Islamic University of Technology

Database Management Systems Lab

CSE 4308 / CSE 4174

Lab 4

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1 JOIN operator

In this lab, we will only be working with “Inner Joins”. Inner Join is the simplest and most common type of join. It returns all rows from multiple tables where the join condition is met. The statement for declaring a inner join is as follows:

```sql
SELECT column1, column2, ...
FROM table1 INNER JOIN table2
ON table1.column = table2.column;
```

For example, joining `STUDENT` table and `DEPARTMENT` table based on a common column named `DEPT_NAME`.

```sql
SELECT *
FROM STUDENT INNER JOIN DEPARTMENT
ON STUDENT.DEPT_NAME = DEPARTMENT.DEPT_NAME;
```

In this case, we are just taking a Cartesian product between both tables and only showing the entries that match their common columns. `INNER JOIN` can be written by:

```sql
SELECT *
FROM STUDENT, DEPARTMENT
WHERE STUDENT.DEPT_NAME = DEPARTMENT.DEPT_NAME;
```

2 Aggregation Function

Aggregate functions are functions that take a collection (a set or multi-set) of values as input and return a single value. SQL offers five built-in aggregate functions:

- Average: `AVG`
- Minimum: `MIN`
- Maximum: `MAX`
- Total: `SUM`
- Count: `COUNT`

The input to AVG and SUM must be a collection of numbers, but the other operators can operate on collections of non-numeric data types, such as strings, as well. The syntax is following:

```
SELECT [AVG/MIN/MAX/SUM/COUNT](attribute_1)
FROM EMPLOYEE;
```

For example,

```
SELECT AVG(SALARY)
FROM EMPLOYEE;
```

2.1 Group By

There are circumstances where we would like to apply the aggregate function not only to a single set of tuples but also to a group of sets of tuples; we specify this wish in SQL using the GROUP BY clause. The attribute or attributes given in the group by clause are used to form groups. Let's say, now we want to know the average salary of each department. So, the statement will be:

```
SELECT DEPT, AVG(SALARY)
FROM EMPLOYEE
GROUP BY DEPT;
```

All selected attributes must be present either in aggregate functions or in group by clause, otherwise the query will be considered erroneous. For example, the following query is incorrect as ID appears in the SELECT statement, but not in the GROUP BY clause:

```
SELECT DEPT, ID, AVG(SALARY)
FROM EMPLOYEE
GROUP BY DEPT;
```

2.2 Having

The HAVING clause is used to specify conditions on groups rather than on tuples. For example, we might be interested in only those departments where the average salary of the employees is more than $5000. We cannot use the WHERE clause in this case because WHERE is used to specify conditions on a single set of tuples, whereas in this case, we are interested in finding a group of departments where the average salary is more than $5000.

```
SELECT DEPT, AVG(SALARY)
FROM EMPLOYEE
GROUP BY DEPT
HAVING AVG(SALARY)>5000;
```

As was the case for the SELECT statement, any attribute that is present in the HAVING clause without being aggregated must appear in the GROUP BY clause, otherwise the query is treated as erroneous.

3 Lab Task

3.1 Anime Table Schema

Column	Data Type	Description
anime_id	INT	Primary key
title	VARCHAR2(50)	Title of the anime
genre	VARCHAR2(20)	Genre of the anime
episodes	INT	Number of episodes
studio	VARCHAR2(50)	Studio that produced the anime
country	VARCHAR2(50)	Country of origin

Table 1: anime Table Schema

3.2 Character Table Schema

Column	Data Type	Description
character_id	INT	Primary key
first_name	VARCHAR2(30)	First name of the character
last_name	VARCHAR2(30)	Last name of the character
country	VARCHAR2(30)	Country where the character is from

Table 2: character Table Schema

anime_id	title	genre	episodes	studio	country
1	Naruto	Shounen	220	Pierrot	Japan
2	One Piece	Shounen	1000	Toei Animation	Japan
3	Attack on Titan	Action	75	MAPPA	Japan
4	Spirited Away	Fantasy	1	Studio Ghibli	Japan
5	Death Note	Thriller	37	Madhouse	Japan
6	Fullmetal Alchemist	Adventure	51	Bones	Japan
7	Your Name	Romance	1	CoMix Wave Films	Japan
8	Dragon Ball Z	Shounen	291	Toei Animation	Japan
9	Cowboy Bebop	Sci-Fi	26	Sunrise	Japan
10	My Hero Academia	Superhero	88	Bones	Japan
11	Demon Slayer	Action	26	Ufotable	Japan
12	Bleach	Shounen	366	Pierrot	Japan

Table 3: `anime` Table Data

3.2.1 `character` Table Data

character_id	first_name	last_name	country
1	Naruto	Uzumaki	Japan
2	Monkey	D. Luffy	Japan
3	Eren	Yeager	Germany
4	Light	Yagami	Japan
5	Edward	Elric	Germany
6	Ichigo	Kurosaki	Japan
7	Goku	Son	Japan
8	Tanjiro	Kamado	Japan
9	Gohan	Son	Japan

Table 4: `character` Table Data

To track which character appears in which anime, create a new table called `character_anime` with the following columns:

Add foreign key constraints on `character_id` referencing `character(character_id)` and on `anime_id` referencing `anime(anime_id)`. Choose a valid **primary key** for this table and populate it as:

Column Name	**Data Type**
`character_id`	INT
`anime_id`	INT
`role`	VARCHAR2(20)

Table 5: `character_anime` Table Schema

character_id	**anime_id**	**role**
1	1	Protagonist
2	2	Protagonist
3	3	Protagonist
4	5	Protagonist
5	6	Protagonist
6	12	Supporting
7	8	Protagonist
8	11	Protagonist
9	8	Protagonist

Table 6: `character_anime` Table Data

1. Count how many anime each character appears in.

2. Show which `genre` of anime has the least number of episodes on average.

3. Find the anime with the lowest number of episodes starting with "D" in their `titles`.

4. Show which character appears in the anime with the fewest episodes.

5. Find the total number of episodes for anime produced by studios from "Japan".

6. Find the average number of episodes for anime in which "Naruto Uzumaki" appears.

7. Sort the list of anime produced by "Toei Animation" by their `episodes` in descending order.

8. Find the average number of episodes for the "Shounen" genre.

9. Show the `first_name` of the character who plays a “Supporting” role in an anime.

10. Display the names of characters and the titles of their anime, separated by a dash (‘-’).

11. Which `country` has the most number of anime productions.

12. Find the list of characters who have appeared in anime produced by studios located in “Japan”.

13. List the anime whose `episodes` are higher than the average.

14. **Bonus:**

    - Write the names of the characters who share a last name and are from the same country.
    - Find the total number of episodes produced by each studio.