Database Lecture 2
Entity-Relationship Model Addendum

Dr. Jefferson Fong

Tutorials

- Start from Week3. You can attend any time slot.

Tue 18:00-18:50	T7-202	Shichen ZHANG
Wed 13:00-13:50	T5-604	Lily LIN
Wed 18:00-18:50	T29-301	Wenchuan ZHANG

- You can attend the tutorials of any sections.
- In tutorials, you can
  - Finish your lab exercises if you haven’t done so in the lab.
  - Ask TA for more explanations, in Chinese if you want.
- If no students show up after 15 minutes, the TA can leave.
  - If you plan to be late, let the TA know beforehand.

Installing XAMPP on your computer

- Handling error messages
  - Search online on how to fix the error.
  - Search Bing or Baidu, “XAMPP (your error message)”
  - In many cases, removing a file mention there would fix the problem.
    - Don’t remove the file; move it the for folder junk\ and rename the file to XXX_junk, where XXX is the old file name, in case you need to revert back to the old file.
- Mac users
  - Solution to installation problem is in iSpace’s Section 1002/1005 > Etc > sol_macos_xampp_import_incomplete.docx.
  - Thank you to TA Lily.
  - Form a club: Mac users for your major.
    - Good activities / volunteer work to put in your CV. Shows your initiative, can learn outside of classes, helping other people, etc.

Past Week's News on Oracle

- Recent tech advances focused on AI: ChatGPT, DeepSeek, self-driving cars, humanoid robots, etc.
- Traditional "old tech" such as Database has been neglected.
- Past week's news: The stocks of Oracle (#1 Database company, see last week's lecture) popped 36% in one day.
- Reason? OpenAI (company that makes ChatGPT) joined in a partnership with Oracle; they need product from old tech company.
  - See articles in Resources folder for our sections in iSpace.

Lessons for students

- Yes, you need to learn some AI
  - AI major is super hot now, but
  - CST majors would be fine if you take at least 2 ME AI courses:
    - Neural Network and Deep Learning, Deep Learning for Computer Vision, Machine Learning, and Natural Language Processing.
    - Offered by 4 different CST professors; if take all 4, you're practically AI major.
- Super hot fields can cool off, after too many people rush into them.
  - Dot-com boom in 1990's followed by a bust in 2000's.
  - AI had undergone 4 or 5 boom and bust cycles in the last 70 years, including "AI winter" in 1970's.
  - Basic fields such as Database remains stable, not much boom or bust.

Slide 3 Design process

[Reference: 1.5 Database Design; 6.1 Overview of Design Process]

Design process has 4 phases:

Slide 4 Phase 1: Conceptual design creates **E-R diagram**.

Slide 5 Phase 2: Logical-design creates **relational schema**.

Slide 6 Phase 3: Optimization removes redundancies by using **functional dependencies** and **normal forms**.

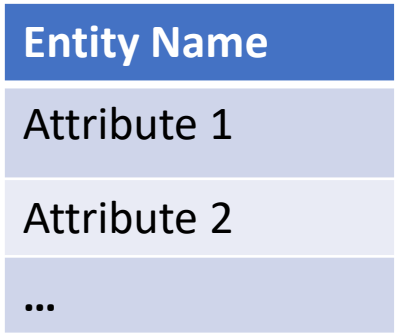
Slide 7 Phase 4: Physical-design, **SQL** coding

We will discuss the details of these phases in later lectures.

Phase 1 E-R Diagram is covered in the rest of this lecture.

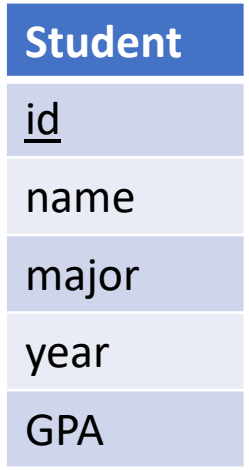
Slide 8 Entity Sets [6.2 The Entity Relationship Model]

- Entity-relationship (E-R) model includes:
  - Entity sets (Slide 8)
  - Relationship sets (Slide 19-23)
  - Attributes (Slide 9-10)



Slide 9-10 Attributes [6.3 Complex Attributes]

- Example of entity (object) and attributes in the class diagram you've learned in Java.
- Instead of class diagrams (in above right on this slide), this course uses the notation described in Slide 9-11.



Slide 11 Basic ER Features [6.9 E-R Diagrams, 6.10 Alternative Notations]

- The book uses a different notation called UML class diagrams.
- The PPT uses the version described in 6.10 Alternative Notations.
- More in the Summary slide near the end of this PPT.

Slide 12-14 Keys [6.5 Primary Key]

- Underline the key (important attribute).

Slide 15-16 Multi-value attributes [6.3 Complex Attributes]

- Double ellipse for more than 1.

Slide 17-18 Composite attribute [6.3 Complex Attributes]

Slide 19-23 Relationship Sets [6.2.2 Relationship Sets]

Slide 19

- Relationship describes association between 2 or more entities.
- We can represent a relationship using a tuple, just like we represent a point in space using the tuple (x, y, z).

Slide 20-21

- (Alice, MacBeth) is a relationship.

borrow = { (Alice, MacBeth), (Bob, Three Body) … } is a relationship set.

Slide 25

- The ternary (3 “things”) relationship *enroll* involves the 3 entities student, course and instructor.

Slide 26 Roles [6.2.2]

- A *course* can be a *successor* or predecessor of another *course*.
  - “successor” and “predecessor” are roles of the entity “course”.
  - E.g. an actor plays a certain role(s) in a movie.
- In slide 22 and 27, can add borrower as the role for the student
  - Similar to adding a comment to the code; sometimes comments are useful.

Slide 28 Derived attributes [6.3 Attributes]

- Derived attribute can be derived from other attributes; indicated by dash ellipse.

- Slide 30 Summary of E-R notation [6.9 Alternative Notations]

Slide 31 Exercises

- Add to the diagram in Slide 29.
- Which are entities (objects)? Which are attributes? Relationships (between 2 or more entities)?
  - Entities and attributes are nouns; relationships are (usually) verbs.
  - E.g. “students (noun) borrow (verb) books (noun).
  - That would help you to figure out how to draw the E-R diagram.
- “Programs, which have program codes, program names and the division that each program belongs to.”
  - Program (entity); code, name and divisions (attributes).

Slide 31 Exercises

- “Students have majors”; majors in what? Incomplete description.
- Change description to “Students major in programs”
  - Student (entity), major (relationship), program (entity).
- “Instructors work for some programs”
  - Same idea as the (modified) last statement.
  - Instructor (entity), work for (relationship), program (entity).
- Change description to “Program PD’ed by an instructor”
  - Make PD to be a verb.

- Solution in “Lec02 ExerciseSoln” and in next week’s lecture.

This week’s lab

- Go through the Lab 02 addendum slides.
- Lecture from Lab02 PPT up to slide 8 or 10.