Normalization I

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1 Administrivia

Outline

1. Normalization Examples

2. Vocabulary

3. Normalization practice

Coming Up

Normalization II.

2　Normalization Examples

Consider the relation:

    NewClass(<u>classNo, stuId</u>, stuLastName, facId, schedule, room, grade)

with the instance:

classNo	stuId	stuLastName	facId	schedule	room	grade
ART103A	S1001	Smith	F101	MWF9	H221	A
ART103A	S1010	Burns	F101	MWF9	H221	
ART103A	S1006	Lee	F101	MWF9	H221	B
CSC201A	S1003	Jones	F105	TuThF10	M110	A
CSC201A	S1006	Lee	F105	TuThF10	M110	G
HST205A	S1001	Smith	F202	MWF11	H221	

1. Identify all dependencies.
2. This relation is in 1NF. Why?
3. This relation is not in 2NF. Why?
4. Decompose the relation into 2NF.
5. Are the resulting relations in 3NF? In BCNF?

Consider the relation:

    NewStudent(<u>stuId</u>, lastName, major, credits, status)

with the instance:

stuId	lastName	major	credits	status
S1001	Smith	History	90	Senior
S1003	Jones	Math	95	Senior
S1006	Lee	CSC	15	Freshman
S1010	Burns	Art	63	Junior
S1060	Jones	CSC	25	Freshman

1. This relation is not in 3NF. Why?

2. How would you put the relation into 3NF?

3. Is putting the relation into 3NF advisable?

3 Vocabulary

1. A functional dependency is actually a(n) _____ relationship from attribute set A to attribute set B.
   A. one-to-one
   B. recursive
   C. many-to-many
   D. many-to-one

2. Describe three types of anomalies that can result from unnormalized schemas.

3. If X and Y are sets of attributes of relation R, we say that Y is functionally dependent on X if
   A. for each X value there is only one Y value
   B. for each Y value there is only one X value
   C. no two X values have the same Y value
   D. when two rows have the same Y value they also have the same X value

4. In the relational model, every determinant is always
   A. a candidate key
   B. a superkey
   C. a composite key
   D. none of the above

5. Which of the following is not one of the major objectives of normalization?
   A. removing redundancy
   B. improving efficiency
   C. removing anomalies
   D. increasing model flexibility

6. A relation is first normal form if
    A. every attribute is single-valued for each tuple
    B. the domains of the attributes are atomic
    C. each cell of the table can contain only one value
    D. all of the above

7. A relation is second normal form if it is 1NF and
    A. every attribute is single-valued
    B. every attribute is determined by a portion of the key
    C. every non-key attribute is dependent on the entire key
    D. no non-key attribute determines another

8. In the relation R($\underline{A}$, $\underline{B}$, C, D), having the composite key $\{A, B\}$, which of the following FDs would demonstrate that the relation is not 2NF?
    A. $A \rightarrow B$
    B. $A \rightarrow C$
    C. $C \rightarrow D$
    D. any of the above

9. A relation having only one candidate key is third normal form if it is 2NF and
    A. no non-key attribute is determined by only part of the key
    B. no non-key attribute is dependent on another non-key attribute
    C. no part of the key is dependent on another part of the key
    D. there are no partial functional dependencies

10. A relation is Boyce-Codd Normal Form if
    A. every superkey is a candidate key
    B. every determinant is a superkey
    C. every candidate key is a primary key
    D. it has overlapping candidate keys

11. In the relation R($\underline{A}$, $\underline{B}$, C, D), having the composite key $\{A, B\}$, which of the following FDs would demonstrate that the relation is not 3NF?
    A. $C \rightarrow \{A, B\}$
    B. $\{A, B\} \rightarrow C$
    C. $C \rightarrow D$
    D. any of the above

12. If a relation is 2NF but not 3NF, it must have which type of functional dependency?
    A. multivalued
    B. partial
    C. join
    D. transitive

4   Normalization Practice

1. Problem 6.5 in the textbook, parts a–c. (You'll need this for 6.6 later.)

2. Problem 6.1 in the textbook, parts a and b. (You'll need this for parts c and d later.)

3. Problem 6.2 in the textbook, parts a and b. (You'll need this for parts c and d later.)