CSC343 Worksheet 13 Solution

July 4, 2020

1. a) **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
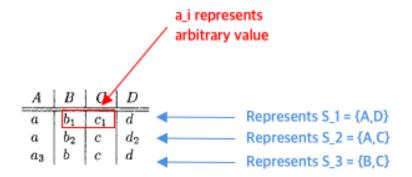   - $\Pi_{S_1}(R) \bowtie \Pi_{S_2}(R) \bowtie \cdots \Pi_{S_i}(R) = R$

   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:

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

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

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. $b_2 \rightarrow b_1$)

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