

Introduction to Database Systems: CS305 A Database of Multiple Tables

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Importing Data: Two ideas

- **First idea:** INSERT line-by-line
 - Slow to code and to make the insertions

Populating tables line-by-line

```
INSERT INTO Table VALUES("1","ww","xx","yy","zz");
```

- **Second Idea:** IMPORT CSV data files via a “build” file.
 - Fast and you can easily rebuild your DB from files with updated data

Populating table-by-table

```
/*data files */  
.import data/department.csv Department
```

Automate Data Entry

How to get data into a base?

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Writers

Department
Tea

Consider This
...

Region	Rep	Item	Units	Unit Cost	Total
Central	Smith	Desk	2	125.00	250.00
Central	Kevin	Desk	5	125.00	625.00
Central	Gill	Pencil	7	1.29	9.03
Central	Jamie	Binder	11	4.99	54.89
Central	Andrews	Pencil	14	1.29	18.06
Central	Gill	Pen	27	19.99	539.73
Central	Morgan	Binder	28	8.99	251.72
Central	Andrews	Binder	28	4.99	139.72
Central	Jamie	Pencil	36	4.99	179.64
Central	Kevin	Pen Set	42	23.95	1,005.90
Central	Gill	Binder	46	8.99	413.54

Data and CSV Files

- Most data may arrive as a spreadsheet to be made into file
- Copy and Pasting is slow...

Making files of CSV's (Comma-separated values)...?

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Consider This

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Data in Spreadsheet Form to Files

Use: "save a copy"

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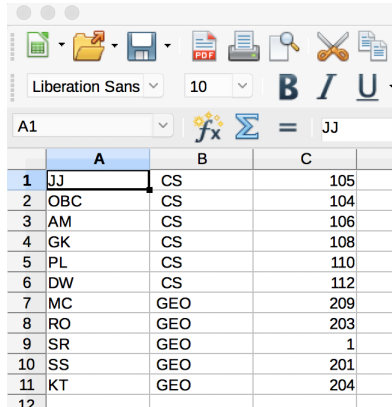
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Consider This

...



	A	B	C
1	JJ	CS	105
2	OBC	CS	104
3	AM	CS	106
4	GK	CS	108
5	PL	CS	110
6	DW	CS	112
7	MC	GEO	209
8	RO	GEO	203
9	SR	GEO	1
10	SS	GEO	201
11	KT	GEO	204
12			

File type: Text CSV (.csv)

- ☒ Automatic file name extension
- ☐ Save with password
- ☐ Edit filter settings

CSV Files

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Consider This

...

```
JJ,CS,105  
OBC,CS,104  
AM,CS,106  
GK,CS,108  
PL,CS,110  
DW,CS,112  
MC,GEO,209  
RO,GEO,203  
SR,GEO,001  
SS,GEO,201  
KT,GEO,204
```

```
JJ,1,Ruban  
OBC,1,PBJ  
AM,1,Chicken  
GK,1,Chicken  
PL,0,Ruban  
DW,0,PBJ  
MC,1,Ruban  
RO,0,PBJ  
SR,1,Ruban  
SS,1,Ruban  
KT,1,Ruban
```

```
JJ,101,pres  
OBC,112,pres  
AM,111,poster  
GK,109,workshop  
PL,109,poster  
DW,101,pres  
MC,112,pres  
RO,111,poster  
SR,111,poster  
SS,109,workshop  
KT,112,article
```

- Each table has own data file: Department, Tea, Session
- Be sure to use an text editor to remove any spaces and unusual characters!

Bring the data!

- **CREATE Tables:** Build your create tables code before you load the data.
- **.separator:** tells SQLite3 how the entries in the files are separated.
- **.import file.csv tableName:** Pull data from and pour into a specific table.

Check sandbox for builder file

```
/*Table Creation Above in This File*/  
.separator ","  
  
/*data files */  
.import data/department.csv Department  
.import data/tea.csv Tea  
.import data/session.csv Session
```

Unix: Compile Your Persistent Database

```
cat buildFile.txt | sqlite3 mydb.sqlite3
```

- UNIX: `cat buildFile.txt` : pull the contents of the text file (DB “builder file”)
- “`|`” means to *pipe* the contents to next function in bash command
- `sqlite3 mydb.sqlite3` : Have `sqlite3` create a file (called, `mydb.sqlite3`) to contain the database and data.
- Windows: Just copy and paste your SQL code from a builder file

New Way To List SQL Tables

List Tables command

```
SELECT
    name
FROM
    sqlite_schema
WHERE
    type ="table" AND
    name NOT LIKE "sqlite_%";
```

```
sqlite> SELECT
...>     name
...> FROM
...>     sqlite_schema
...> WHERE
...>     type ="table" AND
...>     name NOT LIKE "sqlite_%";
```

Writers
Books

Let's try out that table-listing code!

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Consider This
...

Create two tables

```
DROP TABLE IF EXISTS myTable1;  
CREATE TABLE myTable1 (  
    id INTEGER NOT NULL PRIMARY KEY,  
    firstName VARCHAR NOT NULL);
```

```
DROP TABLE IF EXISTS myTable2;  
CREATE TABLE myTable2 (  
    id INTEGER NOT NULL PRIMARY KEY,  
    firstName VARCHAR NOT NULL);
```

Then, the query (from above) to get the tables

```
SELECT name FROM sqlite_schema WHERE type ="table" AND  
    name NOT LIKE "sqlite_%";
```

Overview of The Entity-Relationship Model Design


Consider these!



- What is the *data* to store in the database?
- What are the *relationships* between the *entities* of information?
- What is the conceptual *design* of a system to link all this information together?

Table Relationship

- Relationship: the *id* is a *primary key* meaning that this attribute makes every row unique AND may be used to match authors to books
- Here, since both tables have unique *id*'s relationship we can link tables



```
CREATE TABLE Writers (  
  id INTEGER NOT NULL PRIMARY KEY,  
  firstName VARCHAR(15) NOT NULL,  
  middleName VARCHAR(15),  
  lastName VARCHAR(15) NOT NULL,  
  birthDate VARCHAR(10) NOT NULL,  
  deathDate VARCHAR(10),  
  countryOfOrigin VARCHAR(20) NOT NULL  
);
```

```
CREATE TABLE Books(  
  id INTEGER NOT NULL,  
  title VARCHAR(15) NOT NULL,  
  year VARCHAR(15) NOT NULL,  
  category VARCHAR(15) NOT NULL,  
  price VARCHAR(15) NOT NULL  
);
```

Create the file!

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Consider This

...

The terminal command to open a new database

```
sqlite3 writersAndBooksDB.sqlite3
```

```
obonhamcarter$ sqlite3 writers.sqlite3
SQLite version 3.19.3 2017-06-27 16:48:08
Enter ".help" for usage hints.
sqlite>
```

The Writers Table

From last time...

Create Table command

```
DROP TABLE IF EXISTS Writers;  
CREATE TABLE Writers (  
    id INTEGER NOT NULL PRIMARY KEY,  
    firstName VARCHAR NOT NULL,  
    middleName VARCHAR,  
    lastName VARCHAR NOT NULL,  
    birthDate VARCHAR NOT NULL,  
    deathDate VARCHAR,  
    countryOfOrigin VARCHAR NOT NULL);
```

- .schema Writers
- **Note: id INTEGER NOT NULL PRIMARY KEY,**
 - This attribute will be used to ensure all rows are unique
 - Used to connect to other tables

Adding Data to Writers Table

From last time...

Insert Commands

```
INSERT INTO Writers VALUES(1, "Francis", "Scott",  
    "Fitzgerald", "24Sept1896", "21Dec1940", "USA");
```

```
INSERT INTO Writers VALUES(2, "Arthur", "Conan",  
    "Doyle", "22May1859", "7July1930", "UK");
```

```
INSERT INTO Writers VALUES(3, "Ernest", "Miller",  
    "Hemingway", "21July1899", "2July1961", "USA");
```

```
INSERT INTO Writers VALUES(4, "John", "Edward",  
    "Williams", "29Aug1922", "3Mar1994", "USA");
```

The Books Table

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Consider This

...

Create Table command

```
DROP TABLE IF EXISTS Books;  
CREATE TABLE Books(  
    id INTEGER NOT NULL,  
    title VARCHAR NOT NULL,  
    year  VARCHAR NOT NULL,  
    category VARCHAR NOT NULL,  
    price NUMERIC NOT NULL );
```

- .schema Books
- All attributes must be present since “NOT NULL” is the *rule*

Add Data to the Books Table

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Consider This

...

Insert Commands

```
/* Populate the Books table */
```

```
/* "Francis", "Scott", "Fitzgerald" */
```

```
INSERT INTO Books VALUES(1, "The Great Gatsby", "1925", "F", 5);
```

```
INSERT INTO Books VALUES(1, "This Side of Paradise", "1920", "F", 8);
```

```
INSERT INTO Books VALUES(1, "Tender is the Night", "1934", "F", 9.50);
```

```
INSERT INTO Books VALUES(1, "A Life in Letters", "1975", "nF", 15);
```

```
/* "nF" not written by this person */
```

```
/* **** */
```

```
/* "Arthur", "Conan", "Doyle" */
```

```
INSERT INTO Books VALUES(2, "The Hound of the Baskervilles", "1902", "D", 6.50);
```

```
INSERT INTO Books VALUES(2, "The Adventures of Sherlock Holmes", "1892", "D", 10);
```

```
INSERT INTO Books VALUES(2, "The Lost World", "1912", "D", 13);
```

```
INSERT INTO Books VALUES(2, "The Valley of Fear", "1915", "D", 6);
```

Add Data to the Books Table

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Consider This

...

Insert Commands

```
/* Populate the table */
```

```
/* "Ernest", "Miller", "Hemingway" */
```

```
INSERT INTO Books VALUES(3,"The Old Man and the Sea","1951","H",10);
```

```
INSERT INTO Books VALUES(3,"Men Without Women","1927","H",12);
```

```
INSERT INTO Books VALUES(3,"A Moveable Feast: The Restored Edition","2009","nH",15);
```

```
INSERT INTO Books VALUES(3,"Green Hills of Africa","1935","H",15);
```

```
/* **** */
```

```
/* "John", "Edward", "Williams" */
```

```
INSERT INTO Books VALUES(4,"Stoner","1965","W",27);
```

```
INSERT INTO Books VALUES(4,"Nothing but the Night","1948","W",14);
```

```
INSERT INTO Books VALUES(4,"Butcher's Crossing","1960","W",20);
```

```
INSERT INTO Books VALUES(4,"The Broken Landscape: Poems","1949","W",20);
```

Queries!

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Consider This

...

SQL programming

```
SELECT * FROM Books;
```

Show me all rows in the Writers table

```
SELECT * FROM Writers;
```

Show me only rows for writers in the table who are from USA

```
SELECT * FROM Writers  
WHERE countryOfOrigin == "USA";
```



Queries!

Drawing from both tables simultaneously

Query question

Show me all books written by each of the writers.

General Form

```
SELECT
    Writers.lastName, Books.title
FROM
    Writers, Books
WHERE
    Writers.ID == Books.ID;
```

On fewer lines

```
SELECT Writers.lastName, Books.title FROM
    Writers, Books WHERE Writers.ID == Books.ID;
```

What do these queries give you?

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Consider This

...

```
SELECT Writers.lastName, Books.title  
FROM Writers, Books WHERE Writers.ID == Books.ID;
```

```
SELECT Writers.lastName, Books.title, Books.year  
FROM Writers, Books WHERE Writers.ID == Books.ID;
```

```
SELECT Writers.lastName, Books.title  
FROM Writers, Books WHERE writers.ID == Books.ID AND  
Writers.firstName == "Ernest";
```

What do these queries give you?

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Consider This

...

```
SELECT
    Writers.lastName, Writers.birthDate,
    Books.title, Books.year, Books.price
FROM
    Writers, Books
WHERE
    Writers.ID == Books.ID;
```

```
SELECT
    Writers.lastName, Books.category, Books.title, Books.year
FROM
    Writers, Books
WHERE Writers.ID == Books.ID;
```

What do these queries give you?

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Consider This

...

```
SELECT
    Writers.lastName, Writers.birthDate,
    Books.title, Books.year, Books.price
FROM
    Writers, Books
WHERE
    Writers.ID == Books.ID and price < 12;
```

Fix the below query

Broken query

```
SELECT
    Writers.lastName, Books.title
FROM
    Writers, Books
WHERE
    Writers.ID == Writers.ID AND category == "D";
```

Output

```
Doyle|The Hound of the Baskervilles
Doyle|The Adventures of Sherlock Holmes
Doyle|The Lost World
Doyle|The Valley of Fear
```


Consider this ...

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Consider This

...

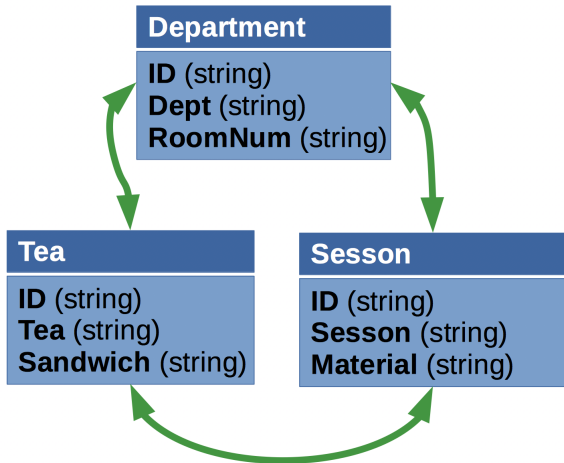


THINK

- Can you design and populate a database?
- Can you run queries to access particular attributes?

Connecting the Tables

Basic Schema



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Consider This

...

Find relationship to link

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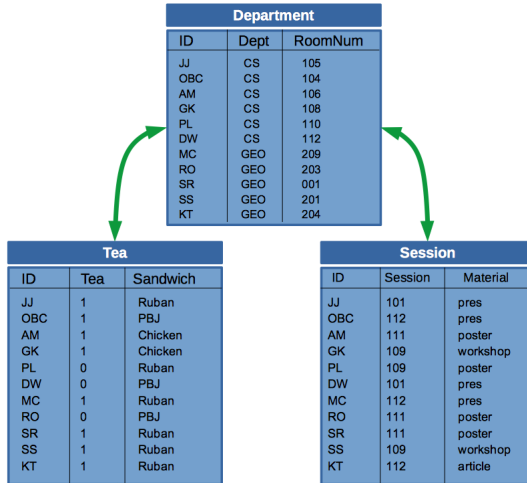
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Consider This

...



Example Code Department Table

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Consider This

...

Create

```
DROP TABLE IF EXISTS Department;  
CREATE TABLE Department (  
  id TEXT NOT NULL PRIMARY KEY,  
  dept TEXT NOT NULL,  
  roomNum INTEGER NOT NULL  
);
```

Populate

```
INSERT INTO Department Values ("JJ","CS",105);  
INSERT INTO Department Values ("OBC","CS",203);  
INSERT INTO Department Values ("DL","CS",106);  
INSERT INTO Department Values ("HZ","CS",104);
```

Example Code Tea Table

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Consider This

...

Create

```
DROP TABLE IF EXISTS Tea;  
CREATE TABLE Tea (  
  id TEXT NOT NULL PRIMARY KEY,  
  tea INTEGER NOT NULL,  
  sandwich TEXT NOT NULL  
);
```

Populate

```
INSERT INTO Tea Values ("JJ",1,"Ruban");  
INSERT INTO Tea Values ("OBC",1,"Salad");  
INSERT INTO Tea Values ("DL",0,"Chicken");  
INSERT INTO Tea Values ("HZ",0,"Pizza");
```

Example Code Session Table

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Consider This

...

Create

```
DROP TABLE IF EXISTS Session;  
CREATE TABLE Session (  
  id TEXT NOT NULL PRIMARY KEY,  
  session INTEGER NOT NULL,  
  material TEXT NOT NULL  
);
```

Populate

```
INSERT INTO Session Values ("JJ ", 101, "pres");  
INSERT INTO Session Values ("OBC", 112, "pres");  
INSERT INTO Session Values ("DL", 119, "poster");  
INSERT INTO Session Values ("HZ", 103, "poster");
```

Queries

Types of queries

Single table

Show me all rows from each of the tables, individually.

Two tables

Show me the name, dept and whether the person will have tea.

Two

Show me the name and dept of each person who will have a Ruban.

Two tables

Show me the sandwich type and the session room number of each person.

Queries, Continued

Show the ID, sandwich type, session material and department room number.

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Consider This

Queries, Part 2

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Consider This

...

Three tables

Show the ID, sandwich type, session material and department room number.

Three tables

Show me all the ID, Material, Tea and Sandwich and department room number.

Three tables

Show me the ID, Material, Tea and Sandwich and department room number for each person who will have a Ruban

Three tables

Show me the ID, Material, Tea and Sandwich and department room number for each person who will be presenting a “pres”

Consider this ...

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Consider This
...



THINK

- Can you design and populate a database of three tables?
- Can you run queries to access particular attributes in three tables?