

{Microsoft SQL, Oracle, MySQL, PostgreSQL}

Systems that store the data in structured way

They follow the relational model

relations
العلاقات

* Relation \rightarrow represents a kind of entity/object with certain attributes \rightarrow ex \rightarrow car (make, model, color)

* A (set) of tuples (relation is a set of tuples)

- unordered
- No duplicates

Relation algebra

Set of operations that can be done on relations

* ~~SQL~~ relation algebra & relational model follow "set semantics" order, no duplicates

* SQL follows "Bag" semantics
تسمح بالترتيب والتكرار

Relational algebra is called procedural
بنسبته الى order العمليات

العمليات

selection (σ)

Rename (ρ)

Projection (π)

union (\cup)

Intersection (\cap)

Difference ($-$)

Product (\times)

Join (\bowtie)

* selection

output tuples that satisfy a condition

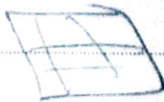
syntax : $\sigma_{condition}(input)$

* Rename

output a relation with renamed attributes

syntax : $\rho_{A_1, A_2, \dots, A_n}(input)$ relation

ex \rightarrow $\rho_{id, make, year}(car)$



$\rho_{id, brand, year}(car)$

• Production de l'acier

- output a relation net has only the specifications att.
- can add, remove, or change att order.

syntag : a_1, a_2, \dots, a_n (input)

all \rightarrow $\text{Sp}_{\text{rand}, \text{next}} (\text{all make, year} + 1 (\text{cur})) \rightarrow$ Changing of operation

* Union

• output tables that appear in one or both of the
IP relations

- Duplicates are removed

- inputs must have same att.

syntax: input 1 U input 2

intersection

• output tubes that enter in both of the 2 IP relays

* Difference

, output couples that appear in the first but not in the second input relations

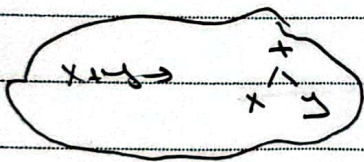
* Product (X)

- AKA Cartesian Product or cross product
- Output all possible combinations of tuples from IP relations

* Join M

- AKA inner join
- syntax: $IP_1 \text{ Natural } IP_2$
- all combinations of tuples from the IP relations with matching attribute values

* Tree Representation

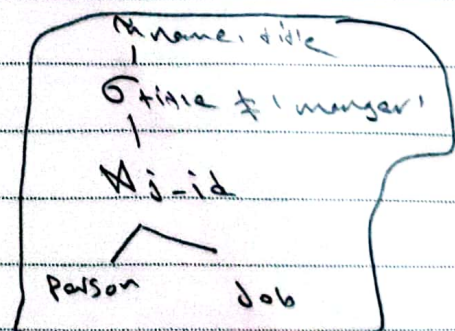


→ Relations → $job(j-id, title)$

person $(p-id, name, j-id)$

Ask → Return the name and job

title for every person who is not
a manager



* فكرة Query optimizer هو تحويل ال query يحتاج تحليل

شجرة tree ويبدأ ببناء شجرة ال query ثم ترتيب الشجرة