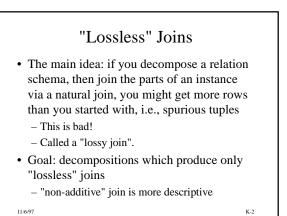
Higher Forms of Normalization

Chapter 13.1-13.3 (skim)

K-1

K-3

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Preserving FDs • What if, when a relation is decomposed, the X of an $X \rightarrow Y$ ends up only in one of the new relations and the Y ends up only in another? · Such a decomposition is not dependency-

preserving. • Goal: Always have FD-preserving

decompositions

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Fact of life... Finding a decomposition which is both lossless and dependency-preserving is not always possible. 11/6/97 K-4

Multivalued Dependencies (MVDs)

- $X \rightarrow Y$ means that given X, there is a unique set of possible Y values (which do not depend on other attributes of the relation)
- Classic example: PARENTNAME→→CHILDNAME
- An FD is also a MVD
- · MVD problems arise if there are two independent 1:N relationships in a relation. K-5

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Fourth Normal Form • A relation R is in 4NF if for every nontrivial $X \rightarrow Y$, X is a superkey of R. • Decomposition into 4NF: If there is a nontrivial $X \rightarrow Y$, form one relation with only X and Y, and another with R-Y. • This will be lossless, but not necessarily FD-preserving. - Achieving 4NF is a trade-off

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Fifth Normal Form

- Sometimes a relation cannot be losslessly decomposed into two relations, but can be into three or more.
- 5NF captures the idea that a relation scheme must have some particular lossless decomposition ("join dependency").
- Finding actual 5NF cases is difficult.

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Normalization Summary

- 1NF: usually part of the woodwork – even so, know how to decompose
- 2NF: usually skipped
 - but lots of defs. that make great exam Q's!
- 3NF: a biggie
 - Always aim for this
- BCNF and 4NF: tradeoffs start here – in re: d-preserving and losslessness
- 5NF: You can say you've heard of it...

Caveat

- Normalization is not the be-all and end-all of DB design
- Example: suppose attributes A and B are always used together, but normalization theory says they should be in different tables.
 - Normalization might produce unacceptable performance loss (extra disk reads)

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