

1. Relational Queries

1. Queries in Calculus, Algebra and SQL

Suppose there is a database with the Signature $\Sigma = \{\text{Movie}, \text{Schedule}\}$, which contains the relations

`Movie(title, director, actor)` `Schedule(theater, mtitle)`

Both attributes, `title` and `mtitle`, refer to the title of a movie.

Consider the following queries:

1. Which theaters show some movies directed by Spielberg?
2. Which theaters do not show any movies directed by Spielberg?
3. Which theaters show only movies directed by Spielberg?
4. Which theaters show all movies directed by Spielberg?

Express each of the queries above in the three query languages of

- Relational Calculus
- Relational Algebra
- SQL.

2. Evaluation Cost of Relational Queries

Given

- a relational algebra query Q ,
- a database instance I ,

determine the worst case running time of a deterministic algorithm computing $Q(I)$.

1. Develop an upper bound in terms of the size of the query and the size of the instance.
2. Can you refine the upper bound by using another characteristic of the query than the size (= length of the string defining the query)?