SQL Overview
Defining a Schema

CPSC 315 – Programming Studio

Fall 2010

Project 1, Lecture 3

Slides adapted from those used by Jeffrey Ullman, via Jennifer Welch

SQL

- **S**tructured **Q**uery **L**anguage
- Database language used to manage and query relational databases
- A well-known, commonly used standard
  - Regularly updated
- **Many** extensions, variations
  - Platform-specific versions, etc.

Generations of Programming Languages

- 1st generation
  - Machine code
- 2nd generation
  - Human-readable but directly related to processor
  - Assembly language, C (sort of)
- 3rd generation
  - Abstraction from processor, easier for humans
  - Fortran, C/C++, Java, etc.
- 4th generation
  - Programming Language for specific task
  - e.g. **SQL**, Matlab
- 5th generation
  - Give constraints (goal), and result follows logically
  - e.g. Prolog

SQL Elements

- Data Definition Language (DDL)
  - Supports creation of database schema
- Data Manipulation Language (DML)
  - Supports entering/removing data
- Querying Language
  - Supports query operations (don't change data itself)
- Others:
  - Transaction control, Data control

Our Discussion of SQL

- Will highlight some of the structures and features of SQL
- Give you an idea of the *basics* of how it works
  - Reflects how relational databases work
  - Not meant to make you SQL programmers
- You will need to implement equivalent functions for *parts* of what we discuss

Database Schema

- The set of relations (tables) in the database.
- Create, delete, change tables

CREATE

- Define a relation

```
CREATE TABLE <name> (
    <element list>
);

element = <name> <type>
```

Element Types

- INT, INTEGER
  - Integers
- FLOAT, REAL
  - Floating-Point numbers
- CHAR(n)
  - Fixed-length string of n characters
- VARCHAR(n)
  - Variable-length string of up to n characters
- DATE
  - yyyy-mm-dd
- TIME
  - hh:mm:ss

Example

```
CREATE TABLE HouseRep (
    Name VARCHAR(80),
    Party CHAR(10),
    Birthdate DATE,
    YearsInCongress INT,
    Salary REAL
);
```

Declaring Keys

- Keys declared within CREATE statement
- Key attributes functionally determine all other attributes in the relation
- List under PRIMARY KEY
  - Elements of primary key can not be NULL

Example

```
CREATE TABLE HouseRep (
    Name VARCHAR(80),
    Party CHAR(10),
    Birthdate DATE,
    YearsInCongress INT,
    Salary REAL,
    PRIMARY KEY (Name)
);
```

Example

```
CREATE TABLE HouseRep (
    Name VARCHAR(80),
    Party CHAR(10),
    Birthdate DATE,
    YearsInCongress INT,
    Salary REAL,
    PRIMARY KEY (Name, Birthdate)
);
```

Other Element Modifiers

- UNIQUE
  - Placed after type
  - Only one tuple in that relation for each value (except NULL)
  - Can imply key if no primary key given
  - Can be NULL
- NOT NULL
  - Cannot take value NULL
- DEFAULT
  - Default value specified

Example

```
CREATE TABLE HouseRep (
    Name VARCHAR(80) UNIQUE,
    Party CHAR(10),
    Birthdate DATE NOT NULL,
    YearsInCongress INT
            DEFAULT 0,
    Salary REAL
            DEFAULT 120000.00
);
```

Other Table Modifications

- `DROP <name>`
  - Deletes that table
- `ALTER TABLE <name> ADD <attribute>`
  - Adds a new column to table
- `ALTER TABLE <name> DROP <attribute>`
  - Removes the column from the table

Views

- Views are a sort of “virtual table”, usually created as the result of a query
  - We’ll discuss queries later
- Format:

```
CREATE VIEW <name> AS <query>
```