



## Exercise Sheet 7: Relational Calculus (until Thursday 15.12.2011)

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 (Mühlenpfordtstraße 23, 2nd floor). Please do not forget your “Matrikelnummer” and your tutorial group number on your solutions. Your solutions may be in German or English. Please note: To pass the “RDB I Modul” you need the exercise points and the exam!

### Database Schema

The following database schema stores information about movies and all participating people. The *Movie* relation includes an id, the movie title, the year of publication, the country where the movie was produced, its box-office takings, and a type (e.g. cinema or TV). A person is identified by an id, has a name, a sex and a birthdate. The *Plays* relation contains all actors with their respective roles. The *Crew* relation contains people attending in the respective movie, e.g. as a director or producer (type='director' ,...). Furthermore, each movie is associated with a number of genres in the *Has\_Genre* relation.

Movie (mid, title, year, country, box\_office\_takings, type)

Person (pid, name, sex, birthdate)

Crew(person → Person, movie → Movie, type)

Plays (person → Person, movie → Movie, role)

Has\_Genre(movie → Movie, genre → Genre)

Genre(name, description)

### Exercise 7.1 (12 points)

Generate the relational algebra, tuple relational calculus, and domain relational calculus expressions for the following queries:

- Show a list of all movies (title) with the genre 'Action'. (3 points)
- List the titles of all movies that were directed by 'Steven Spielberg'. (3 points)
- Show a list of all actors (pid, name, sex, birthdate) that never played a 'doctor' (role). (6 points)

### Exercise 7.2 (4 points)

Describe the following expressions in natural language.

- $\{m \mid \text{Movie}(m) \wedge \exists ps \exists p (\text{Plays}(ps) \wedge \text{Person}(p) \wedge m.\text{mid}=ps.\text{movie} \wedge ps.\text{person}=p.\text{pid} \wedge ps.\text{role}='Wolverine' \wedge p.\text{name}='Hugh\ Jackman')\}$  (1 point)

b)  $\pi_{p.name} \left( \sigma_{a.income > 10.000.000} \left( \rho_{ps.person} \bowtie_{sum(m.bot) income} (Plays ps \bowtie_{ps.movie=m.mid} Movie m) \right) \right) a$   
 $\bowtie_{a.person=p.pid} Person p$   
 –  $\pi_{p.name} (Plays ps \bowtie_{ps.person=p.pid} Person p \bowtie_{ps.movie=c.movie} Crew c \bowtie_{c.person=p2.pid}$   
 $\sigma_{p2.name='GeorgeLucas'} Person p2)^1$  (3 points)

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<sup>1</sup> bot=box-office takings