

SQL Overview

Defining a Schema

CPSC 315 – Programming Studio

Project 1, Lecture 3

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

SQL

- **Structured Query Language**
- 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>