CS1555 Recitation 10 Solution

Objective: to practice normalization, finding canonical forms.

**Part 1:** For each of the following relations R and sets of functional dependencies F, find the canonical cover (minimal cover) of F.

**1.** Consider the following set of functional dependencies F on a relation R (A, B, C, D, E):

A → BC

A → D

B → C

C → D

DE → C

BC → D

Finding the canonical form:

* Transform all FDs to canonical form (i.e., one attributes on the right):

A → B

A → C

A → D

B → C

C → D

DE → C

BC → D

* Drop extraneous attributes:

B in BC → D is extraneous, since we already have C → D. The set of FDs becomes:

A → B

A → C

A → D

B → C

C → D

DE → C

* Drop redundant FDs:

A → B and B → C implies A → C, so we drop A → C.

A → B, B → C and C → D implies A → D, so we drop A → D.

The set of FDs becomes:

A → B

B → C

C → D

DE → C

which is the canonical cover of F.

**2.** Consider the following set of functional dependencies F on relation R (A, B, C, D, E, H):

A → C

AC → D

E → AD

E → H

A → CD

E → AH

Finding the canonical form:

* Transform all FDs to canonical form (i.e., one attribute on the right):

A → C

AC →D

E → AD becomes E →A and E→D

E → H

A→ CD becomes A→C and A→D

E → AH becomes E→A and E→H

* Remove redundant dependencies:

A → C

AC → D

E → A

E → D

E → H

A → D

* Drop extraneous attributes:

AC→D can be removed because we have A→D so C is redundant:

A → C

E → A

E → D

E → H

A → D

* Drop redundant FDs:

Try removing some dependencies in F and still have a set of dependencies equivalent to F.

E→D can be deduced from E→A and A→D so we can remove E→D.

The set of FDs becomes:

A→C

E→A

E→H

A→D

which is the canonical cover of F.