Relational Algebra vis-à-vis Domain Relational Calculus

Example:

Consider the database shown below:

Student <StID, SName, Dept, Status>

Department<DCode, DName, Location, Tel, DHead>

Instructor<InsID, InsName, Dept>

Course<CCode, CName, Credit, Dept>

Enrolled<StID, CourseID, InsID, Year, Semester>

(Notation used: Project: Π Select: σ Join: |×|)

==========

Query 1: Find all students taking CENG356 in Spring 2014

Relational Algebra

$\Pi_{StID,SName}\ \sigma_{CourseID = 'CENG356' \text{ AND } Year = 2014 \text{ AND } Semester = 'Spring'}$ (Student |×| Enrolled)

Relational Calculus

{<ID, Name> | $\exists$ Dept, Stat <ID, Name, Dept, Stat> $\in$ Student,

$\wedge \exists$ A,B,C,D,E < A,B,C,D,E> $\in$ Enrolled

$\wedge$ ID=A $\wedge$ B='CENG356' $\wedge$ D=2014 $\wedge$ E='Spring'}

Query 2: Find instructors offering CENG356 in Spring 2015

Relational Algebra

$\Pi_{InsName, Dept}\ \sigma_{CourseID = 'CENG356' \text{ AND } Year = 2015 \text{ AND } Semester = 'Spring'}$ (Instructor|×| Enrolled)

Relational Calculus

{<Name, Dept> | $\exists$ ID <ID, Name, Dept > $\in$ Instructor,

$\wedge \exists$ A,B,C,D,E < A,B,C,D,E> $\in$ Enrolled

$\wedge$ ID=C $\wedge$ B='CENG356' $\wedge$ D=2015 $\wedge$ E='Spring'}

Query 3: Find all courses taken by the student named 'Emre'

Relational Algebra

$\Pi_{CCode,CName}\ \sigma_{SName = 'Emre'}\ (($Student $|\times|$ Enrolled) $|\times|_{CCode=CourseID}$ Course)

Relational Calculus

{<Code, Name > | $\exists$ ID <ID, Name, Dept > $\in$ Student,

$\wedge \exists$ A,B,C,D,E < A,B,C,D,E> $\in$ Enrolled

$\wedge \exists$ F,G,H,K < F,G,H,K> $\in$ Course

$\wedge$ ID=A $\wedge$ F=B }

Query 4: Find the department head of 'Computer Engineering'

Relational Algebra

$\Pi_{InsName}\ \sigma_{DName = 'Computer\ Engineering'}\ (($Instructor $|\times|_{InsID=DHead}$ Department)

Relational Calculus

{<Name > | $\exists$ ID, Dept <ID, Name, Dept > $\in$ Instructor,

$\wedge \exists$ A,B,C,D,E < A,B,C,D,E> $\in$ Department

$\wedge$ ID=E $\wedge$ B='Computer Engineering' }