1. Overview of the Course

2. Databases

3. Benefits of Databases

4. The Concurrency Problem

5. Assignment
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Overview of the Course

- Relational databases
  - Basics
  - Normal forms
  - Triggers
  - Views
Dynamic web pages

- HTML
- CSS
- PHP
- Javascript
- AJAX
- JQuery
Overview of the Course

- Semistructured databases
  - XML
  - XPath
  - XSLT
Develop a social network application for the web.
Outline

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Databases

Definition (Database)
A database (DB) is a collection of related data.

Definition (Database Management System)
A database management system (DBMS) is a program that accepts queries into a database and returns responses.

Definition (Query)
A query is a request that is sent to a DBMS instructing it to perform an operation on a database. A query may retrieve, insert, delete, or update data in the database.
Databases

Characteristics of a DBMS.

- Limited redundancy
- Restricted access (privileges and views)
- Persistent storage
- Efficiency
- Backup and recovery
- Multiple users (concurrency)
- Data integrity
As we will see, it can be quite tedious to enter the queries through a command line.

Often the “user” is actually an application program or a webpage, in which the queries are preprogrammed.

After our initial study of databases, we will design webpages that will automatically query the underlying database.
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Benefits of Databases

- A few of the benefits of using a database:
  - The user does not need to have knowledge of how the data is stored. He works through a user-friendly interface.
  - Different users can be given different views of the data. Each user may be unaware of the views that other users have.
  - Data can be easily shared among users.
Benefits of Databases

- Online Catalog
- Sales Records
- Inventory

Customer
Salesman
Manager
Benefits of Databases

Comprehensive Database
(Catalog, Sales, Inventory)

Customer

Salesman

Manager

Robb T. Koether (Hampden-Sydney College)
Various Roles

- Roles of various individuals involved.
  - The database administrator (DBA) – Oversees the entire system.
  - The database designer – Designs a database to meet the specs.
  - The user – Queries the database according to his needs.

- At various times in this course, we will be the database designer and the database user.
Roles of various individuals involved.

- The database administrator (DBA) – Oversees the entire system.
- The database designer – Designs a database to meet the specs.
- The user – Queries the database according to his needs.

At various times in this course, we will be the database designer and the database user.

One other person involved is the person who built the DBMS.
Outline

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Multiple users accessing the very same data at the very same time leads to the concurrency problem.

For example, Alice, a customer, requests the price of item #123.

At the very same time, Bob, an employee, is updating the price of item #123.

Which price will Alice see?
Concurrency

- Multiple users accessing the very same data at the very same time leads to the concurrency problem.
- For example, Alice, a customer, requests the price of item #123.
- At the very same time, Bob, an employee, is updating the price of item #123.
- Which price will Alice see?
- It depends on who goes first, Alice or Bob.
More significantly, Alice, an airline employee goes online to select a list of passengers on flight #123.

At the very same time, Bob, another airline employee, goes online to change the flight number from #123 to #456.

Alice selects the first 50 names of passengers on flight #123.

At that moment, the flight number is changed to #456.

The last 50 names are not selected because the flight number was no longer #123.

This type of conflict must be avoided.
Online analytical processing (OLAP) involves querying a database to obtain summary data, typical retrievals and aggregation.

- Most database applications fall into one of two categories: OLAP or OLTP.
- A typical OLAP application would be to get the total daily sales from online purchases.
- OLAP is computationally intensive (e.g., summing over millions of records).
- This is more like what we will do when we first study databases.
Online transaction processing (OLTP) involves many small queries, typically insertions.

- A typical OLTP application would be a database of online purchases. Each purchase is inserted into the database.
- OLTP is not computationally intensive.
- This is more like what we will do with PHP and Javascript.
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Assignment

- Read Chapter 1 - Databases and Database Users.
- Read Chapter 2 - Database System Concepts and Architecture.