

UNIT - D2

Relational Algebra.

Two formal languages associated with relational data models are (1) Relational Algebra
(2) Relational calculus.

Operators

① Selection (σ) :- To select the rows or records or tuples of a table

$c \rightarrow$ condition

Syntax: $\sigma_c (T/E)$. $T \rightarrow$ table name / Expression

Ex:- Find the details of all Sailors with rating above 7

$\sigma_{rating > 7} (Sailors)$

② projection (π) → To select columns of a table

Syntax:-

$\pi_{c_1, c_2, c_3, \dots, c_n} (T/E)$

$c_1, c_2, \dots, c_n \rightarrow$ column
 $T \rightarrow$ tablename

Ex:- Find the Sid, Sname of sailors

$\pi_{sid, sname} (Sailors)$

③ Set operators:- $\cup, \cap, -$

$\cup \rightarrow$ union

$\cap \rightarrow$ intersection

$- \rightarrow$ set difference

Ex:-

(Select) $R \rightarrow$ (Select) R

Select by the common values available in both

(Project) $R \rightarrow$ (Project) R

not doing because

potentially get unnecessary relationships. so division of
pertaining to the two statements. so have no answer
that satisfying all the known conditions

(Divide) R
 $R \div S$

Division - It is used to find records in one relation
that are associated with all records in another relation.
- It is commonly used when we want to identify entities
that satisfy certain conditions across multiple related
data sets.

~~For~~ If R, S are two relations the division operator
the division operators. $R \div S$ can be applied if
i) the attributes of S are proper subset of the attributes of R
result will include all attributes of R except those that
are in S. It returns the tuples from R that are associated
with every tuple in S

Ex:- Find the Sailors who rescued all boats

$$\Pi_{SId, Bid}^{(Rescues)} \div \Pi_{Bid}^{(Boats)}$$

Find the Sailors who rescue all red boats

$$\Pi_{SId, Bid}^{(Rescues)} \div \Pi_{Bid}^{(\text{Boats})} \quad \text{color = 'red'}$$

Generalised projection

It extends the projection operations by allowing operations such as arithmetic and string functions to be used in the projection list.

Syntax

$$\Pi_{f_1(A_1), f_2(A_2), \dots, f_n(A_n)}^{(Table)}$$

Ex:- Find the independently incremented ratings of all Sailors.

$$\Pi_{rating+1}^{(Sailors)}$$

Compute the annual salaries of all employees

$$\Pi_{Salary * 12}^{(Employee)}$$

Aggregation operators

↳ means the use of aggregate function

Syntax:-

$$G_{Op(Att)}^{(T/E)}$$

$$G_{Op(Att)}$$

$$G_1, G_2, G_3, \dots, Op(Att)$$

This is to apply aggregate functions to different groups

Ex:-

① Find the no. of sailors.

G {Sailors}

Count(sid)

② Find the avg age of sailors for each rating level

rating G Sailors
avg age

TRC [Tuple Relational calculus]

Syntax

{T | P(T)}

T - A tuple variable

P(T) - formula that describes a tuple variable

Ex:-

① Find all sailors with rating above 7

{S | s ∈ Sailors ∧ s.rating > 7}

② Find the all details of sailors with age < 40

{S | s ∈ Sailors ∧ s.age < 40}

③ Find sid, sname of the sailors with rating > 7

{P | ∃s ∈ Sailors ∧ (s.rating > 7 ∧ P.sid = s.sid ∧ P.sname = s.sname)}

Ex- ① Find the sailor names, boat id, and reservation day with each reservation.

Ans:

{P | ∃sailors ∃R & Reserves. (s.sid = r.sid ∧ p.sname = r.pname) ∧ p.bid = R.bid ∧ p.day = R.day}

② Find the names of sailors who have reserved boat

Ans:

{P | ∃sailors. ∃R & Reserves (s.sid = r.sid ∧ p.sname = r.pname) ∧ p.bid = 103}

Ans:

open

george pinter

to r

(sailors booked after)

Sym:

sailor sgte & -T

{(T)g | T}

Ex:-

which boat almost ~ (T)g

Sailo

sailor sgte

with

bil

Comp

Friedo, pinter still waiting for

{sgtore & waiting | 2}

Or - go new sailing schedule 11b with

Agg

b P

Syr

start

show

{on & go & a crlflo | 3 }

for pinter & this sailing will be removed to

the billo - billo. qd & pinter. 2) waiting | 9

{arrive & money}