

EECS 1012: Introduction to Computer Science

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Databases

- An organized collection of data
- Basic goal is to organize the data and to provide a standard, well defined, way of accessing that information.



Relational database

- Standard model of databases (from the 1970's)
- Data can be thought of as belonging to a collection of tables
- Rows correspond to records (or tuples).
- Columns are attributes
- Each row has a unique key

Imagine a student database

Key	Last Name	First Name	Street
101	Smith	John	Yonge
102	Jones	Franck	Bay
103			

Key - makes it possible to uniquely identify a record

DB operations are known as transactions

- Do this to a table
- Do that to a table

Schema Definition

- Process of taking some representational task and defining the attributes & tables to represent the data
- Fundamental and complex problem.
- Need to know what operations are going to be performed, how frequently, to know how to structure the data.

Operations on DB's

- Standard language for manipulating relational databases is through a language known as SQL
 - Structured Query Language
- It is a programming language
 - Can do many complex things with it.

(we will do very little)

A simple example

id	album	artist	year	cover
101	Led Zeppelin IV	Led Zeppelin	1974	http://....
102	Kind of Blue	Davis, Miles	1959	http://...

(This is the database in the VBox)

Dealing with the DB

- The specific database system used in this course is known as sqlite
- It maintains relational databases in a single file in the host OS
- Designed for very small, lightweight databases
- It is the standard representational mechanism for Android and IOS devices.

sqlite

- Has a terminal application program known as sqlite3
- sqlite3 <database name>
- prompt sqlite>
- .quit command to quit

sqlite3 commands

- Dot commands (higher level commands)
- Non dot commands - access the databases themselves

Dot commands

- .quit - quit
- .tables - list tables
- .databases - list databases
- .help - get help
- Many others. See a manual (or .help)

Database commands

- Can create tables, add records, add categories, delete records, delete tables, and search.
- We will concentrate on search here
 - Although the lab does a few examples of others

Search

- `select * from collection;`
 - Gets everything
- `select year from collection;`
 - Gets the year attribute
- `select * from collection where year=1979;`
 - Get everything with year=1979

Search Cont.

- `select * from collection with year=1979 and artist='Who, The';`
 - Can make very complex boolean expressions.
- `select distinct year from collection;`
 - Get all the year values that are distinct
- `select year from collection order by year;`
 - Order the output
- `select distinct year from collection order by year;`

Add/remove columns

- `alter table <tablename> add <columnname> <type>`
- `alter table <tablename> drop <columnname>`

Insert data

- insert into <tablename> (c1, c2, ..., cn) values (v1, v2, ..., vn)

Remove record

- delete from <table> where <column>=<value>

Update record

- update <tablename> set <column>=<value>
where <column>=<value>;

Summary

- Effective mechanism to represent data in collection of tables.
- Standard user interface (SQL), many standard implementations (e.g., mysql)
- You will only just touch the surface of this here.
 - See 3rd and 4th year courses for more in depth coverage.