CMPE 351 19.11.18

- Relational Algebra

Operators

SELECT

symbol = σ (sigma)

syntax = $\sigma_{\langle \text{selection condition} \rangle}(R)$

Where: selectioncondition is a boolean expression on the attributes of R.

R = relational algebra expression

EMPLOYEE

attributes → headers

e_id	e_name	e_surname	salary
e001	Ece	Ece	50
e050	Oya	Ece	20
e100	Ali	Ece	70
e2	Ali	Omar	20

tuple

Q_1 = Use Relational Algebra to select all employees with salary > 30 out of EMPLOYEE relation.

$R \leftarrow \sigma_{\langle salary > 30 \rangle}(\text{EMPLOYEE})$

R =

e_id	e_name	e_surname	salary
e001	Ece	Ece	50
e100	Ali	Ece	70

Q_2 = Use R.A. to select all emp. having Name = Ece and salary > 20

$R \leftarrow \sigma_{\langle e\_name = Ece \rangle \text{ AND } \langle salary > 20 \rangle}(\text{EMPLOYEE})$

$R \leftarrow \sigma_{\langle e\_name = ece \rangle}\left(\sigma_{\langle salary > 20 \rangle}(\text{EMPLOYEE}) \right)$

→

Def. = Cordinality = number of Tuple
Def. = Degree = number of attribute

Example:

degree (EMPLOOYEE) = 4
SELECT op. does not change the degree.
cord (EMPLOYEE) = 4 (tuples, rows)
cord (R_1) = 2
cord (R_2) = 1

PROJECT:
symbol = π
syntax = $\pi_{\text{listofattribute}}(R)$

Example: Use R.A. To select <e_id, salary> att. out of EMPLOYEE.

$R_3 \leftarrow \pi_{e\_id,\ salary}$ (EMPLOYEE)

degree = 2
cord = 4

R_3 =

e_id	salary
e001	50
e050	20
e100	70
e2	20

Example: Use R.A. to project EMPLOYEE over salary.

$R_4 \leftarrow \pi_{salary}$ (EMPLOYEE)

degree = 4
cord = 3

R_4 =

salary
50
20
70

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UNION, INTERSECTION and MINUS op.

Syntax : $R \cup S$, $R \cap S$, $R - S$

R and S must be union compatible :

They must have same number of attribute

$$\left.\begin{array}{l} R(A_1, A_2, \ldots A_n) \\ S(B_1, B_2, \ldots B_n) \end{array}\right\} \begin{array}{l} n = m \\ dom(A_i) = dom(B_i) \\ \forall i = 1, \ldots, n \end{array}$$

Example: Retrieve The SSN of all employees who either work in DNO5 OR directly supervise an employee from DNO5 (departman number 5)

$$DEPT5\_EMP \leftarrow \sigma_{DNO\,5}(EMPLOYEE)$$

degree (DEPT5_EMP) = 10
card (DEPT5_EMP) = 4

$$SSN\_DEPT5\_EMP \leftarrow \pi_{SSN}(DEPT5\_EMP)$$

degree = 5 ?
card = 4

$$SSN\_SUPERVISE \leftarrow \pi_{super\_SSN}(DEPT5\_EMP)$$

degree = 1
card = 2

$$R = SSN\_DEPT5\_EMP \cup SSN\_SUPERVISE$$

- Cartesian Product

Syntax = $R \times S$

Semantic :

$$Q = R(A_1, A_2, \ldots, A_n) \times S(B_1, B_2, \ldots, B_m)$$

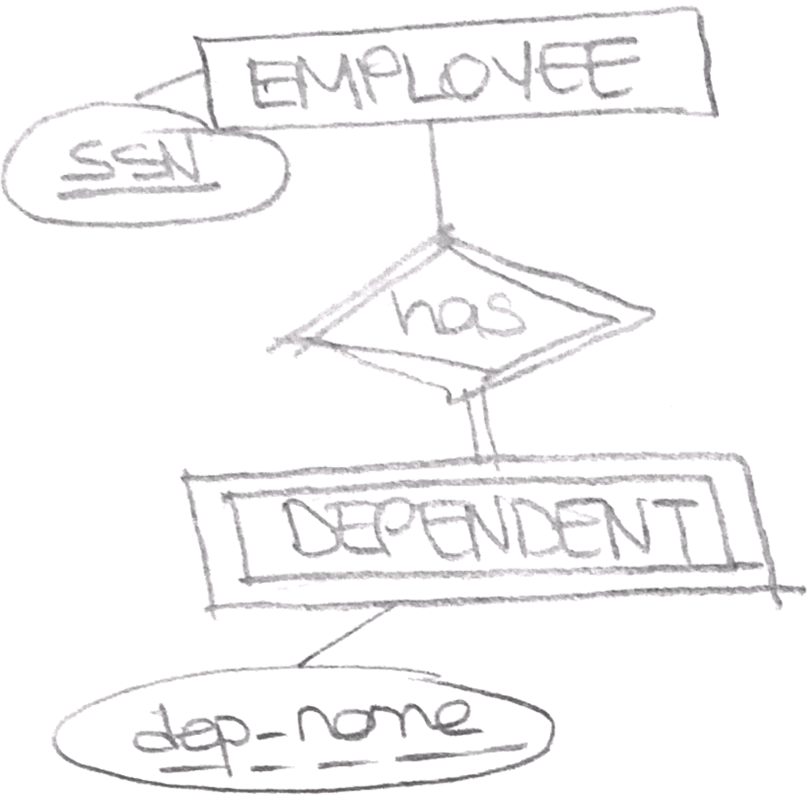
$$Q = (A_1, A_2, \ldots A_n, B_1, B_2, \ldots, B_m)$$

$$degree(Q) = degree(R) + degree(S)$$

If $|R| = n_r$ and $|S| = n_s$ then

$$|Q| = n_r \times n_s$$

Example: Use RA to retrieve the name of the dependent of each F employee together with "FNAME" and "LNAME" of employee.



$FEM\_DEP \leftarrow \pi_{ESSN,\ DEPENDENTNAME}(\sigma_{sex=F}(DEPENDENT))$

degree = 2
card = 4

FEM_DEP

ESSN	DEP. Name
333	Alice
333	Joy
123	Alice
123	Elizabeth

$Temp \leftarrow FEM\_DEP \times EMPLOYEE$

degree = 10+2
card = 8x4

Temp

ESSN	
333	