Basics of Relational Database Modeling

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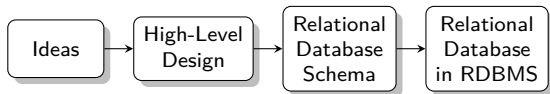
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February 11, 2025

Outline

Overview

```
┌────────┐   ┌────────────┐   ┌────────────┐   ┌────────────┐
│        │   │            │   │ Relational │   │ Relational │
│ Ideas  │ → │ High-Level │ → │ Database   │ → │ Database   │
│        │   │ Design     │   │ Schema     │   │ in RDBMS   │
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```

Outline

Relation in Relation Model

Relation models are based on *relations* where a relation is a 2-dimensional table.

Name	Start Year	Major	E-Mail
John Doe	2021	Computer Science	johndoe@johndoe.info
Jane Doe	2020	Information Systems	janedoe@johndoe.info

- ▶ The columns of a relation are named by *attributes*.
- ▶ The rows of a relation, other than the header row containing the attribute names, are called *tuples*.
- ▶ A relation is a set of tuples, *not* a list of tuples.
- ▶ Moreover, we can reorder the attributes of the relation as we choose, without changing the relation.

Schema

A relation is defined by its schema consisting of

- ▶ the name of the relation, and
- ▶ the set of attributes

Example.
```
Student(name, startyear, major, email)
```

Domains

▶ Each component of each tuple be *atomic*, i.e., each must be of some elementary type. The elementary type of an attribute is called the *domain* of the attribute.

Example.
```
Student(name:string, startyear:integer, major:string,
email:string)
```

Exercise. Are these two schemas the same relation?

```
Student(name:string, startyear:integer, major:string,
email:string)

Student(startyear:integer, name:string, major:string,
email:string)
```

Relational Instance

A set of tuples for a given relation an instance of that relation

Keys of Relations

▶ The relational model allows us to place many types of contraints on database schemas.

▶ The key constraints are fundamental

Example. Student(`startyear:integer, name:string, major:string, `<u>`email`</u>`:string`)

▶ Many real-world databases use artificial keys

  ▶ is it safe to make any assumption about the values of attributes outside their control?

  ▶ for efficiency consideration

Example. Employee ID, Student ID, Course ID ...

An Example of Relational Database Schema

```
Student(sid:string, name:string, startyear:integer)
Class(cid:string, title:string, section:string,
semester:string, year:integer, hours:integer)
Enrollment(sid, cid:string)
```

Outline

Assignment

Let's work on an exercise problem ...