

Database Management System (DBMS)

Lecture-18

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Relational Algebra

Consider the following database which consists of three tables.

<i>sid</i>	<i>sname</i>	<i>rating</i>	<i>age</i>
22	Dustin	7	45.0
29	Brutus	1	33.0
31	Lubber	8	55.5
32	Andy	8	25.5
58	Rusty	10	35.0
64	Horatio	7	35.0
71	Zorba	10	16.0
74	Horatio	9	35.0
85	Art	3	25.5
95	Bob	3	63.5

Instance S_3 of sailors

<i>sid</i>	<i>bid</i>	<i>day</i>
22	101	10/10/98
22	102	10/10/98
22	103	10/8/98
22	104	10/7/98
31	102	11/10/98
31	103	11/6/98
31	104	11/12/98
64	101	9/5/98
64	102	9/8/98
74	103	9/8/98

Instance R_2 of Reserves

<i>bid</i>	<i>bname</i>	<i>color</i>
101	Interlake	blue
102	Interlake	red
103	Clipper	green
104	Marine	red

Instance B_1 of Boats Reserves

Relational Algebra

Write the following queries in relational algebra:

1. Find the names of sailors who have reserved boat 103.

Solution: $\Pi_{sname}((\sigma_{bid=103}(Reserves)) \bowtie Sailors)$

2. Find the names of sailors who have reserved a red boat.

Solution: $\Pi_{sname}((\sigma_{color="red"}(Boats)) \bowtie Reserves \bowtie Sailors)$

3. Find the colors of boats reserved by Lubber.

Solution: $\Pi_{color}((\sigma_{sname="Lubber"}(Sailors)) \bowtie Reserves \bowtie Boats)$

4. Find the names of sailors who have reserved at least one boat.

Solution: $\Pi_{sname}(Sailors \bowtie Reserves)$

5. Find the names of sailors who have reserved a red or a green boat.

Solution: $temp \leftarrow \Pi_{sname,color}(Sailors \bowtie Reserves \bowtie Boat)$
 $\Pi_{sname}(\sigma_{color="red"}(temp)) \cup \Pi_{sname}(\sigma_{color="green"}(temp))$

Relational Algebra

Write the following queries in relational algebra:

1. Find the names of sailors who have reserved a red and a green boat.

Solution: $temp \leftarrow \Pi_{sname,color}(Sailors \bowtie Reserves \bowtie Boat)$
 $\Pi_{sname}(\sigma_{color="red"}(temp)) \cap \Pi_{sname}(\sigma_{color="green"}(temp))$

2. Find the names of sailors who have reserved at least two boats.

Solution: $temp \leftarrow \Pi_{sid,sname,bid}(Sailors \bowtie Reserves)$
 $\Pi_{sname}(\sigma_{temp1.sid=r.sid \wedge temp1.bid \neq r.bid}(temp \times \rho_r(temp)))$

3. Find the sids of sailors with age over 20 who have not reserved a red boat.

Solution:

$\Pi_{sid}(\sigma_{age>20}(Sailors)) - \Pi_{sid}((\sigma_{color="red"}(Boats)) \bowtie Reserves \bowtie Sailors)$

Relational Algebra

Write the following queries in relational algebra:

1. Find the names of sailors who have reserved all boats.

Solution: $N \leftarrow \Pi_{sname, bid}(Sailors \bowtie Reserves)$

$D \leftarrow \Pi_{bid}(Boat)$

Therefore, final query is $N \div D$

2. Find the names of sailors who have reserved all boats called Interlake.

Solution: $N \leftarrow \Pi_{sname, bid}(Sailors \bowtie Reserves)$

$D \leftarrow \Pi_{bid}(\sigma_{bname="Interlake"}(Boat))$

Therefore, final query is $N \div D$