Exercise 4 “Advanced Data Models”

Due until 11 June, 2008 before/after lecture SS 08

Exercise 4.1 [Data Integration] :
Briefly explain the following concepts: (2 pt.)

- mediator, global schema, and local schema
- global-as-view (GAV), local-as-view (LAV), and global-local-as-view (GLAV)
- query rewriting, and query answering
- query unfolding, and maximally contained rewriting

Exercise 4.2 [GAV, LAV, GLAV] :
Consider three sources: (2 pt.)

- Database 1 has one relation Area(Id, field) providing areas of specialisation of employees; the Id field identifies an employee.
- Database 2 has two relations: Teach(professor, course) and In(course, field) specifying possible fields a course can belong to.
- Database 3 has two relations: Grant(researcher, grant#) for grants given to researchers, and For(grant#, field) stating which fields the grants are for.

We want to have a global schema database with two relations: Works(Id, project) stating that an employee works for a particular project, and Area(project, field) associating projects with one or more fields.

1. Provides a LAV mapping between database 1 and the global schema.
2. Provides a GLAV mapping between the global schema and the local schemas.
3. Suppose one extra relation Funds(grant#, project) is added to database 3, please provides a GAV mapping.
Exercise 4.3 [Answering Queries Using Views]:

1. Consider a global schema with a ternary relation $R$ and binary relations $S$ and $T$, and a query

   $$ q(x) : -R(x, y, 1), S(x, 2), T(x, 2) $$

   Suppose we have two views given by

   $$ V1(x, y, z, w) : -R(x, y, z), S(x, w), T(x, w) $$

   $$ V2(x, y, z, w) : -R(x, y, z), S(x, w) $$

   Is $q$ rewritable over $V1$ and $V2$? If so, what is the rewriting in terms of $V1$ and $V2$? (3 pt.)

2. Suppose we have a database with two relations $R(A, B, C)$ and $S(A, B)$, and a query $Q$ over that database:

   ```sql
   SELECT R1.A
   FROM R R1, R R2, S S1, S S2, S S3
   ```

   Now the database provides one view $V$ with attributes $A, B, C$ given by

   ```sql
   SELECT R.A, R.B, R.C
   FROM R, S
   WHERE R.A=S.A AND R.B=S.B
   ```

   Can query $Q$ be answered from $V$? If so, what is an equivalent query in terms of $V$? (3 pt.)