

Databases - 2

More on the Relational Model and Selection

Relational Algebra operations

Selection	σ
Projection	π
Cartesian Product	\times
Union	\cup
Set Difference	$-$
Join	\bowtie
Intersection	\cap
Division	\div

Choose particular rows

SELECTION

$\sigma_{\text{predicate}}(R)$

Selection operation works on a single relation R and defines a relation that contains only those tuples (rows) of R that satisfy the specified condition (predicate)

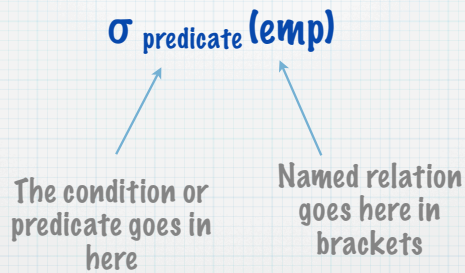
SELECTION RA example

List all staff with a salary greater than £25,000

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
405	MARCH	ADMIN	938	13/06/1997	18000		2
535	BYRNE	SALES	734	15/08/1997	26000	300	3
557	BELL	SALES	734	26/03/2000	22500	500	3
602	BIRD	MANAGER	875	31/10/1997	39750		2
690	AHMAD	SALES	734	05/12/1997	22500	1400	3
734	COX	MANAGER	875	11/06/2002	38500		3
818	POLLARD	MANAGER	875	14/05/2000	34500		1
824	REES	ANALYST	602	05/03/2000	40000		2
875	PARKER	PRESIDENT		09/07/2002	60000		1
880	TURNER	SALES	734	04/06/2001	25000	0	3
912	HAYES	ADMIN	824	04/06/2001	21000		2
936	CASSY	ADMIN	734	23/07/2002	19500		3
938	GIBSON	ANALYST	602	05/12/1997	40000		2
970	BLACK	ADMIN	818	21/11/1997	23000		1

SELECTION RA example

List all staff with a salary greater than £25,000



Predicates

Expressions that evaluate to **true** or **false** once all the names have been replaced with a value

expression	explanation
$\text{job} = \text{"manager"}$	is job equal to "manager"
$\text{sal} > 30000$	is salary greater than 30000
$\text{job} = \text{"admin" and sal} > 25000$	is job equal to "admin" and salary > 25000

Predicates

hints	example
literal strings must be wrapped in " "	"Manager"
Use <, >, =, <=, >= and <>	sal>=25000 comm<=300 deptno<>3
Build more complex expressions with and , or , not	sal<25000 and deptno=5

SELECTION RA example

List all staff with a salary greater than £25,000

The condition or predicate goes in here

$\sigma_{sal > 25000} (emp)$

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
535	BYRNE	SALES	734	15/08/1997	26000	300	3
602	BIRD	MANAGER	875	31/10/1997	39750		2
734	COX	MANAGER	875	11/06/2002	38500		3
818	POLLARD	MANAGER	875	14/05/2000	34500		1
824	REES	ANALYST	602	05/03/2000	40000		2
875	PARKER	PRESIDENT		09/07/2002	60000		1
938	GIBSON	ANALYST	602	05/12/1997	40000		2

SELECTION RA example (2)

Show all the staff who are managers

The condition or predicate goes in here

$\sigma_{job = \text{"manager"}} (emp)$

Named relation goes here in brackets

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
602	BIRD	MANAGER	875	31/10/1997	39750		2
734	COX	MANAGER	875	11/06/2002	38500		3
818	POLLARD	MANAGER	875	14/05/2000	34500		1

SELECTION RA example (3)

Show all the staff who are managed by employee no 734

$\sigma_{mgr=734}(emp)$

The condition or predicate goes in here

Named relation goes here in brackets

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
535	BYRNE	SALES	734	15/08/1997	26000	300	3
557	BELL	SALES	734	26/03/2000	22500	500	3
690	AHMAD	SALES	734	05/12/1997	22500	1400	3
880	TURNER	SALES	734	04/06/2001	25000	0	3
936	CASSY	ADMIN	734	23/07/2002	19500		3

SELECTION RA example (4)

Display all the staff who are administrators and earn over £22000

$\sigma_{job='Admin' \text{ and } sal > 22000}(emp)$

The condition or predicate goes in here

Named relation goes here in brackets

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
970	BLACK	ADMIN	818	21/11/1997	23000		1

So: how do we do SELECTION in SQL?

SQL always looks like this:

select * or expression
from relations
[where expression]

the 'where' part is optional

SELECTION SQL example

List all staff with a salary greater than £25,000

select *
from emp
where sal > 25000

the particular columns we require go here

table name goes here

the predicate goes here

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
535	BYRNE	SALES	734	15/08/1997	26000	300	3
602	BIRD	MANAGER	875	31/10/1997	39750		2
734	COX	MANAGER	875	11/06/2002	38500		3
818	POLLARD	MANAGER	875	14/05/2000	34500		1
824	REES	ANALYST	602	05/03/2000	40000		2
875	PARKER	PRESIDENT		09/07/2002	60000		1
938	GIBSON	ANALYST	602	05/12/1997	40000		2

SELECTION SQL - other examples

Show all the staff who are managers

$\sigma_{\text{job}=\text{"manager"}}(\text{emp})$

SQL:

SELECTION SQL - other examples

Show all the staff who are managed by employee no 734

$\sigma_{\text{mgr}=734}(\text{emp})$

SQL:

SELECTION SQL - other examples

Display all the staff who are administrators and earn over £22000

σ job="Admin" and sal>22000 (emp)

SQL:

Note

In fact, the standard SQL select statement does selection and projection

select * or expression
from relations
where expression

to choose particular
columns, write
projection columns
here

to choose
particular rows,
write selection
predicates here

PROJECTION AND SELECTION SQL example

Produce a list of staff who earn over 25000, showing only the Empno, EName and Job

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
405	MARCH	ADMIN	938	13/06/1997	18000		2
535	BYRNE	SALES	734	15/08/1997	26000	300	3
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970	BLACK	ADMIN	818	21/11/1997	23000		1

PROJECTION AND SELECTION SQL example

Produce a list of staff who earn over 25000, showing only the Empno, EName and Job

```
select empno, ename, job  
from emp  
where sal > 25000
```

particular
columns go here

table name goes
here

conditions go
here

empno	ename	job
535	BYRNE	SALES
602	BIRD	MANAGER
734	COX	MANAGER
818	POLLARD	MANAGER
824	REES	ANALYST
875	PARKER	PRESIDENT
938	GIBSON	ANALYST

Note - even though we are using sal in the selection, it's not necessary in the projection