Hella Crunk
Opfibrations
THE THIRD

Multiple Forc

For (showing in theatre) associated to showing!
for (address is Address)
if (showing theatre address, theatre address)

for (showing movie in Ittham)
showing movie

else list all the movies playing in Ittham

Adjacent Forc

For (showing, address in theatre, theatre address)
...

How to query over two database?

Categorical Product & Databases

\[ \langle \Sigma \times \mathcal{D} \rangle \times \langle \mathcal{E}, 0' \rangle = \langle \Sigma \times \mathcal{E}, 0 \rangle \]

Categorical Product

\[ \langle f \rangle \quad \langle e, 0 \rangle \]
\[ \langle f, \Sigma \rangle \quad \langle f, \mathcal{D} \rangle \]
\[ \langle f, \mathcal{E} \rangle \quad \langle f, 0' \rangle \]

Multiset Databases

Object: \( \langle \Sigma, \mathcal{E}, e \rangle \)
where \( \Sigma \) is a schema and \( E \) is a set and \( e: E \rightarrow \Sigma \)

Maps: \( \langle f_1, f_2, f_3 \rangle \)
where \( f_1: \Sigma \rightarrow \Sigma \)
\( f_2: E \rightarrow E' \)
\( f_3: \mathcal{E} \rightarrow \mathcal{E}' \)

(ie. \( E \) is the set of adjectives and a specifies their values)
**Products of Multiset Databases**

\[
\begin{array}{c|c|c|}
\text{set} & \text{multiset} & \text{set} \\
\hline
\{a\} & \{b, b, b\} & \{a\} \\
\hline
\{b\} & \{a, a, a\} & \{b\} \\
\hline
\{c\} & \{a, a, a\} & \{c\} \\
\end{array}
\]

**Fibres of Multiset Databases**

\[f: (\Sigma, \mathcal{E}, e) \to (\Sigma', \mathcal{E}', e') \]

for \( e \in \mathcal{E} \) such that \( UF = id \) for \( \Sigma \) and \( \Sigma' \).

**Vertical Map in Multiset Database over \( \Sigma \)**

\[(\Sigma_0, \Sigma_0) (\Sigma, \mathcal{E}, e) \to (\Sigma, \mathcal{E}, e') \]

where \( \mathcal{E}_e: E \to E' \)

**Ribbon Products for Multiset Database (over \( \Sigma \))**

\[\begin{array}{c}
\Sigma \times \mathcal{E} \\
\hline
\Sigma \times \{0\} \\
\hline
\Sigma \times \{1\} \\
\hline
\end{array}
\]

**Database Join**

\[\begin{array}{c}
\Sigma \times \mathcal{E} \\
\hline
\Sigma \times \{0, 0\} \\
\hline
\Sigma \times \{1, 1\} \\
\hline
\end{array}
\]
\[ a_j \]

\[ \text{for } (d \neq 0) \]
\[ \text{for } (d' \neq 0') \]
\[ \text{if } (d_{\text{comm}} = d'_{\text{comm}}) \]
\[ \langle d_{\text{comm}}, d_{\text{comm}}, d'_{\text{comm}} \rangle \]