

CS 240A : Databases and Knowledge Base

Homework #4

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Question 1

Now EHist(Eno, Sal, Title, From, To) is a concrete view that stores the transaction time history for the relation EMP(Eno, Sal, Title). The concrete view must be maintained by active DB2 rules. Please write those rules (testing optional).

Solution

```
CREATE TRIGGER HireEmployee
AFTER INSERT ON EMP
FOR EACH ROW
INSERT INTO EHist VALUES(Eno, Sal, Title, CURRENTDATE, Null)
```

```
CREATE TRIGGER FireEmployee
AFTER DELETE ON EMP
FOR EACH ROW
UPDATE EHist SET To = CURRENTDATE
WHERE EHist.Eno = OLD.Eno AND EHist.To = Null
```

```
CREATE TRIGGER ChangeEmployeeUp
AFTER UPDATE ON EMP
FOR EACH ROW
UPDATE EHist SET To = CURRENTDATE
WHERE EHist.Eno = OLD.Eno AND EHist.To = Null
```

```
CREATE TRIGGER ChangeEmployeeIn
AFTER UPDATE ON EMP
FOR EACH ROW
INSERT INTO EHist VALUES(Eno, Sal, Title, CURRENTDATE, Null)
```

Question 2

Many airports use a complex conveyor system to deliver luggage to their destination. Some pieces of luggage end up going around in a cyclic pattern. We have sensors at each location producing a sequence:

events(itemNo, SensorNo, SensorType, Time)

You must write a query to detect items that are going around in a cycle, i.e., they have returned to the same location within one day. Many objects do not move fast, so the sensor might produce consecutive readings of the same object even if this is not in a cycle. Express your query using the proposed new SQL standards.

Solution

```
SELECT E.itemNo, E.SensorNo, E.Time
FROM events MATCH_RECOGNIZE(
    PARTITION BY itemNo ORDER BY Time
    MEASURES E1.SensorNo AS E1_SensorNo,
              E2.SensorNo AS E2_SensorNo,
              E3.SensorNo AS E3_SensorNo,
              E4.SensorNo AS E4_SensorNo,
    ONE ROW PER MATCH
    AFTER MATCH SKIP PAST LAST ROW
    PATTERN(E1 E2* E3+ E4)
    DEFINE E2 as (E2_SensorNo = E1_SensorNo),
           E3 as (E3_SensorNo <> E1_SensorNo),
           E4 as (E4_SensorNo = E1_SensorNo AND E4.Time - E1.Time <= 1)) as E;
```

Question 3

Do problem 11.2 from the ADS textbook.

What is the z-value of the pixel (11, 00) in Figure 11.4? What is its Hilbert value?

Solution

Consider pixel (11,00), we have $X = 11$ and $Y = 00$. The resulting Z-value of the pixel is calculated as follows:

z-value is the interleaving of bits from the x and y components of point which also called the shuffle of x and y.

$\therefore z - value = shuffle("1, 2, 1, 2", X, Y)$

$z - value = (1010)_2 = (10)_{10}$

Hilbert Value = The position of the pixel on the Hilbert Curve = (15)

Question 4

Write an SQL query that constructs the SalesCube for the following table as the sum of the Sales in every subcuboid:

cars(*Model*, *Color*, *Year*, *Dealer*, *Sales*)

Solution

```
SELECT Model, Color, Year, Dealer,  
       SUM(Sales) as SalesCube  
FROM cars  
GROUP BY CUBE(Model, Color, Year, Dealer);
```

Question 5

Assuming that the SalesCube above is constructed by sorting the table cars compute how many sorts are required and list them all.

Solution

The number of sorts required to construct the SalesCube = 15

The sorts are listed below:

1. (Model)
2. (Color)
3. (Year)
4. (Dealer)
5. (Model,Color)
6. (Model,Year)
7. (Model,Dealer)
8. (Color,Year)
9. (Color,Dealer)
10. (Year,Dealer)
11. (Model,Color,Year)
12. (Model,Color,Dealer)
13. (Model,Year,Dealer)
14. (Color,Year,Dealer)
15. (Model,Color,Year,Dealer)