

Course ISE 322: Database Systems

Recitation 7 Exercise

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December 2, 2009

Today we will cover a few different topics in the recitation. First we will complete the discussion of UNION, EXCEPT, and INTERSECT which we didn't finish last time. Second, we will go over the "sailor with two boats on the same day" query in detail, explaining precisely what is going on in the query. Third, I will give you some sample queries to write on your own using the sample schema below.

1 Finishing UNION, EXCEPT, INTERSECT

Explanation and examples from the slides.

2 Exploring the "Two different boats" Query

The sample schema for this exercise is:

```
Sailors(sid:integer, sname:string, rating:integer, age:real)
Boats(bid:integer, bname:string, color:string)
Reserves(sid:integer, bid:integer, day:date)
```

The query discussed in class was the following:

Show the names and ratings of sailors who have sailed two different boats on the same day.

One way to write the query in SQL is as follows:

```
SELECT DISTINCT S.sname, S.rating
FROM Sailors S, Reserves R1, Reserves R2
WHERE S.sid = R1.sid AND S.sid = R2.sid
AND R1.day = R2.day AND R1.bid <> R2.bid
```

Create the tables above using the following SQL:

```
CREATE TABLE Sailors (sid integer PRIMARY KEY,
sname char(20),
rating integer,
age real);

CREATE TABLE Boats (bid integer PRIMARY KEY,
bname char(20),
color char(20));
```

```
CREATE TABLE Reserves (bid integer,
sid integer,
day DATETIME,
PRIMARY KEY(bid, sid, day),
FOREIGN KEY (sid) REFERENCES Sailors,
FOREIGN KEY (bid) REFERENCES Boats)
```

To understand what is going on here, let's take the query apart one piece at a time.
We will execute the following parts of the query to see what is going on under the hood:

1. First, using just one copy of Reserves:

```
SELECT *
FROM Sailors S, Reserves R1
```

2. Adding the checks for sid and sid

```
SELECT *
FROM Sailors S, Reserves R1
WHERE S.sid = R1.sid
```

3. Taking the just the columns we want:

```
SELECT S.sname, S.rating
FROM Sailors S, Reserves R1
WHERE S.sid = R1.sid
```

4. There is no way to check for two different reservations on the same day here - we want to do the following:

- For each sailor, see if he has made two reservations
- See if the two are for different boats
- See if the two are on the same day

Logically, this involves looking at all possible combinations of sailors and pairs of reservations. In SQL that means two copies of the same table. Try each of the following queries to see what they do:

```
SELECT *
FROM Reserves R1, Reserves R2
```

```
SELECT *
FROM Sailors S, Reserves R1, Reserves R2
```

5. We need to add some checks to filter out garbage rows. Let's look individually at each check and see what they do:

```
SELECT *
FROM Sailors S, Reserves R1, Reserves R2
WHERE S.sid = R1.sid
```

```
SELECT *
FROM Sailors S, Reserves R1, Reserves R2
WHERE S.sid = R2.sid
```

```
SELECT *
FROM Sailors S, Reserves R1, Reserves R2
WHERE R1.sid = R2.sid
```

Putting them all together:

```
SELECT *
FROM Sailors S, Reserves R1, Reserves R2
WHERE S.sid = R1.sid AND S.sid = R2.sid
```

6. Now let's add the next filter. Try the following queries to see what happens:

```
SELECT *
FROM Sailors S, Reserves R1, Reserves R2
WHERE R1.day = R2.day
```

```
SELECT *
FROM Sailors S, Reserves R1, Reserves R2
WHERE S.sid = R1.sid AND S.sid = R2.sid
AND R1.day = R2.day
```

7. Last, let's add the last filter:

```
SELECT *
FROM Sailors S, Reserves R1, Reserves R2
WHERE R1.bid <> R2.bid
```

```
SELECT *
FROM Sailors S, Reserves R1, Reserves R2
WHERE R1.bid <> R2.bid
AND R1.day = R2.day
```

```
SELECT *
FROM Sailors S, Reserves R1, Reserves R2
WHERE R1.bid <> R2.bid
AND S.sid = R1.sid AND S.sid = R2.sid
```

8. Let's look now at the final table

```
SELECT *
FROM Sailors S, Reserves R1, Reserves R2
WHERE R1.bid <> R2.bid
AND S.sid = R1.sid AND S.sid = R2.sid
AND R1.day = R2.day
```

9. After we remove the columns:

```
SELECT S.sname, S.rating
FROM Sailors S, Reserves R1, Reserves R2
WHERE S.sid = R1.sid AND S.sid = R2.sid
AND R1.day = R2.day AND R1.bid <> R2.bid
```

10. And finally

```
SELECT DISTINCT S.sname, S.rating
FROM Sailors S, Reserves R1, Reserves R2
WHERE S.sid = R1.sid AND S.sid = R2.sid
AND R1.day = R2.day AND R1.bid <> R2.bid
```

3 Sample Queries

1. Show the names of all of the boats reserved by Lubber or Tina
2. Show the names of the boats reserved by Tina but not by Dustin
3. Show the names of all of the boats that Dustin didn't reserve
4. Show the names of all of the sailors who didn't reserve any boats
5. Show the names of all the sailors who reserved at least three different boats.