Database design I

Linus Falk

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Contents

Lecture 2: DBMS and RE models

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1 DBMS

meta is a description of the data.

typical DBMS functionality

- define database in terms of data types
- construct or load database content
- Manipulate the database, Retrieval, Querying, modification, Accessing the database through web applications

Application activities against a database. Quires that access the different part of data and gives a result. Transactions a set of actions, read and update. Applications should not be accesses by non authorized personal.

Additional DBMS functionality

- active processing to take internal action on data

Example of database

Mini-world is for example a organization. entities of the mini-world are for example in the university case: students, courses and sections (of courses).

This entities have different meta data. Courses have course name, credits etc.

Main characteristics of the database

Insulation between the program and the data. Means that me as user can change the data in the database without changing the code. Allow changing the program/code ontop without change the DMBS code. Database abstraction the DBMS can give different visualization of the database for the user.

DBMS allow concurrent user to retrieve and update the database. Can keep log to undo operation when transactions goes wrong.

The users can be different groups. The one who manages who design, just "watchers" etc.

Actors

System analysts understand the user and what they need. Application programmers taking the information from the the analysis and implement from the specification.

Why use databases

Controlling redundancy in data storage. sharing with multiple users, security etc. Optimization of queries for efficient processing. Provides backup services, Gives different interfaces to different user classes,. Potential to implement standards.

2 Entity relationship model

The system analysis must understand the need/scenario and build a model. ER-model is a popular method to model the needs/requirements before implementing.

We use models to have a formal way to present the formula for the system.

For entities we use nouns, the relationships describe connections between entities and we can use verbs for this as name, capital letter for Entities and relationship.

Design

Begin in natural language and putting together a conceptual model (ER model) then continue with logical modelling, programing and then

Design progress

- Database deign
- Application design

Why a conceptual model

More formal than natural language, to avoid misconception. Can be understood without technical background. Can be used as documentation. Rules how to make this modelling, and can therefore be transformed and mapped to the implementation.

Starting with a ER model

first try to identify the three categories first. Relationships should be links between entities. Entities got different attributes.

Tips good practice to do it minimally. Start from top left and go to bottom right. The employee works on project, going from left to right. Easier to read and understand.

Lecture 3: DBMS and RE models

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3 ER modelling, recap COMPANY example

- Tips, use colors to identify entities, relationships and attributes. Solutions are not unique and there could be many solutions. Naming scheme, nouns for entities, verbs for relationships. Capital from entitles and relationship. Lower case for attributes.

- Conceptual models are abstract and lacks details but are more formal than natural language.

- Double oval multi-value attribute.

- Trick for many to many, think of table how they are connected. John can only be a manager for one department. The department can have many employees, John, Joseph and Jenny.

- In relationship, 1:1 1:N or N:M. Double it should be a connection, single line is optional. An department may not have any employees but all employees should belong to a department.

- Key should be unique in entity set. Key is underlined. Can be a composite of two attributes. The combination should then be unique. For an example a project can have the same name but the combination with a project number should be unique.

- Weak entity vs strong: weak can not exist without the existence of another strong entity, does not have a key. Dependent is a weak entity, need Employee that is strong and have key.

- Read the ER diagram from top left to bottom right and try to model it this way.

- A way to choose a key is to look at the size of the key, if one is smaller this one could be better to use.

- Relation is a table, be careful with the

Attributes and value sets

Domains is a range of values for the attribute.

Relationship of higher degree

- degree 2 called binary

- degree 3 called ternary

Avoid using relationship degree higher than two (binary). Constraint are harder to specify for higher (>2) degree relationships.

4 Exercise 1

Galleries keep information about artists, their names (which are unique), birthplaces, age, and style of art. For each piece of artists, the artist, the year it was made, its unique title, its type of art (e.g., painting, lithograph, sculpture, photograph), and its price must be stored. Pieces of artwork are also classified into groups of various kinds, for example, portraits, still lifes, works by Picasso, or works of the 19th century; a given piece may belong to more than one group. Each group is identified by a name (like those just given) that describes the group. Finally, galleries keep information about customers. For each customer, galleries keep that person's unique name, address, total amount of dollars spent in the gallery (very important!), and the artists and groups of art that the customer tends to like.

Entities

Relationship