Relational Calculus

CSE 132a Winter 2016

Existential and Universal Quantifiers

$\exists b \in \text{Books}[...]$
There exists a book b where this condition holds.
$\exists b \in \text{Books}[\forall c \in \text{Customers}[\exists p \in \text{Purchases}[...]]]$
There exists a book, where for each customer, there exists a purchase where this condition holds.
Analagous to ”FROM Books b WHERE ...” in SQL.

Tuples

Tuples are like rows in the database

$\exists b \in \text{Books}[b(\text{title})...]$

$\exists b \in \text{Books}[\forall c \in \text{Customers}[\exists p \in \text{Purchases}[$
$c(\text{customerid})...p(\text{customerid})...p(\text{bookid})...b(\text{bookid})]]]$

Similar to b.title and p.price

Additional Operators

Operators: $\wedge, \vee, =, \neq, \rightarrow, <, >, \leq, \geq$

$\exists b \in \text{Books}[b(\text{title}) = \text{'Twilight'}]$

$\exists b \in \text{Books}[\forall c \in \text{Customers}[\exists p \in \text{Purchases}[$
$c(\text{customerid}) = p(\text{customerid}) \wedge p(\text{bookid}) = b(\text{bookid})]]]$

SELECT Analogy

$$\{r : bookid \mid \exists b \in \text{Books}[b(\text{title}) = \text{'Twilight'} \wedge r(\text{bookid}) = b(\text{bookid})]\}$$

$$\{r : title \mid \exists b \in \text{Books}[\forall c \in \text{Customers}[\exists p \in \text{Purchases}[c(\text{customerid}) = p(\text{customerid}) \wedge p(\text{bookid}) = b(\text{bookid})]] \wedge b(title) = r(title)]\}$$