Assignment 3

hand in on November 21, 2005 during the tutorial

Please hand in your solutions in groups of up to 3 students.
Do not forget to write down your name and matriculation number on the solutions you hand in. Please also add your study course (e.g. Dipl.-Inf., Master SSE, ...).

Task 3.1 (ER Diagram) (2 Points)
The software company Mike\(^1\) works for has to develop a database system for museums. It should manage the following information:

- A museum can be uniquely identified by its name. Furthermore, it should be possible to store its address (consisting of zip code, city and street).
- We want to distinguish (a bit over-simplified) between public museums that are associated with a government agency and have a budget per year, and private museums that get their money from private investors (with name and amount of contribution).
- A museum shows exhibitions that have a name identifying them among all exhibitions at the museum. Furthermore, their start and end date must be stored.
- An exhibition consists of several works of art, that can be uniquely identified by a global registration number. Besides this, the creator and the year of its creation must be saved.
- In addition to this general information about works of art we want to store characteristics of the following more special pieces: Paintings (height and width of the picture), sculptures (height and weight) and items on loan (the loaner’s name, amount of payment)
- A museum presents at least one exhibition, an exhibition takes place at exactly one museum.
- A work of art can be (over time) part of arbitrarily many (or no) exhibition(s). An exhibition consists of at least 5 pieces of art.

Mike (with the help of his software tool) regards this as an easy task and summarizes the above requirements in the following ER diagram after only a few minutes:

Take a look at Mike’s solution, find the errors he made and correct them!

Task 3.2 (Mapping to ER model) (3 Points)
Map your corrected ER diagram for the scenario of the task above to a relational database schema. Use the formal notation presented in the lecture\(^2\) including intra- and inter-relational dependencies.

\(^{1}\)known from exercise 2.4
\(^{2}\)see slide 16 in chapter 3
Task 3.3 (Mapping of Is-a-relations)

In the lecture you have learned about four ways to map is-a-relations to relational database schemata\(^3\). Choose the most appropriate mapping method for each of the small ER models below (each method should be used only once), provide the resulting relational database schema in the formal notation (incl. interrelational dependencies) and give a short argument for your decision.

\[\text{Diagram 1}\]

\[\text{Diagram 2}\]

\[\text{Diagram 3}\]

\[\text{Diagram 4}\]

Task 3.4 (Ternary Relationships)

Consider the two scenarios depicted by the following ER diagrams\(^4\):

\[\text{Diagram 5}\]

\[\text{Diagram 6}\]

Students work on seminar topics offered by chairs. Since we plan to store data from different semesters in one database, a chair can offer the same topic more than once. As usual, students can take more than one seminar (also at the same chair, if they want to). It is possible that different chairs offer the same topic, but a student is not allowed to work on the same topic twice.

A marriage between a man and a woman is stored together with the certificate that proves their marriage. We do not want to store any information about former wives resp. husbands. Therefore, we can assume that a man is married with only one woman (and vice versa).

Remember the different semantics of cardinality constraints in non-binary relationships as presented in the 0th tutorial session!

a) Annotate for both scenarios the relationship with appropriate cardinality constraints in both variants (1:n and (min,max) notation)\(^5\).

b) Decide which notation is more suitable for which scenario. Which constraint(s) is/are lost if the inappropriate variant is chosen?

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\(^3\)There is also a very brief summary available on our homepage.
\(^4\)For simplicity we omitted the attributes.
\(^5\)resulting in four diagrams!