Announcements

Please Turn in Project 2D
Project 3 will be posted this afternoon

Unannounced Quiz 3

Please stow all papers, books, phones, computers, pdas, etc.
Take out 1 sheet of paper, print your name, student ID and section #

Unannounced Quiz 3

Answer all questions. In databases...
1. “Tuple” is the same as (a) row, (b) record, (c) table, (d) attribute; list all that apply
2. “Field” is the same as (a) column, (b) row, (c) attribute, (d) table; list all that apply
3. Give the five fundamental operations on tables for relational databases

Thinking of Databases

Databases are organized on two levels: ‘physical’ is how the data is stored, ‘logical’ is how it’s viewed

Avoiding Redundancy

Redundancy is bad because it can lead to inconsistent data ... very bad!
- Keep only one copy of any data ...
  does that make it right???
- Rather than repeating data, reference it in the places where it is needed
  - Keep data in its own table
  - Save its key wherever it is needed
  - Users want the data, get it using its key!

Physical Database

Physical databases store data in the “best” way -- no redundancy, ...
- Expect many tables of “simple” entities
- “Physical” means that the data is actually stored on the disk -- contrast with logical DBs that are “virtual tables”
- Physical databases are designed “for the computer” not for the user
- The “physical schema” gives table definitions and the relationships
### Relationships

The table data entries are not just text & numbers, but they have meaning
- Relationships spell out that meaning

![Relationships Diagram](image)

### Kinds of Relationships

- **One-to-One**
  - Faculty → Parking Permit
- **One-to-Many**
  - Dorm → Student
- **Many-to-Many**
  - Student → Club

These relationships by their meaning

### Logical Databases

Users want & need different information
- Different tasks require different information
- Different authority levels, e.g. need to know
- Customizing to users means everyone sees exactly what they need to see
  - A view is a user’s customized database
- Views are virtual, built on-the-fly from the physical database and not kept
  - Data is always current
  - Custom structure can be very adaptable

### Queries

Queries are commands (using the 5 table operations) that create logical database (views) from physical

- Physical to Logical
  - Select(Projekt(+) - "))

Queries produced by queries are just tables

### SQL

The structured query language is the industry standard query language
- "Structured" means the queries have a standard form
- Common clauses:
  - SELECT <fields desired>
  - FROM <list of tables>
  - INNER JOIN <table> ON <conditions>
  - WHERE <criterion>

SQL is not case sensitive

### Sample Database

Define a university DB schema
- **ER Diagram**
  - Faculty
  - Student
  - Specifying a 1-to-many relationship

![Sample Database Diagram](image)
Sample SQL Queries

Typical: SELECT<attrs>FROM<tables>

SELECT Student.FirstN, Student.LastN, Student.MajorID
FROM Student
WHERE Student.S_ID = '0206125';

SELECT Student.FirstN, Student.LastN
FROM Student
WHERE MajorID = 14;

Join Example

Find the students of a given professor

SELECT Student.FirstN, Student.LastN, Faculty.LastN
FROM Student INNER JOIN Faculty
ON Student.Advisor = Faculty.Fac_ID

• Notice that selection comes from the combined (by Inner Join) table

DB Design Paradigm

Guidelines for good databases:
• Build physical DB to avoid redundancy, etc
• Each physical table represents 1 entity
• Expect that no physical table gives any user their exact view
• To build view, build a query that ...
  Joins tables together into a “super” table
  Trims out only the items the user wants

The guidelines are not an algorithm; they usually produce good results.

Project 3: SLAMA

Design DB to support a small mythical WA town’s police department ...

• “San Lucas Arrest Monitoring Application”
  The DB keeps track of suspects, police, and arrests. It monitors the blood alcohol and drug testing process while protecting the privacy of the citizens
  You will create the DB in MS Access, including tables, queries, forms and reports

Defining Tables

The physical database is a collection of (3-4) tables

<table>
<thead>
<tr>
<th>Field</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Field_type</td>
</tr>
<tr>
<td>Age</td>
<td>Integer</td>
</tr>
<tr>
<td>Address</td>
<td>Text</td>
</tr>
<tr>
<td>Phone</td>
<td>Text</td>
</tr>
<tr>
<td>Email</td>
<td>Text</td>
</tr>
</tbody>
</table>

Filling Tables

Things are slow in San Lucas, so you will have to generate data
Defining Queries

The logical database (views) remove data from tables for users

- Can write SQL directly, or
- Can use Query By Example

GUIs For The Views

The GUIs (forms) for users must be neat and attractive, with a slogan

Tracking Number

To protect privacy, lab samples are not coded with suspect’s name