

TUTORIAL FOR WEEK 12 (Prof. Navathe)

RELATIONAL DESIGN ALGORITHMS

Q1. Binary Decomposition with Non-additive decomposition

Consider the relation

SUPPLY (Supplier#, Part#, Date, Project, Quantity, Supp_name, Part_name)

The FDs are:

Fd1: Supplier#, Part#, Date \rightarrow SUPPLY

Fd2: Supplier# \rightarrow Supp_name

Fd3: Part# \rightarrow Part_name.

If we decompose SUPPLY into:

A. SUPPLY1 (Supplier#, Part#, Date, Project, Quantity, Part_name)

SUPPLIER (Supplier#, Supp_name)

- Have we preserved the Fds?
 - Is this decomposition non-additive (lossless) – why?
 - What NF is SUPPLY1 in?
- B. Show a further decomposition of SUPPLY 1 and show that the decomposition is non-additive and achieves BCNF.

Q2. Relational Synthesis into 3NF relations.

Assume that we are given a universal relation corresponding to the data we have on students and courses which looks like:

STUDENT_COURSE (Stud#, Course#, St_name, Course_name, Course_credit_hr, Grade, Major_dept, Dept_phone_no)

The given set of F.d.s for the universal relation are:

F: {Stud#, Course# \rightarrow St_name, Course_name, Course_credit_hr, Grade, Major_dept, Dept_phone_no;

Stud# \rightarrow St_name, Major_dept, Dept_phone_no;

Course# \rightarrow Course_name, Course_credit_hr

Major_dept \rightarrow Dept_phone_no.}.

- A. Apply the synthesis algorithm 15.4 that constructs 3NF relations from a given set of F.d.'s, on the universal relation. What 3NF design will be produced by this algorithm? Show how you get the answer
- B. Evaluate your 3NF design and evaluate if it meets BCNF design.

Q3. BCNF Decomposition and n-ary non-additive decomposition test:

Consider a relation:

PATIENT_PROC (Patient#, Doctor#, Date, Doctor_name, Doctor_specialty, Procedure, Charge)

The Fds are:

FD1: Patient#, Doctor#, Date \rightarrow PATIENT_PROC

FD2: Doctor# \rightarrow Doctor_name, Doctor_specialty

FD3: Procedure \rightarrow Doctor

A. Successive Normalization

- (i) Evaluate and explain the normal form status of the given relation.
- (ii) Follow the practice of successive normalization upto BCNF. For converting 3NF to BCNF, apply the decomposition as per the decomposition in algorithm 15.5.

B. Direct testing and application of Algo 15.5

- (i) Argue using the BCNF general definition that PATIENT_PROC does not meet BCNF ‘
- (iii) . By applying decomposition in algorithm 15.5 successively produce the BCNF design.

C. Applying n-ary non-additive decomposition test in Algo 15.3

Show that the resulting relations you produced as BCNF design in A meet the non-additive join property using this algorithm.

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