Dependency-Preserving Decomposition

Designing Schemas

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Kevin C.C. Chang, Professor Computer Science @ Illinois

Learning Objectives

By the end of this video, you will be able to:

- Define dependency preserving, and explain why it is desired.
- Explain why BCNF may not be dependency preserving.

A Decomposition May Not Preserve Dependency

- A schema S is dependency preserving if, for every FD f of it:
 - f can be checked in a table T in S, or
 - f can be implied by those FDs that can be checked in single tables.
- Favorites(drinker, bar, beer)
- f_1 : beer \rightarrow bar, f_2 : drinker, bar \rightarrow beer
- Decomposition:

$$R_1 = \text{(beer, bar)}, R_2 = \text{(beer, drinker)}$$

- Preserve dependencies?
 - f_1 : beer \rightarrow bar
 - f_2 : drinker, bar \rightarrow beer

drinker	bar	beer
Alex	John Bar	Sam Adams
Carissa	Green Bar	Bud Light
Alex	Purple Bar	Coors



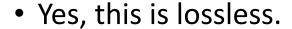
beer	bar
Sam Adams	John Bar
Bud Light	Green Bar
Coors	Purple Bar

beer	drinker
Sam Adams	Alex
Bud Light	Carissa
Coors	Alex

BCNF May Not Preserve Dependency

- Favorites(drinker, bar, beer)
- f_1 : beer \rightarrow bar, f_2 : drinker, bar \rightarrow beer
- Decomposition:

$$R_1 = \text{(beer, bar)}, R_2 = \text{(beer, drinker)}$$



• But it does not preserve dependency!

drinker	bar	beer
Alex	John Bar	Sam Adams
Carissa	Green Bar	Bud Light
Alex	Purple Bar	Coors



beer	bar
Sam Adams	John Bar
Bud Light	Green Bar
Coors	Purple Bar

beer	drinker
Sam Adams	Alex
Bud Light	Carissa
Coors	Alex

Example decomposition

For a relation R and FDs F, a dependencypreserving BCNF may not exist. Agree?

drinker	bar	beer
Alex	John Bar	Sam Adams
Carissa	Green Bar Bud Light	
Alex	Purple Bar	Coors



beer	bar
Sam Adams	John Bar
Bud Light	Green Bar
Coors	Purple Bar

beer	drinker
Sam Adams	Alex
Bud Light	Carissa
Coors	Alex

Any BCNF that would preserve all dependencies?

 f_1 : beer \rightarrow bar,

 f_2 : drinker, bar \rightarrow beer