

## Solution to Final Exam, Problem 8

### Question

Using the database schema of Question 7, which is also provided below, write a Relational Algebra Expression for the following query:

Titles of the oldest movies in the database (year attribute's value is the minimum of all year values). Simplicity of your answer is important during grading.

movies(title, year, length, type)  
stars(StarName, address)  
studios(StudioName, location)  
owns(StudioName, title)  
play-in(StarName, title)

### Solution 1

$$M_1 = \text{movies} \quad M_2 = \text{movies} \quad R_1 = \Pi_{M_1.\text{title}} \sigma_{M_1.\text{year} > M_2.\text{year}} (M_1 \times M_2) \\ R_2 = \Pi_{\text{title}}(\text{movies}) - R_1$$

### Solution 2

$$R_1 = \Pi_{\text{title}, \text{year}}(\text{movies}) \quad R_2 = \Pi_{\text{year}}(\text{movies}) \quad R_3 = \Pi_{R_1.\text{title}, R_2.\text{year}} (R_1 \bowtie_{R_1.\text{year} \leq R_2.\text{year}} R_2) \\ R_4 = R_3 / R_2$$

Thanks to Etkin Baris Ozgul

### Solution 3

$$M_1 = \text{movies} \quad M_2 = \text{movies} \quad R_1 = \sigma_{M_1.\text{year} < M_2.\text{year}} (M_1 \times M_2) \quad R_2 = \sigma_{M_1.\text{year} > M_2.\text{year}} (M_1 \times M_2) \\ R_3 = \Pi_{\text{title}}(R_1 - (R_1 \cap R_2))$$

Thanks to Pelin Saglam