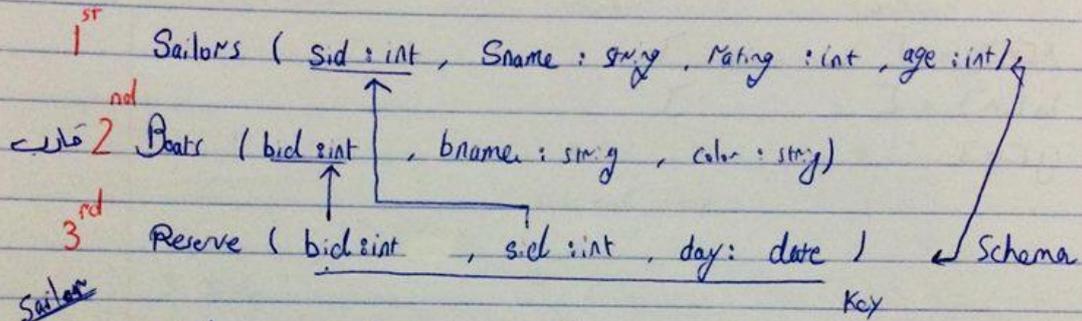


* Chapter 4: Relational Algebra

29-9-2018

Assume we have three Relations

1



Sailors

sid	Sname	Rating	age
28	Yuppy	9	35
31	Lubber	8	55
44	grampy	5	35
58	Ruty	10	35

Select

σ (Relation name)
 <condition>] New Relation

(Sailors)
 $\sigma_{age > 35}$

sid	sname	Rating	age	output
31	Lubber	8	55	←

New Relation is output

$\sigma_{l=1}$ (Sailors)

2

ظروف = True
Condition = True

$\sigma_{sid > 31}$ (Sailors)

sid	sname	rating	age
44
58

$\sigma_{sid > 31 \wedge rating > 6}$
and

sid	sname	rating	age
58	Ruby	10	31

\wedge : and
 \vee : or

Note:- Conditions are used to determine tuples (Row)

* New operator called [PROJECT]

PROJECT [Π (relation name)] New Relation
<column list>

Π (Sailors)
sname \Rightarrow
Yuppy
Lupper
Juppy
Ruby

assume we add the following row
 \Rightarrow 59 lubber 7 38

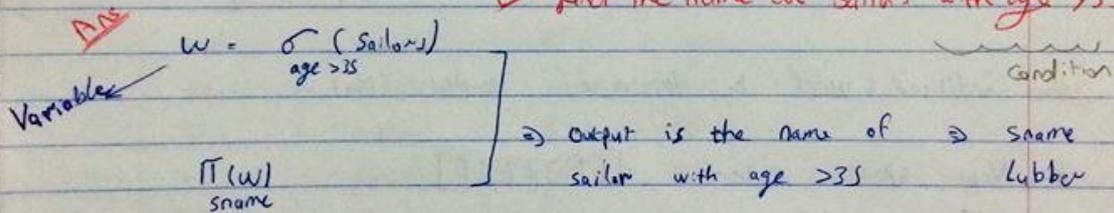
after add the row
if we use Π ... :- We will not see another lubbers

because it's gives us the ^{المتف} distinct tuples 3
^{لا يتكرر اكثر}

distinct tuples	← Π (Sailors)	sname	age
		sname, age	
		Xuppy	35
		Lubber	55
		Guppy	35
		Ruby	35
		Lubber	35

Ex How To Mix between Vertical & Horizontal. ?

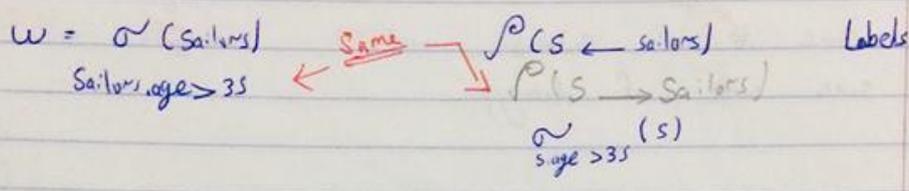
Ex Find the name of sailors with age > 35



OR $\Pi_{sname} [\sigma_{age > 35}(\text{Sailors})]$

We can put any # of conditions &

If we have more than one Relation 4



S₁ = Sailors

sid	sname	rating	age
28	Xuppy	9	35
31	Lubber	8	55
44	Grampy	5	35
58	Ruby	10	35
59	Lubber	7	38

S₂

sid	sname	rating	age
28	Xuppy	9	35
66	Ahmed	9	55

Union $S_1 \cup S_2 \Rightarrow 6$ tuples \Rightarrow Xuppy etc

Intersection $S_1 \cap S_2 \Rightarrow 1$ tuple

Set difference $S_1 - S_2$ Every thing is in S_1 and not exist in S_2

- sid
- 31
- 44
- 58
- 59

V, A and - Work if ?

- 1 - Same # of columns ← Number 15
- 2 - same order of datatype

Reserve

B	sid	b.d	day
	28	5	1/1/2018
	28	6	1/2/2018

$S_2 \times B$

↓
Cartesian
Product

$$A = \{a, b\}$$

$$\Rightarrow A \times B = \{(a,1), (a,2), (b,1), (b,2)\}$$

$$B = \{1, 2\}$$

	sid	sname	marry	age	sid'	b.d	date
✓	(28)	XUPPY	9	35	(25)	5	1/1/18
✓	(28)	XUPPY	9	35	(28)	6	1/2/2018
×	(66)	Ah.	9	55	(28)	5	1/1/18
×	(66)	Ah.	9	55	(28)	6	1/2/18

$$\sigma_{(S_2 \times B)}$$

$$S_2.sid' = B.sid$$

σ Select \Rightarrow from tuples العبر الأفقي 10-10-2018
 Π Project \Rightarrow from column
 ρ Rename (Sailors \rightarrow S)

\cup
 \cap
 $-$: Works on row only \Rightarrow Ex $A = \{1, 2, 3\}$ $B = \{1, 2\}$ $A - B = A \setminus B$
 $A - B \neq \{3\}$

\times Cartesian Product ∞

Sailors (sid, sname, age, rating)

Reserve (sid, bid, day)

Boats (bid, bname, colour)

Assume

Sailors				Reserve		
sid	name	age	rating	sid	bid	day
1	AB	22	9	1	103	Mon
2	AC	23	7	1	105	Tue
3	AD	18	6	2	103	Fri

Cartesian Product

	sid	name	age	rating	sid'	bid	day
✓	1	AB	22	9	1	103	Mon
✓	1	AB	22	9	1	105	Tue
✗	1	AB	22	9	2	103	Fri
✗	2	AC	23	7	1	103	Mon
✗	2	AC	23	7	1	105	Tue
✗	2	AC	23	7	2	103	Fri
✓	2	AC	23	7	2	103	Fri
✗	3	AD	18	6	1	103	Mon
✗	3	AD	18	6	1	105	Tue
✗	3	AD	18	6	2	103	Fri
✗	3	AD	18	6	2	103	Fri

~~سؤال~~ $\pi_{S.age > 22} [\pi_{S.name} (S \bowtie R)]$ X

(3)

س name قبل Join من ايس

$\pi_{S.name} [\pi_{S.age > 22} (S \bowtie R)]$ ✓

The previous is join between 2 tables

~~سؤال~~ استمر الاستعلام الى جبراً قارب احمد

Sail نقل R مملكة
 Boat نقل R
 R و نقل B و S

$\pi_{S.name} [S \bowtie [R \bowtie \pi_{B.name = 'abd'} (B)]] = \pi_{S.name} [\pi_{S.name} [S \bowtie (R \bowtie B)]]$!

على أكثر

Note: join is double loop on 2 tables
 reduce # of data then join

~~سؤال~~

استمر القواب الى جبراً احمد $\pi_{B.name} [S(s) \bowtie R]$ X

$\pi_{B.name} [\pi_{S.name = 'Ahmed'} [B \bowtie (R \bowtie S)]] \equiv \pi_{B.name} [B \bowtie (R \bowtie \pi_{S.name = 'Ahmed'} (S))]$

↑
 Push down قبل join

Review

Sailors (sid , sname , rating , age)

13-10-2018

Boats (bid , bname , colour)

①

Reserve (sid , bid , day)

\sim
 Π
 $\times \Rightarrow \infty$ (join) مكان اجمع اكثر من table
 \cup
 \cap
 $-$
 ρ

فسر أو افسر \sim (S \times R \times B) \cup \sim (S \times R \times B)
 B.colour = 'red' B.colour = 'green'

\vee use it
 \wedge don't use it

سؤال :- افسر الأشخاص اكتب جواباً قارئين

sid	bid	day		sid	bid	day	sid	bid	day
1	103	Mon	\times	1	103	Mon	1	103	Mon
1	105	Tue		1	105	Tue	1	103	Mon
2	107	Weed	\times	2	107	Weed	1	103	Mon
				1	103	Mon	1	105	Tue
			\times	1	105	Tue	1	105	Tue
			\times	2	107	Weed	1	105	Tue
			\times	1	103	Mon	2	107	Weed
			\times	1	105	Tue	2	107	Weed
			\times	2	107	Weed	2	107	Weed

Query ②

$\sigma_{R.bid < R'.bid}$ $\left[\sigma_{R.sid = R'.sid} \mid R \times \rho(R \rightarrow R') \right]$

أكبر أو أصغر \leftarrow $R.bid < R'.bid$
 قارب واحد \leftarrow $R.sid = R'.sid$

$\sigma_{R.bid < R'.bid}$ $\left[\dots \right]$

x : هنا أنا وحدة \leftarrow
 x : هنا أنا وحدة \leftarrow

Assume we want to find id for persons who don't reserve any Boat. "Non-Monotonic Query"
 نطلع عنان نوجب النتيجة

$$\pi_{sid}(S) - \pi_{sid}(R) \quad [\text{computable, Both have sid}]$$

In this chapter ~~we~~^{only we} want [Relational Algebra]

- Logic x
- Tuple calc x
- Division x

Exercise 8-4 [From Text Book]

$$\pi_{sname} \left(\pi_{sid} \left[\left(\sigma_{color='red'} Parts \right) \bowtie \left(\sigma_{cost < 100} catalog \right) \right] \bowtie suppliers \right)$$

sid لا يتغير مع Join
 Parts
 Suppliers (sid, sname, add)
 Parts (pid, pname, color)
 Catalog (sid, pid, cost)

② ← Part
 قوتة السلي
 name لا يتغير مع Join
 sid

What does this query do ?

Join : sid لا يتغير مع
 → Natural Join

Part ③
$$\pi_{sname} \left(\left(\sigma_{color='red'} Parts \right) \bowtie \left(\sigma_{cost < 100} catalog \right) \bowtie suppliers \right) \cap \pi_{sname} \left(\sigma_{color='green'} Parts \right)$$

supplier slave
 في اقلها قوتة خضراء أو حمراء ويسمى أقل من 100

Ex R = n tuples
 S = m tuples



And Maximum tuples $R \times S \Rightarrow m \times n$

$R \bowtie S \Rightarrow \min(n, m)$
 لأنه يجب الاشتراك

④ Same but sid

④

⑤ Π sname | Π sid, sname [...]

Natural Join

3, 5
3 x 5 = 15

sid	bid	day
1	103	Mon
2	105	Tue
3	107	Wed

sid	bid	sid'	bid'
1	103	1	103
1	105	1	105
x 1	107	2	107
x 2	103	1	103
x 2	105	1	105
2	107	2	107
x 3	103	1	103
x 3	105	1	105
x 3	107	2	107

min ✓ ← 3

لوبي P.K, FK تجلت