Translating Entity-Relationship to Relational Tables

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CS 348
Introduction to Database Management
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Main ideas:

- Each entity set maps to a new table
- Each attribute maps to a new table column
- Each relationship set maps to either new table columns or to a new table
Representing Strong Entity Sets

Entity set $E$ with attributes $a_1, \ldots, a_n$ translates to table $E$ with attributes $a_1, \ldots, a_n$

Entity of type $E$ $\leftrightarrow$ row in table $E$

Primary key of entity set $\rightarrow$ primary key of table

Example:

Student

<table>
<thead>
<tr>
<th>StudentNum</th>
<th>StudentName</th>
<th>Major</th>
</tr>
</thead>
</table>

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Representing Weak Entity Sets

Weak entity set $E$ translates to table $E$.

Columns of table $E$ should include:

- Attributes of the weak entity set
- Attributes of the identifying relationship set
- Primary key attributes of entity set for dominating entities

Primary key of weak entity set $→$ primary key of table.
Representing Weak Entity Sets (cont.)

Example:

```
Balance     Account     AccNum

Log

Transaction   TransNum

Date     Amount

Account

AccNum | Balance

Transaction

TransNum | AccNum | Date | Amount
```
Representing Relationship Sets

- If the relationship set is an identifying relationship set for a weak entity set then no action needed.

- If we can deduce the general cardinality constraint (1,1) for a component entity set $E$ then add following columns to table $E$
  - Attributes of the relationship set
  - Primary key attributes of remaining component entity sets

- Otherwise: relationship set $R \rightarrow$ table $R$
• Columns of table $R$ should include
  • Attributes of the relationship set
  • Primary key attributes of each component entity set

• Primary key of table $R$ determined as follows
  • If we can deduce the general cardinality constraint $(0,1)$ for a component entity set $E$, then take the primary key attributes for $E$
  • Otherwise, choose primary key attributes of each component entity
Note that the role name of a component entity set should be prepended to its primary key attributes, if supplied.
Representing Aggregation

Tabular representation of aggregation of $R$

$= \text{tabular representation for relationship set } R$

To represent relationship set involving aggregation of $R$, treat the aggregation like an entity set whose primary key is the \textbf{primary key} of the table for $R$
Representing Aggregation (cont.)

Example:

```
Representing Aggregation (cont.)

Example:

```

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Subject

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Representing Specialization

Create table for higher-level entity set, and treat specialized entity subsets like weak entity sets (without discriminators)

Example:

Student
  └── StudentNumber
  └── StudentName

Graduate
  └── StudentNumber
  └── ProfessorName

SupervisedBy
  └── (1, 1)

Professor
  └── ProfessorName

Degrees
  └── (0, N)

Student
  └── StudentNumber
  └── StudentName

Graduate
  └── StudentNumber
  └── ProfessorName

Degree
  └── StudentNumber
  └── Degree

Professor
  └── ProfessorName
Representing Generalization (Approach #1)

Create a table for each lower-level entity set only

Columns of new tables should include

- Attributes of lower level entity set
- Attributes of the superset

The higher-level entity set can be defined as a view on the tables for the lower-level entity sets
Representing Generalization (Approach #1)

Example:

```
<table>
<thead>
<tr>
<th>LicenceNum</th>
<th>MakeAndModel</th>
<th>Price</th>
<th>Tonnage</th>
<th>AxelCount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LicenceNum</td>
<td>MakeAndModel</td>
<td>Price</td>
<td>MaxSpeed</td>
<td>PassengerCount</td>
</tr>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

ER to Relational
Representing Generalization (Approach #2)

Treat generalization the same as specialization.

Example:

```
Vehicle
  LicenceNum
  MakeAndModel
  Price
  COVERS
    LicenceNum
    MakeAndModel
    Price
    Truck
    Car
    Tonnage
    AxelCount
    PassengerCount

Truck
  LicenceNum
  Tonnage
  AxelCount

Car
  LicenceNum
  MaxSpeed
  PassengerCount
```
Example Translation: ER Diagram