Principles of Information and Database Management
198:336
Week 4 – Feb 14
Matthew Stone

Today
Relational model
- Big picture
- Schemas and tables
- ER diagrams to schemas
- Queries and SQL

Recap
Week 1: Motivation for info management
Week 2: Theory of representation
Week 3: Practice of representation
Week 4: A classic case study

Pictorial view

Definition operation
Describes the structure of specific information to IM
- Corresponds to a conceptual model
- Helps avoid errors
Relations

<table>
<thead>
<tr>
<th>sid</th>
<th>name</th>
<th>login</th>
<th>age</th>
<th>gpa</th>
</tr>
</thead>
<tbody>
<tr>
<td>53666</td>
<td>Jones</td>
<td>jones@cs</td>
<td>18</td>
<td>3.4</td>
</tr>
<tr>
<td>53688</td>
<td>Smith</td>
<td>smith@eecs</td>
<td>18</td>
<td>3.2</td>
</tr>
<tr>
<td>53650</td>
<td>Smith</td>
<td>smith@math</td>
<td>19</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Example of students relation

Named after logical relation

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<td>19</td>
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</tr>
</tbody>
</table>

Corresponds to
Student(53666, Jones, jones@cs, 18, 3.4)
Student(53688, Smith, smith@eecs, 18, 3.2)
Student(53650, Smith, smith@math, 19, 3.8)

Also called Tables

<table>
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For obvious reasons

In the relational model, IM stores set of relations or tables

Relational model

Define
– Creates new tables
Tell
– Inserts new rows into tables
Query
– SQL expressions describe data of interest
– Results are returned as tables

Relational Model: Example

Definition statement

```sql
create table books
( isbn char(13) not null primary key,
  author char(80),
  title char(100),
  price float(4,2)
);
```
Relational model example

Tell statement

```
insert into books values
('0-672-31697-8',
'Michael Morgan',
'Java 2 for Professional Developers',
34.99);
```

Relational model example

Tell statement

– Adds a row to the specified table in the information manager to include the specified entity or relationship.

Relational model example

Query example

```
SELECT author, title
FROM books
WHERE price > 30;
```

This returns a new table

<table>
<thead>
<tr>
<th>author</th>
<th>title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michael</td>
<td>Java 2 for Professional Developers</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

Relational Model

Most widely used model.
– Vendors: IBM, Informix, Microsoft, Oracle, Sybase, etc.
“Legacy systems” in older models
– E.G., IBM’s IMS

Relational Query Languages

Queries can be written intuitively, and the DBMS is responsible for efficient evaluation.
– The key: precise semantics for relational queries.
– Allows the optimizer to extensively re-order operations, and still ensure that the answer does not change.
**Schemas**

CREATE TABLE name(
    field TYPE OPTIONS,
    ...
    field TYPE OPTIONS
);

**Types**

int
char(n)
float(x,y)
date
varchar
text

**Options**

not null
primary key
references table(field)

**Interaction**

use database;
show tables;
describe table;