Netaji Subhas University of Technology

Practical Report

Database Management Systems

Computer Science Engineering (Internet of Things)
Semester 3

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2021UCI8036

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December 19, 2022

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1 Introduction

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2 The Sea

2.1 Schema

Consider the following relational schema:

```
SAILORS (sid, sname, rating, date_of_birth)

BOATS (bid, bname, color)

RESERVES (sid, bid, date, time_slot)
```

2.2 Queries

1. Find sailors who've reserved at least one boat
   (a) Relational Algebra

$$\pi_{sid,sname}(SAILORS \bowtie RESERVES))$$

   (b) SQL

```sql
SELECT sname
FROM SAILORS
WHERE sid IN (
    SELECT sid
    FROM RESERVES
);
```

2. Find names of sailors who've reserved a red or a green boat in the month of March.
   (a) Relational Algebra

$$\pi_{sname}(SAILORS \bowtie RESERVES \bowtie BOATS) \bowtie \sigma_{\text{bname=red}\vee\text{bname=green}}(\sigma_{\text{date=March}}(BOATS \bowtie RESERVES))$$

   (b) SQL

```sql
SELECT sname
FROM SAILORS
WHERE sid IN
    (SELECT sid
    FROM RESERVES
    WHERE bid IN
        (SELECT bid
        FROM BOATS
        WHERE bname = 'red' OR bname = 'green')
    AND (SELECT extract(month FROM date) FROM RESERVES) = 3)
```

3. Find names of sailors who've reserved a red and a green boat
   (a) Relational Algebra

$$\pi_{sname}(SAILORS \bowtie RESERVES \bowtie (\sigma_{\text{color}=red}(BOATS))) \cap \pi_{sname}(SAILORS \bowtie RESERVES \bowtie (\sigma_{\text{color}=green}(BOATS)))$$

   (b) SQL

```sql
SELECT DISTINCT S1.sname
FROM SAILORS S1, RESERVES R1, BOATS B1,
RESERVES R2, BOATS B2
WHERE S1.sid = R1.sid
    AND R1.bid = B1.bid
    AND S1.sid = R2.sid
    AND R2.bid = B2.bid
    AND B1.color = "red"
    AND B2.color = "green";
```

4. Find SID of sailors who have <u>not</u> reserved a boat after Jan 2018.
   (a) Relational Algebra

$$\pi_{\text{sid}} - \pi_{\text{sid}}(SAILORS \bowtie \sigma_{\text{date\_of\_birth} > \text{Jan 2018}}(RESERVES))$$

   (b) SQL

```sql
SELECT sid FROM SAILORS
WHERE sid NOT IN
    (SELECT sid FROM RESERVES
    WHERE date_of_birth > "2018-01-01")
```

5. Find sailors whose rating is greater than that of all the sailors named "John"
   (a) Relational Algebra

$$\pi_{\text{sid,sname}}(SAILORS) - \pi_{S_2.\text{sid},S_2.\text{sname}}(\sigma_{S_2.\text{rating}<S.\text{rating}}(\rho_{S_2}(SAILORS) \times \rho_S(SAILORS)))$$

   (b) SQL

```sql
SELECT sid, sname FROM SAILORS S1
WHERE S1.rating > ALL
        (SELECT S2.rating FROM SAILORS S2
        WHERE S2.sname = "John")
```

6. Find sailors who've reserved all boats
   (a) Relational Algebra

$$\pi_{\text{sid,sname}}(\pi_{\text{sid,bid}}(RESERVES) \div \pi_{\text{bid}}(BOATS)) \bowtie SAILORS$$

(b) SQL

```sql
SELECT S.sid, S.sname
FROM SAILORS S
WHERE NOT EXISTS
        (SELECT B.bid
        FROM BOATS B
        WHERE NOT EXISTS
                (SELECT R.sid, R.bid
                FROM RESERVES R
                WHERE R.sid = S.sid
                        AND R.bid = B.bid))
```

7. Find name and age of the oldest sailor(s)
   (a) Relational Algebra

$$\pi_{\text{sname,age}}(\pi_{sid}(SAILORS) - \pi_{S_2.sid}(\sigma_{S_2.\text{age}<S.\text{age}}(\rho_{S_2}(SAILORS) \times \rho_S(SAILORS)))) \bowtie SAILORS$$

   (b) SQL

```sql
SELECT sname, age FROM SAILORS S1
WHERE S1.date_of_birth > ALL
        (SELECT S2.date_of_birth FROM SAILORS S2)
```

8. Find the age of the youngest sailor for each rating with at least 2 such sailors
   (a) Relational Algebra

$$\pi_{\text{rating,minage}}(\sigma_{\text{no\_of\_sailors}>1}(\rho_{r(\text{rating,no\_of\_sailors,minage})}\ \mathcal{F}\ (\text{rating},count(\text{sid}),min(\text{age}))(SAILORS)))$$

   (b) SQL

```sql
SELECT rating, age FROM SAILORS S1
WHERE S1.date_of_birth > ALL AS minage
                (SELECT S2.date_of_birth FROM SAILORS S2
                WHERE S2.rating = S1.rating)
GROUP BY rating
HAVING COUNT(*) >= 2
```

References

[1] A. Einstein, "Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]," *Annalen der Physik*, vol. 322, no. 10, pp. 891–921, 1905.