Overview

- Introduction to databases
- Relational Model
- Using MS Access

Ubiquity of Databases

- Anywhere where a large amount of information needs to be managed safely and efficiently
  - Web sites
  - Phone, cable, and gas companies
  - Schools
  - Hospitals
  - Government agencies
  - ...

Two notions of Database

- Database software
  - Oracle, DB2, MS SQLServer, MySQL, PostgreSQL, MS Access
- Collection of data
  - "create a database in Access"

Database vs. File

- More efficient search
- ACID
  - Atomicity
  - Consistency
  - Isolation
  - Durability

Data Organization

- Physical Model – how data is stored on disk
- Logical Model – conceptual organization of data
  - Hierarchical
  - Network
  - Relational
Hierarchical Model

Company

R&D  Manufacture  Sales  Accounting

Trust Accounting  Corp Accounting

Manager  Employee 1  Employee 2  Employee 3

Name  Phone  Email

Network Model

Company

R&D  Manufacture  Sales  Accounting

Trust Accounting  Corp Accounting

Manager  Employee 1  Employee 2  Employee 3

Name  Phone  Email

Relational Model

- Proposed by Edgar F. Codd in earlier 1970’s
- All major databases are relational

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone</th>
<th>Email</th>
<th>Title</th>
<th>Dept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susan</td>
<td>626-1234567</td>
<td><a href="mailto:susan@some.company">susan@some.company</a></td>
<td>Manager</td>
<td>Trust Accounting</td>
</tr>
<tr>
<td>Susan</td>
<td>626-1234567</td>
<td><a href="mailto:susan@some.company">susan@some.company</a></td>
<td>Manager</td>
<td>Corp Accounting</td>
</tr>
<tr>
<td>Jane</td>
<td>626-7654321</td>
<td><a href="mailto:jane@some.company">jane@some.company</a></td>
<td>Employee</td>
<td>Sales</td>
</tr>
</tbody>
</table>

Some Relational Database Terminology

- Database
- Table, relation
- Attribute, field
- Record, tuple, row
- Column

Attribute Type

- Or field type, or data type
- Determines the storage required for a field
- Common attribute types
  - Text, Text(n)
  - Integer, Real
  - Currency, Date, Time
  - Image

Schema

- “Definition” of a database
  - Names of the tables
  - Attributes and attribute types in each table
  - Constraints on each tables
  - Dependencies between tables
SQL

- Standard query language of relational database
- Supported by all relational databases (with minor variations)
- Pronunciation

Using MS Access

Create a New Database

- Blank Access database
- File → New → Database
- Note: save the database to somewhere you can find

Create a New Table

- Select Tables in the Objects list
- Create table in Design view
- Save the table and give it a name
- Click no when asked for a primary key

EmployeeInfo <ID, Name, Title, Dept, Salary>

View Table Information

- View table design
- View table data

Input a Query

- Select Queries in the Objects list
- Click New then Design View
- Close the Show Table window then select SQL View
SQL Queries

General form:
select field_name(s) from table_name(s) where some_condition;

Get all employee information:
select * from EmployeeInfo;

Get all employee names:
select name from EmployeeInfo;

Get the names of the employees whose salaries
are higher than $55,000
select name from EmployeeInfo where salary > 55,000;

A Few Notes about SQL

◆ Command, field, and table names are case-insensitive
◆ Number of white spaces does not matter
◆ A string is enclosed between a pair of \\
◆ String comparison using = is case-insensitive

Exercise

◆ Download student.mdb
◆ Run following queries:
  1. Find all student names
  2. Find the names of the students whose
     major is MATH
  3. Find the pre-requisites of COSC3380
◆ Save your queries as Query1, Query2, Query3