CS411
Database Systems

06c: SQL-3

DB Modification, Definition, Views

Why Do We Learn This?

Database Modification

Database Modifications

- A modification command does not return a result as a query does, but it changes the database in some way.
- There are three kinds of modifications:

1. *Insert* a tuple or tuples.
2. *Delete* a tuple or tuples.
3. *Update* the value(s) of an existing tuple or tuples.

Insertion

- To insert a single tuple:

  INSERT INTO <relation>

  VALUES (<list of values>);

- Example: add to Likes(drinker, beer) the fact that Sally likes Bud.

```
INSERT INTO Likes
VALUES('Sally', 'Bud');
```

Specifying Attributes in INSERT

- We may add to the relation name a list of attributes.
- There are two reasons to do so:
  1. We forget the standard order of attributes for the relation.
  2. We don’t have values for all attributes, and we want the system to fill in missing components with NULL or a default value.

Example: Specifying Attributes

- Another way to add the fact that Sally likes Bud to Likes(drinker, beer):

```
INSERT INTO Likes(beer, drinker)
VALUES('Bud', 'Sally');
```

Inserting Many Tuples

- We may insert the entire result of a query into a relation, using the form:

  INSERT INTO <relation>

  (<subquery>);

E.g., INSERT INTO Beers(name)

SELECT beer from Sells;

Example: Insert a Subquery

- Using Frequents(drinker, bar), enter into the new relation PotBuddies(name) all of Sally's "potential buddies," i.e., those drinkers who frequent at least one bar that Sally also frequents.

Solution

The other drinker

Pairs of Drinker tuples where the first is for Sally, the second is for someone else, and the bars are the same.

```
INSERT INTO PotBuddies
(SELECT d2.drinker
 FROM Frequents d1, Frequents d2
 WHERE d1.drinker = 'Sally' AND
   d2.drinker <> 'Sally' AND
   d1.bar = d2.bar
);
```

Deletion

- To delete tuples satisfying a condition from some relation:

  DELETE FROM <relation>

  WHERE <condition>;

Example: Deletion

- Delete from Likes(drinker, beer) the fact that Sally likes Bud:

```
DELETE FROM Likes
WHERE drinker = ‘Sally’ AND
      beer = ‘Bud’;
```

Example: Delete all Tuples

- Make the relation Likes empty:

```
DELETE FROM Likes;
```

- Note no WHERE clause needed.

Example: Delete Many Tuples

- Delete from Beers(name, manf) all beers for which there is another beer by the same manufacturer.

```
DELETE FROM Beers b
WHERE EXISTS (
    SELECT name FROM Beers
    WHERE manf = b.manf AND
        name <> b.name);
```

Beers with the same manufacturer and a different name from the name of the beer represented by tuple b.

Semantics of Deletion -- 1

- Suppose Busch makes only Bud and Bud Lite.
- Suppose we come to the tuple *b* for Bud first.
- The subquery is nonempty, because of the Bud Lite tuple, so we delete Bud.
- Now, When *b* is the tuple for Bud Lite, do we delete that tuple too?

Semantics of Deletion -- 2

- The answer is that we *do* delete Bud Lite as well.
- The reason is that deletion proceeds in two stages:
  1. Mark all tuples for which the WHERE condition is satisfied in the original relation.
  2. Delete the marked tuples.

Updates

- To change certain attributes in certain tuples of a relation:

  UPDATE <relation>

  SET <list of attribute assignments>

  WHERE <condition on tuples>;

Example: Update

- Change drinker Fred's phone number to 555-1212:

```
UPDATE Drinkers
SET phone = '555-1212'
WHERE name = 'Fred';
```

Example: Update Several Tuples

- Increase price that is cheap:

```
UPDATE Sells
SET price = price * 1.07
WHERE price < 3.0;
```

Defining a Database Schema

Views

Views

- A view is a “virtual table,” a relation that is defined in terms of the contents of other tables and views.
- Declare by:

  CREATE VIEW <name> AS <query>;
- In contrast, a relation whose value is really stored in the database is called a *base table*.

Example: View Definition

- CanDrink(drinker, beer) is a view "containing" the drinker-beer pairs such that the drinker frequents at least one bar that serves the beer:

```
CREATE VIEW CanDrink AS
   SELECT drinker, beer
   FROM Frequents, Sells
   WHERE Frequents.bar = Sells.bar;
```

Example: Accessing a View

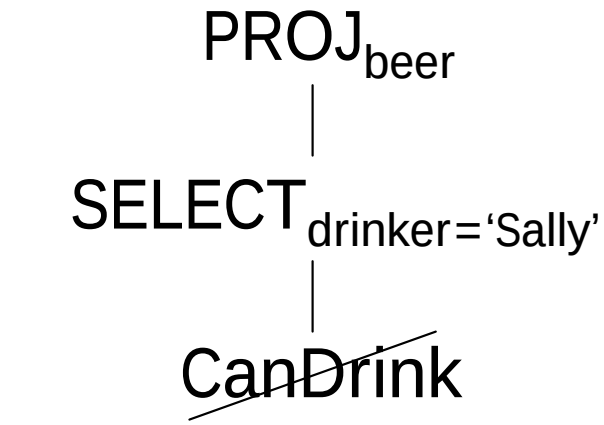
- You may query a view as if it were a base table.
  - There is a limited ability to modify views if the modification makes sense as a modification of the underlying base table.
- Example:

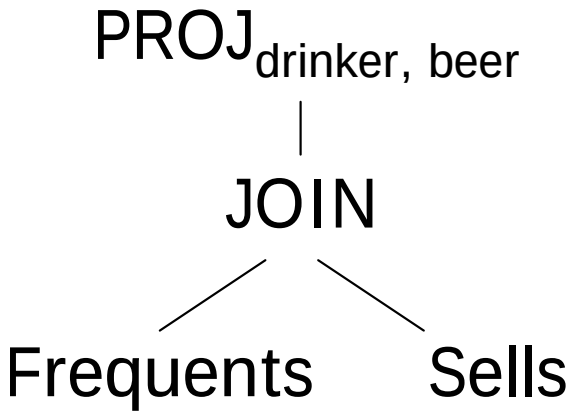
```
SELECT beer FROM CanDrink
WHERE drinker = 'Sally';
```

What Happens When a View Is Used?

- The DBMS starts by interpreting the query as if the view were a base table.
  - Typical DBMS turns the query into something like relational algebra.
- The queries defining any views used by the query are also replaced by their algebraic equivalents, and “spliced into” the expression tree for the query.

Example: View Expansion





Updating Views

How can I insert a tuple into a table that doesn't exist?

```
CREATE VIEW  JoeBarSells AS
  SELECT beer, price
  FROM  Sells
  WHERE bar = 'joe bar';
```

If we make the following insertion:

```
INSERT INTO  JoeBarSells
VALUES("bud special", 3.5)
```

It becomes:

```
INSERT INTO  Sells
VALUES(NULL, 'bud special', 3.5)
```

Q: Is the new tuple in table Sells? In the view JoeBarSells?

Non-Updatable Views

```
CREATE VIEW  Champaign-view  AS

        SELECT  name, product, store
        FROM    Person, Purchase
        WHERE   Person.city = "Champaign"    AND
                Person.name = Purchase.buyer
```

How can we add the following tuple to the view?

("Joe", "Shoe Model 12345", "Nine West")

We need to add "Joe" to Person first. One copy ? More copies ?

View Update Can be Tricky!

- Check textbook for rules of “updatable” views.

- Even when an update is allowed, it may not work intuitively as you would expect.