TD 02 Base de Données

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1 Exercise 2

We just write the algebra when possible :

1. $\Pi_{\texttt{Name,Time}}\left(\sigma_{\texttt{Title="Mad Max"}}(\text{Cinema})\right)$
2. $\Pi_{\texttt{Time}}\left(\sigma_{\texttt{Actor=Orson Welles}}(\text{Movie})\right)$
3. $\Pi_{\texttt{Actor}}\left(\sigma_{\texttt{Title="Ran"}}\left(\text{Movie}\right)\right)$
4. $\Pi_{\texttt{Name}}\left(\sigma_{\texttt{Actor=Signoret}}\left(\text{Cinema} \bowtie_{\text{Cinema.}\texttt{Title}=\text{Movie.}\texttt{Title}} \text{Movie}\right)\right)$
5. $\Pi_{\texttt{Actor}}\left(\text{Movie} \bowtie_{\text{Movie.}\texttt{Actor}=\text{Produced.}\texttt{Producer}} \text{Produced}\right)$
6. $\Pi_{\texttt{Actor}}\left(\text{Movie} \bowtie_{\text{Movie.}\texttt{Actor}=\text{Produced.}\texttt{Producer}\wedge\text{Movie.}\texttt{Title}=\text{Produced.}\texttt{Title}} \text{Produced}\right)$
7. $\Pi_{\texttt{Actor}}\left(\text{Movie} \bowtie_{\text{Movie.}\texttt{Title}=\text{Movie.}\texttt{TITRE}} \rho_{\texttt{Title}\to\texttt{TITRE}}\left(\sigma_{\texttt{Actor=Orson Welles}}\left(\text{Movie}\right)\right)\right)$
8. Algebra being equivalent to calculus, there is no algebraic formula in PSJR for this query.

We just write the formulas when possible :

1. $\{(x_1, x_2) \mid \exists x, \text{Cinema}(x_1, x_2, x) \wedge x = \text{"}\texttt{Mad Max}\text{"}\}$
2. $\{z \mid \exists y, \text{Producer}(y, z) \wedge y = \texttt{Orson Welles}\}$
3. $\{z \mid \exists x, y, \text{Movie}(x, y, z) \wedge x = \text{"}\texttt{Ran}\text{"}\}$
4. $\{x \mid \exists y, z, \text{Cinema}(x, y, z) \wedge (\exists d, a, \text{Movie}(z, d, a) \wedge a = \texttt{Signoret})\}$
5. $\{a \mid (\exists t, d, \text{Movie}(t, d, a)) \wedge (\exists t, \text{Produced}(a, t))\}$
6. $\{a \mid \exists t, (\text{Produced}(a, t) \wedge (\exists d, \text{Movie}(t, d, a)))\}$
7. $\{a \mid \exists t, d, (\text{Movie}(t, d, a) \wedge (\exists b, \text{Movie}(t, d, b) \wedge b = \texttt{Orson Welles}))\}$
8. This is not possible in PSJM since adding data might make the results to this query false.

2 Exercise 3

We just write the algebraic formula when possible :

1. $\Pi_{\texttt{Viewer}}\left(\text{Seen}\right) \setminus \Pi_{\texttt{Viewer}}\left(\left(\Pi_{\texttt{Viewer}}(\text{Seen}) \times \Pi_{\texttt{title}}(\text{Movie})\right) \setminus \text{Seen}\right)$
2. We have :
$$\Pi_{\texttt{Viewer}}(\text{Seen} \bowtie_{\text{Seen.}\texttt{Viewer}=\text{Likes.}\texttt{Viewer}} \text{Likes}) \setminus$$
$$\Pi_{\texttt{Viewer}}\left(\text{Seen} \bowtie_{\text{Seen.}\texttt{Viewer}=\text{Likes.}\texttt{Viewer}} \text{Likes} \setminus \left(\text{Seen} \bowtie_{\text{Seen.}\texttt{Viewer}=\text{Likes.}\texttt{Viewer}\wedge\text{Seen.}\texttt{Title}=\text{Likes.}\texttt{Title}} \text{Likes}\right)\right)$$
3. $\Pi_{\texttt{Producer}}(\text{Produced}) \setminus \Pi_{\texttt{Producer}}\left(\text{Produced} \bowtie_{\text{Produced.}\texttt{Title}=\text{Cinema.}\texttt{Title}} \text{Cinema}\right)$
4. We have :
$$\Pi_{\texttt{Producer}}\left(\text{Produced} \bowtie_{\texttt{Producer}=\texttt{Viewer}} \text{Seen}\right) \setminus$$
$$\Pi_{\texttt{Producer}}\left(\text{Seen} \bowtie_{\texttt{Viewer}=\texttt{Producer}} \text{Produced} \setminus \left(\text{Seen} \bowtie_{\texttt{Viewer}=\texttt{Producer}\wedge\text{Seen.}\texttt{Title}=\text{Produced.}\texttt{Title}} \text{Produced}\right)\right)$$
5. Same argument as before, this is not possible.

We just write the calculus formulas when possible :

1. $\{v \mid \forall m, \exists d, a, \text{Movie}(m, d, a) \wedge \text{Seen}(v, m)\}$
2. $\{v \mid \forall t, \text{Seen}(v, t) \Rightarrow \text{Likes}(v, t)\}$
3. $\{p \mid \exists t, d, a, \text{Produced}(p, t) \wedge \text{Movie}(t, d, a) \wedge \forall n, y, \neg\text{Cinema}(n, y, t)\}$
4. $\{p \mid \forall t, \text{Produced}(p, t) \Rightarrow \text{Seen}(p, t)\}$
5. This is impossible since we cannot create functions in FOL.

3 Exercise 4

We have that $I \div J$ over $X \setminus Y$ is :

$$\Pi_X(I) \setminus \Pi_X\left(\Pi_x(I) \times \Pi_y(J) \setminus J\right)$$

4 Exercise 7

First the relational Calculus :

1. $\{x \mid \exists b, R(x,b) \wedge b > 1 \wedge \forall b', c, \neg\left(S(b',c) \wedge c = x\right)\}$
2. $\{x \mid \exists b, R(x,b) \wedge \forall y, c, R(y,c) \Rightarrow y \leq x\}$

Then the algebra :

1. $\Pi_A(\sigma_{B>1}(R \bowtie_{S.C \neq R.A} S))$
2. $\Pi_A(R) \setminus \Pi_{A_1}(\sigma_{A_1 < A_2}\left(\rho_{A \to A_1}(A) \times \rho_{A \to A_2}(A)\right))$