SQL Queries

(Chapter 3.3)

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Hospital Database

Patient

Name	ID	CM	KG
Anderson	100	200	130
Brown	111	150	50
Davis	222	190	90
Edwards	333	160	90
Ford	345	165	100
Hardy	454	175	70
Johnson	567	170	50
Smith	755	180	120

Doctor

Name	ID	Age	Specialty
Cheney	987	50	pediatry
Hardy	454	53	osteopathology
McBride	377	36	radiology
Miller	300	60	neurology
Moss	244	30	neurology
Nelson	400	76	cardiology
Oltman	181	56	urology
Paine	266	45	cardiology
Pepper	555	42	cardiology
Snow	500	65	radiology

Visit

PID	DID	Month	Day	Year
100	181	5	20	2008
100	555	6	30	2009
111	987	8	20	2009
111	987	5	28	2010
222	266	9	12	2007
222	400	5	20	2008
222	555	5	20	2008
333	987	6	23	2009
345	300	5	16	2009
454	244	6	10	2010
567	377	2	20	2010
567	454	5	28	2010
755	987	6	23	2009

Basic SQL Queries

Basic:

CREATE VIEW $R(B_1, \ldots, B_m)$
SELECT $A_1, \ldots, A_n$
FROM $R_1, \ldots, R_l$
WHERE C_1 AND ... AND C_o

The CREATE VIEW and WHERE clauses are optional.

Example: Find the specialty of all the doctors in the hospital.

SELECT Specialty
FROM Doctor

Specialty
pediatry
osteopathology
radiology
neurology
neurology
cardiology
urology
cardiology
cardiology
radiology

Basic SQL Queries

We can use also an optional DISTINCT keyword.

Example: Find the specialty of all the doctors in the hospital.

```
SELECT   DISTINCT Specialty
FROM     Doctor
```

Specialty
pediatry
osteopathology
radiology
neurology
cardiology
urology

This is equivalent to a projection in relational algebra.

Basic SQL Queries

Example: Find when each patient visited the hospital.

```
SELECT   Patient.Name, Visit.Month, Visit.Day, Visit.Year
FROM     Patient, Visit
WHERE    Patient.ID = Visit.PID
```

Patient.Name	Visit.Month	Visit.Day	Visit.Year
Anderson	5	20	2008
Anderson	6	30	2009
Brown	8	20	2009
Brown	5	28	2010
Davis	9	12	2007
Davis	5	20	2008
Davis	5	20	2008
Edwards	6	23	2009
Ford	5	16	2009
Hardy	6	10	2010
Johnson	2	20	2010
Johnson	5	28	2010
Smith	6	23	2009

This is equivalent to a join followed by a projection in relational algebra.

Basic SQL Queries

Example: Find which doctor treats which patient.

```
CREATE VIEW   Treats(DoctorName, PatientName)
SELECT        D.Name, P.Name,
FROM          Patient AS P, Doctor AS D, Visit AS V
WHERE         P.ID = V.PID AND D.ID = V.DID
```

Treats

DoctorName	PatientName
Oltman	Anderson
Pepper	Anderson
Cheney	Brown
Cheney	Brown
Paine	Davis
Nelson	Davis
Pepper	Davis
Cheney	Edwards
Miller	Ford
Moss	Hardy
McBride	Johnson
Hardy	Johnson
Cheney	Smith

Aggregation SQL Queries

Aggregation Operators take as input a set of values and give as output a single value. Examples: AVG, COUNT, MAX, MIN and SUM.

Aggregation:

```
SELECT     B1,...,Bn,  AGGREGATE_OPERATOR(Ai)
FROM       ...
WHERE      ...
GROUP BY   B1,...,Bn
```

Example: Find the number of cardiologists.

```
SELECT   COUNT(ID)
FROM     Doctor
WHERE    Specialty = "cardiology"
```

Count(ID)
3

Aggregation SQL Queries

The optional GROUP BY clause divides all the records into groups such that in each group the values of the attributes B_1, B_n are the same.

Example: Find the number of doctors for each specialty.

```
SELECT    Specialty, COUNT(ID)
FROM      Doctor
GROUP BY  Specialty
```

Name	ID	Age	Specialty
Nelson	400	76	cardiology
Paine	266	45	cardiology
Pepper	555	42	cardiology
Miller	300	60	neurology
Moss	244	30	neurology
Hardy	454	53	osteopathology
Cheney	987	50	pediatry
McBride	377	36	radiology
Snow	500	65	radiology
Oltman	181	56	urology

Specialty	Count(ID)
cardiology	3
neurology	2
osteopathology	1
pediatry	1
radiology	2
urology	1

SQL Queries with Set Operators

SQL set operator keywords are UNION, INTERSECT and MINUS representing set union, set intersection and set difference.

Set:

```
SQL Query 1
SET_OPERATOR
SQL Query 2
```

Example: Find the doctors who are also patients.

```
SELECT      Name
FROM        Doctor
INTERSECT
SELECT      Name
FROM        Patient
```

Name
Hardy

Nested SQL Queries

Nested:

```
SELECT   ...
FROM     ...
WHERE    ... AND  A_i  NEST_OPERATOR  (SELECT   A_j
                                        FROM     ...
                                        WHERE    ...)
```

Example: Find the oldest radiologist in the hospital.

```
SELECT   Name
FROM     Doctor
WHERE    Specialty="radiology"
         AND  Age  >= ALL    (SELECT   Age
                              FROM     Doctors
                              WHERE    Specialty="radiology")
```

Name
Snow

SQL Queries - Summary

Basic:

CREATE VIEW $R(B_1, \ldots, B_m)$
SELECT $A_1, \ldots, A_n$
FROM $R_1, \ldots, R_l$
WHERE C_1 AND ... AND C_o

Aggregation:

SELECT $B_1, \ldots, B_n$, AGGREGATE_OPERATOR(A_i)
FROM ...
WHERE ...
GROUP BY $B_1, \ldots, B_n$

Set:

SQL Query 1
SET_OPERATOR
SQL Query 2

Nested:

SELECT ...
FROM ...
WHERE ... AND A_i NEST_OPERATOR (SELECT A_j
FROM ...
WHERE ...)