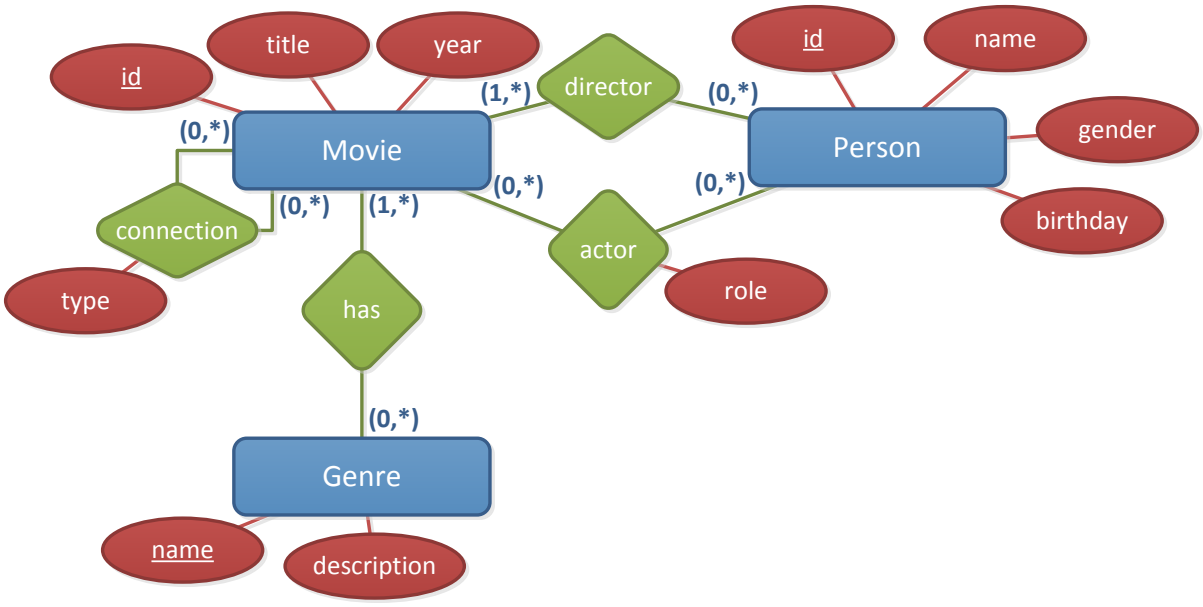
Exercise Sheet 6: Relational Algebra

(until Thursday 29.11.2012)

Please note that you need **50%** of all exercise points to receive the "Studienleistung". Exercises have to be turned in until **Thursday** of each respective week and must be completed in teams of two students each. You may hand in your solutions either on paper **before the lecture** or into the mailbox at the IFIS floor (Informatikzentrum 2nd floor). Please do not forget to write your "Matrikelnummer" and your tutorial group number on your solutions. Your solutions may be in German or English. Please note: To pass the "RDB 1 Modul" you need both the exercise points and the exam!

Exercise 6.1 (14 points)

Following conceptual schema describes a simple movie database.



The schema describes movie data, including the movie's title and the production year. Also actors and directors are described, by introducing the relationship types "actor" and "director", which connects persons with movies. The actor relationship type also includes the role played by the person in the respective movie. As neither persons nor movies can be uniquely identified by a set of their "natural" attributes, an id was introduced. Persons are further described by their name, gender and birthday. Movies can also be connected to each other. For example one movie can be a "parody" or "sequel" to another movie. In that case the attribute "type" of the relationship type "connection" would yield the value "sequel" or "parody". A movie can also have several genres, which are further described by a description attribute.

With respect to the given conceptual schema the following relation schema was derived:

Movie(id, title, year)
Person(id, name, gender, birthday)
Genre(name, description)
actor(person → Person, movie → Movie, role)
director(person → Person, movie → Movie)
hasGenre(movie → Movie, genre → Genre)
connection(from → Movie, to → Movie, type)

Based on this relation schema, please provide statements returning following results in relational algebra:

a. The names of all female persons, who were born on '01.01.1950'. (1 Point)
b. The names of all persons, who played a role in the movie "The legacy of Codd". (1 Point)
c. The names of all persons, who at least once acted and directed in the same movie. (2 Points)
d. The number of parodies to the movie "Adventures with relational databases". (2 Points)
e. Genres that are not assigned to any movie at all. (2 Points)
f. The titles of movies that are a "sequel" of a "parody". (2 Points)
g. The person(s) who played the role "relational algebra hacker" most. (4 Points)

Exercise 6.2 (4 points)

Please answer the following questions in your own words:

a. How are null-values treated, when applying an aggregation? (1 point)
b. How are duplicates treated, when applying an aggregation? (1 point)
c. What property must be given by two relations *A* and *B* so that set operations like ∪, ∩ or \ can be applied? (1 point)
d. How can the expression $R \bowtie_\theta S$ be expressed with basic relational algebra operators? (1 point)

Exercise 6.3 (3 points)

Given two set compatible relations *A* and *B* and a set of attributes *S* that is a subset of attributes of A and B. Is the following statement true? If not, give a counter example:

$$\pi_S(A \cap B) = (\pi_S A) \cap (\pi_S B)$$