COS 425:
Database and Information
Management Systems

Entity-relationship (ER) model

Entity-relationship model

- Goal: Capture semantics of information objects
- Goal: Capture complexity of relationships between objects

- Used first for database modeling but now expanded use

History

- Developed 1976 by Peter Chen
  after relational model
- Chen felt relational model not rich enough
  - relational model: everything a (mathematical) relation on collection of domains Di
    - e.g. name from domain of strings
    - Relation subset of $D_1 \times D_2 \times \ldots \times D_k$ (k-ary)
  - ER model differentiate between objects described by attributes and relationships among objects

ER model basics

- *Attributes* are basic / indivisible properties
  no usable substructure
- An *entity* (object) is a *tuple* (or set) *of attributes*
  - Attributes describe/define entity
- A *relationship* is a *tuple* of *entities*
  - Entities are thus related
  - A relationship can have its own *attributes*
    Different from entity attributes

Example

- Entity course with attributes:
  department, number, semester
- Entity student with attributes:
  first name, last name, ID number

- Relationship "take" relating:
  A student to a course

- Both entities and relationships are tuples but at different granularities
- We choose which are entities and which are relationships
- We choose attributes that best describe entities
- We choose semantics of a relationship between entities

Types

- Entity type :
  - Defined by $A_1 \times A_2 \times \ldots \times A_k$ where $A_1, \ldots, A_k$ are attribute types (for entity with k attributes)
  - Defines kind of object (e.g. student)
  - Set of entities of same type – entity set
- Relationship type :
  - Defined by $E_1 \times E_2 \times \ldots \times E_m$ where $E_1, \ldots, E_m$ are entity types (for relationship between m entities)
  - Defines kind of relationship (e.g. “take”)
  - Set of relationships of same type – relationship set
- Then have instances of entity type and relationship type (e.g. (fred, smith, 123456))

Board Example