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COP4710 - Database Systems
Chapter 6 ER Textbook Notes

Chapter 6 - Extending Relationships/Structural Constraints

6.1 - Introduction

This chapter covers how to define *structural constraints (cardinality and participation)* as well as producing a grammar to describe our ER-diagrams more precisely. Mapping rules for relationships are also developed.

6.2 - The Cardinality Ratio of a Relationship

Cardinality ratio - the ratio of how many entities relate to other entities

- 1:1
- M:1
- M:M
- 1:m

In the Chen-like model, cardinality is added to the lines that connect the relationships and entities

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6.3 - Participation: Full/Partial

participation constraints (optionality constraints)

In an ER diagram:

- double line indicates *full participation (mandatory)*
    - this type of participation can't have any NULL values
- a single line indicates *partial participation (optional)*

6.4 - English Descriptions / 6.5 - Tighter English

When creating ER diagrams, it is useful to include a *precise* sentence that describes the relationship. The language cannot be vague or else it will be open to interpretation.

There are four possible patterns for expression relationships:

- Pattern 1 - x:y::k:1
    - k must be full-participation (k = 1 or M)
    - x's in database must be related to one and only one y
    - no x is related to more than one y

- Pattern 2 - x:y::k:1
    - k is partial participation
    - x *may* be related to one and only one y
    - some x's are not related to a y
    - the x's may not be related to more than one y

- Pattern 3 - x:y::k:M
    - k is full participation
    - the x's recorded in the database must be related to many (one or more) y.

- Pattern 4 - x:y::k:M
    - k is partial participation
    - x may be related to many (one or more) y
    - some x's may not be related to a y

6.8 - Mapping Relationships to a Relational Database

Mapping Rule 5 - Mapping binary M:N relationships

- For each M:N relationship, create a new table with the primary keys of each of the two entities that are being related in the M:N relationship.
- The primary key of this new table will be the concatenated keys of the owner entities.
- Included any attributes that the M:N relationship may have in this new table.

Mapping Rule 6 - Mapping binary 1:1 relationships when one side of the relationship has full participation and the other has partial participation

- Store the primary key of the side with partial participation on the side with the full participation as a foreign key
    - use the full participation as the main entity and then use the partial participation as a foreign key
- include any attributes on the relationship on the same side to which the key was added

Mapping Rule 7 - Mapping binary 1:1 relationships when both side have partial participation constraints

- When both entities have partial participation constraints, there exists two ways to map the relation

- *7a* - Select either one of the relations to store the key of the other (and live with some null values)
- *7b* - depending on the semantics, you can create a new relation to house the relationship that would contain the key of the two related entities (as is done in mapping rule 5)
    - this method will leave out any null values from the linking table
    - NOTE: There seems to be some details missing from this method, look into further resources to help

Mapping Rule 8 - Mapping binary 1:1 relationships when both sides have full participation constraints

- Use the semantics of the relationship to select which of the relations should contain the key of the other. If the choice is unclear, use mapping rule 7B
- Whatever the choice is, just be sure not to include the primary keys in both tables as foreign keys (avoid introducing redundancy into the database)

Mapping Rule 9 - Mapping binary 1:N relationships when the N side has full participation

- Include the key of the entity on the 1 side of the relationship as a foreign key on the N side
    - take the first entity and use its primary key as a foreign key in the N entity table

Mapping Rule 10 - Mapping binary 1:N relationships when the N side has partial participation

- handel like binary M:N relationship with a separate table for the relationship
- key of the new relation would consist of a concatenation of the keys of the related entities
- include any attributes that were on the relationship on this new table