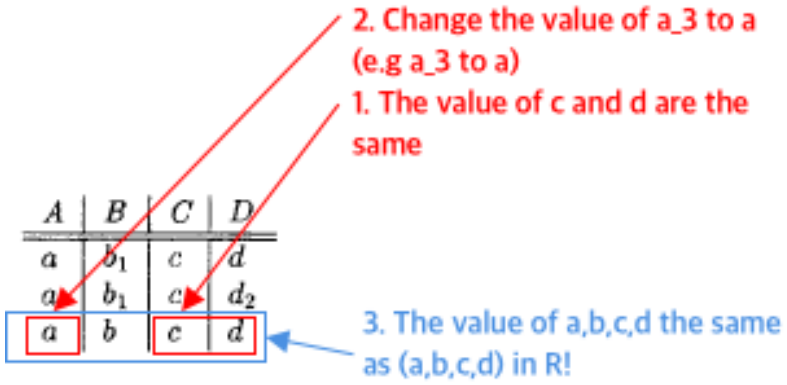
Step 2: $B \to C$

Set the value c with the same value of b to be the same. (e.g. $b_2 \to b_1$)



Step 3: $CD \to A$

Set the value a with the same value of c and d to be the same. (e.g. $a_3 \to a$)



So, we can conclude the join is lossless.