Relational Model 4: Relational Calculus

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Relational Algebra & Calculus

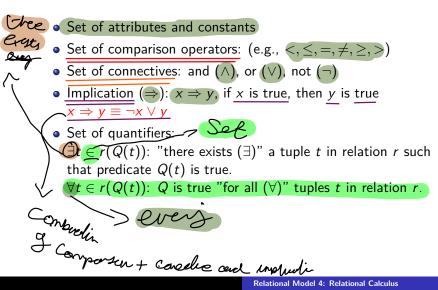
- Relational Algebra is procedural.
- Relational calculus is declarative
- It has been proven that Relational Calculus is equivalent to Relational Algebra in term of expressive power.
- The upshot of this is that no matter in what form a query
 (e.g. using SQL) is made, the DBMS should be able to ignore
 the steps implied by the formulation of the query and make
 decisions about how to fulfil that query in the most efficient
 manner.
- This is the process known as Query Optimisation.

Tuple Relational Calculus

• A non-procedural query language, where each query is of the form: $\{t|P(t)\}$

- It is the set of all tuples t such that predicate \underline{P} is $\underline{\text{true for } t}$
- t is a tuple variable, t[A] denotes the value of tuple t on attribute A
- $t \in r$ denotes that tuple t is in relation r
- P is a formula

Predicate Calculus Formula



loan	loan-number	branch-name	amount
	L110	swansea	1530
	L223	cardiff	2140
	L331	neath	1000

Query 1: Find the loan-number, branch-name and amount for loans of over £1200

loan	loan-number	branch-name	amount
J ;	L110	swansea	1530
S:	L223	cardiff	2140
	L331	neath	1000

Query 2:

Find the loan number for each loan of an amount > £1200

[con-ruber (comount > 1200 Corout])

	Projection on			
borrower	Projection on Ioan-number	cust-name	depositor	cust-name
5	L110	Gary	u	Gary
5	L223	Maple	N	April
5	L331	Syrup	W	Dave

Query 3: Inion of both tables

<u>_Find the names</u> of all customers having a loan, an account, or both at the bank

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borrower	loan-number	cust-name	loan	loan-number	branch-name	amount
	L110	Gary		L110	swansea	1530
	L223	Maple		L223	cardiff	2140
	L331	Syrup		L331	neath	1000

Query 4:

Find the names of all customers having a loan at the Neath branch

borrower	loan-number	cust-name	
	L110	Gary	
	L223	Maple	
	L331	Syrup	

loan-number	branch-name	amount
L110	swansea	1530
L223	neath	2140
L331	neath	1000

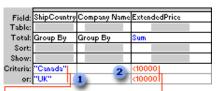
Query 5:

Find the names of all customers who have a loan at the 'neath' branch, but no account at any branch of the bank

loan

	depositor
ust-name	acct-num
Gary	123
Maple	345
Dave	567

Microsoft Access: Query-By-Example



Ship Country	Company Name	SumOf	ExtendedPrice
Canada	Bottom-Dollar Markets		\$28,025.51
Canada	Laughing Bacchus		\$522.50
Canada	Mére Paillarde		\$37,123.65
UK	Around the Horn		\$14,602.15
UK	B's Beverages		\$7,383.90

Ship Country	Company Name	SumOf	ExtendedPrice
Canada	Laughing Bacchus		\$522.50
UK	B's Beverages		\$7,383.90

Base on:

Relational calculus theory

Usage:

Define what you want **Not how** you get it

DBMS generate the query code for you.

For quick exploration No knowledge of SQL

