Lab Session 2: Entity-Relationship Model

Exercise 1.

This first exercise will guide you through the creation of an E-R model for a movie database. This will be done in a step-by-step manner. At each step, you should improve or revise your model in order to accommodate the newly provided information. You may carry out this exercise with pencil and paper, or using a diagramming tool such as *Dia*[1].

a) An actor has a name which, in order to avoid confusion, is assumed to be unique in this database. An actor has also a birthday and a city and country of origin.

b) Every movie has a title, a year, a rating[2] (e.g. "PG-13", "R"), and a length (in minutes). There may be different movies with the same title, but not within the same year.

c) Actors participate in movies. A movie needs several actors and each actor may participate in several movies.

d) When an actor participates in a movie, he/she plays a certain role (i.e. a certain character in the movie).

e) In this database, every movie has one (and only one) director. The director is a person who, like an actor, is identified by name and has a birthday, city, and country of origin. (A person may be an actor in one movie and a director of another movie.)

f) A movie is released in several countries. For each country that the movie is released in, we need to know the date when the movie was released there.

g) A movie may be based on a book. A book has an ISBN, a title, a publisher, and a year.

h) A book is written by an author (i.e. another type of person).

i) A person may be a relative of another person. If it is a relative, then we must know what kind of family relationship it has (e.g. son, daughter, cousin, brother-in-law, etc.)

j) A film studio (with a company name and country) takes care of hiring the actors for a given movie. In particular, the studio hires a specific actor to participate in a specific movie, with a specific salary.

k) An actor cannot be hired twice for the same movie.

l) A studio is owned by someone (i.e. a person).

[1] Dia is available for Windows, Mac and Linux at: http://dia-installer.de/. Use the ER symbol sheet.
[2] In Portugal, these ratings are usually M/6, M/12, M/18, etc.

Exercise 2.

Draw an E-R model for the following scenario:

Notown Records has decided to store information about musicians who perform on its albums (as well as other company data) in a database. The company has wisely chosen to hire you as a database designer (at your usual consulting fee of $2500/day).

a) Each musician that records at Notown has an SSN, a name, an address, and a phone number. Poorly paid musicians often share the same address, and no address has more than one phone.

b) Each instrument used in songs recorded at Notown has a unique identification number, a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, B-flat, E-flat).

c) Each album recorded on the Notown label has a unique identification number, a title, a copyright date, a format (e.g. CD), and an album identifier.

d) Each song recorded at Notown has a title and an author.

e) Each musician may play several instruments, and a given instrument may be played by several musicians.

f) Each album has a number of songs on it, but no song may appear on more than one album.

g) Each song is performed by one or more musicians, and a musician may perform a number of songs.

h) Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course.

Exercise 3.

Draw an E-R model for the following scenario:

The Prescriptions-R-X chain of pharmacies has offered to give you a free lifetime supply of medicine if you design its database. Given the rising cost of health care, you agree. Here's the information that you gather:

a) Patients are identified by an SSN, and their names, addresses, and ages must be recorded.

b) Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded.

c) Each pharmaceutical company is identified by name and has a phone number.

d) For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. If a pharmaceutical company is deleted, you need not keep track of its products any longer.

e) Each pharmacy has a name, address, and phone number.

f) Every patient has a primary physician. Every doctor has at least one patient.

g) Each pharmacy sells several drugs and has a price for each. A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another.

h) Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it. You can assume that, if a doctor prescribes the same drug for the same patient more than once, only the last such prescription needs to be stored.

i) Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, and the text of the contract.

j) Pharmacies appoint a supervisor for each contract. There must always be a supervisor for each contract, but the contract supervisor can change over the lifetime of the contract.

Exercise 4.

Draw an E-R model for the following scenario:

Consider the following information about a university database:

a) Professors have an SSN, a name, an age, a rank, and a research specialty.

b) Projects have a project number, a sponsor name (e.g., NSF), a starting date, an ending date, and a budget.

c) Graduate students have an SSN, a name, an age, and a degree program (e.g., M.S. or Ph.D.).

d) Each project is managed by one professor (known as the project's principal investigator).

e) Each project is worked on by one or more professors (known as the project's co-investigators).

f) Professors can manage and/or work on multiple projects.

g) Each project is worked on by one or more graduate students (known as the project's research assistants).

h) When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.

i) Departments have a department number, a department name, and a main office.

j) Departments have a professor (known as the chairman) who runs the department.

k) Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.

l) Graduate students have one major department in which they are working on their degree.

m) Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take.