CSC343 Worksheet 13 Solution

July 4, 2020

1. a) **<u>Notes:</u>**

- 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
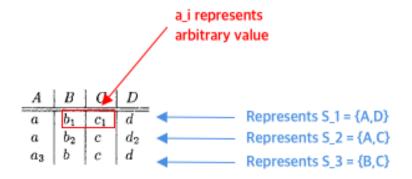   - $\Pi_{S_1}(R) \bowtie \Pi_{S_2}(R) \bowtie \cdots \Pi_{S_i}(R) = R$

    <u>Three things to remember:</u>
    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 $\pi_{S_1}(R) \bowtie \pi_{S_2}(R) \bowtie \cdots \bowtie \pi_{S_k}(R)$.
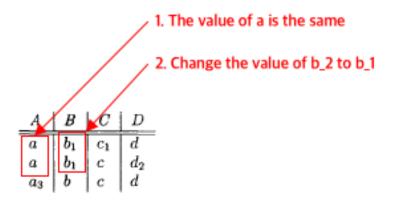
    <u>Example:</u>

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

    $A \rightarrow B$, $B \rightarrow C$, $CD \rightarrow A$

a_i represents
arbitrary value

A	B	C	D
a	b_1	c_1	d
a	b_2	c	d_2
a_3	b	c	d

Represents S_1 = {A,D}
Represents S_2 = {A,C}
Represents S_3 = {B,C}

Step 1: $A \rightarrow B$

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

1. The value of a is the same

2. Change the value of b_2 to b_1

A	B	C	D
a	b_1	c_1	d
a	b_1	c	d_2
a_3	b	c	d

Step 2: $B \rightarrow C$

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

1. The value of b is the same

2. Change the value of c_1 to c

A	B	C	D
a	b_1	c	d
a	b_1	c	d_2
a_3	b	c	d