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CSE-414: Database Systems

Homework K-4

11/8/2017

Employee(eid, name, office), Manager(eid, mid)

Q1 Retrieve all employees that have 2 or more managers. Output their IDs and names.

a) Datalog Query:

Ans(eid, name) :- Employee(eid, name, ), Manager(eid, mid1), Manager(eid, mid2),  
mid1 != mid2

b) Relational Algebra:

$\delta_{e.eid, e.name} (\text{Manager m})$

$\bowtie_{m1.mid < > m.mid \text{ and } m1.eid = e.eid}$

$((\text{Manager m}) \bowtie_{m.eid = e.eid} (\text{Employee e}))$

→ (contd.)

Q2 Retrieve all employees that have no managers. (For example the CEO of the company has no managers.). Output their IDs and names.

a) Datalog Query:

Ans(e) :- Employee(e, , ), Manager(e, , )

Ans(e, name) :- Employee(e, name, ), not NonAns(e)

b) Relational Algebra:

$$\delta (\pi_{e.eid, e.name} ((Employee e1) \bowtie_{e.eid > m.eid} ((Manager m)$$
$$~~~~~ \bowtie_{c.eid = m.eid} (Employee e))))$$

03 Retrieve the offices of all managers of employees named 'Alice'.  
(note that there could be multiple employees named 'Alice', and each such employee could have multiple managers).

a) Datalog query:

Ans (0) :- Employee(e, 'Alice'), Manager(e, m), Employee(m, , 0)

b) Relational Algebra:

$$\delta (\pi_{e.office} ((Employee e1) \bowtie_{e1.eid = m.mid} \sigma_{ename = 'Alice'} ((Manager m)$$
$$~~~~~ \bowtie_{e.eid = m.eid} (Employee e))))$$

04 Find all the managers with the property that every employee they manage is located in same office. output the manager's ID and name and the office where all their employees are located.

a) Datalog query:

$dOffice(m) :- Manager(e_1, m), Employee(e_1, , o_1)$

$Manager(e_2, m), Employee(e_2, , o_2)$

$o_1 \neq o_2$

$SameOffice(e, m) :- Manager(e, m), \neg dOffice(m)$

$Ans(m, n, o) :- Employee(m, n, ), Employee(e, , o), sameOffice(e, m)$

b) Relational query:

$\delta(\pi_{mid, e3.name, e1.office}(((Employee e4) \bowtie_{m.cid = e4.eid} (Employee e3)))$

$\bowtie_{m.mid = e3.eid} ((Manager - \pi_{eid, mid} ((Employee e1)))$

$\bowtie_{e1.eid = m1.eid} ((Manager m1)) \bowtie_{mid = mid \text{ and } e1.office < e2.office} ((Employee e2) \bowtie_{e2.eid = m2.eid} ((Manager m2))))$

→ Contd.

Q5

Find all "second-level managers", that is, those managers who manage at least one employee that is also a manager (i.e., that manages at least one other employee). Output each second-level manager's ID and name.

a) Datalog query

$\text{noManager}(e) :- \text{Employee}(e, ,), \text{NOT Manager}(, e)$

$\text{noSecondLevel}(m) :- \text{Manager}(e, m), \text{noManager}(e)$

$\text{Ans}(m, n) :- \text{Employee}(m, n, ), \text{NOT noSecondLevel}(m)$

b) Relational query:

$\delta(\pi_{e3.eid, e3.name}((\text{Employee } e3) \bowtie_{e3.eid = m3.mid} (\text{Manager } m3))$

$(\text{Manager } m3) \bowtie_{m3.eid = m2.mid}$

$(\pi_{m2.mid} ((\text{Manager } m2) \bowtie_{m2.eid = e2.eid}$

$((\text{Employee } e2) - (\pi_{e1.eid, e1.name, e1.office}$

$((\text{Employee } e1) \bowtie_{e1.eid = m1.mid} (\text{Manager } m1)))))))$