Week 5 Assignment

Saturday, May 3, 2014 7:42 AM

Find minimal cover and identify all possible candidate keys.

ACD --> EF
AG --> A
B --> CFH
D --> C
DF --> G
F --> C
F --> D

Preparation Step - Identify all non-trivial FDs

- Using the Reflexivity axiom, AG -> G is a trivial FD and can be removed before we start the normalization process. We are left with the following non-trivial FDs for the relation R(ABCDEFGH)

ACD --> EF
B --> CFH
D --> C
DF --> G
F --> C
F --> D

Step 1 - Split the right hand side of all FDs using the Union rule

ACD -> E
ACD -> F
B -> C
B -> F
B -> H
D -> C
DF -> G
F -> C
F -> D

Step 2 - Reduce the left hand side using the Pseudo transitivity rule.

We will examine each FD where there are multiple attributes on the left hand side and use pseudo transitivity to determine if the dependency can be reduced.

ACD -> E

- A -> C ? No
- A -> D? No
- C -> A No
- C -> D No
- D -> A No
- D -> C Yes - therefore this dependency can be reduced to AD -> E and other FD's can be reduced where CD appear. Therefore ACD -> F can be reduced to AD -> F

DF -> G

- D -> F ? No
- F -> D Yes - therefore this dependency can be reduced to F -> G.

Step 3 - Eliminate redundant FDs

AD -> E
AD -> F
B -> C
B -> F
B -> H
D -> C
F -> G
F -> C
F -> D

Step 3a - There are no duplicate FDs so we will proceed to the next step.

Step 3b - We will evaluate any FDs where there are multiple attributes on the left hand side to simplify based on other FDs. AD -> E and AD -> F cannot be reduced so we will move to the next step.

Step 3c - We will remove each FD and attempt to see if it can be represented by the remaining FDs.

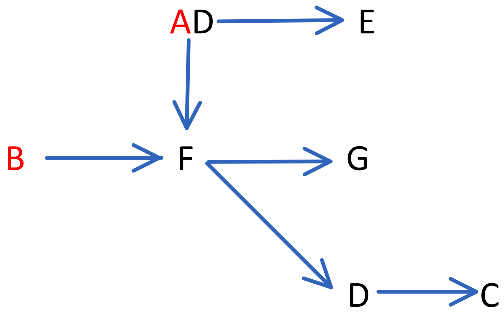
AD -> E (This is not redundant since there is not a way to get to E from the other FDs)
AD -> F (This is not redundant since there is not a way to get to F from the other FDs)
B -> C (This is redundant and can be removed due to the Transitivity rule since B -> F and F -> C)
B -> F (This is not redundant since there is not a way to get to F from the other FDs)
B -> H (This is not redundant since this is the only way to get to H)
D -> C (This is not redundant)
F -> G (This is not redundant since this is the only way to get to G)
F -> C (This is redundant and can be removed due to the Transitivity rule since F -> D and D -> C)
F -> D (This is not redundant as this is the only way to get to D)

The set of FDs is:

AD -> E
AD -> F
B -> F
B -> H
D -> C
F -> G
F -> D

The minimal set of FDs can also be written as:
AD -> EF
B -> FH
D -> C
F -> DG

Identify all candidate keys



We can see from the diagram above that we can get to all dependencies through A and B. Therefore AB is the candidate key.