

SQL: relational Algebra

Set of Tables \rightarrow Table "closed language"

- named columns
- names of the appl. domain
(City, population, grade, ...)

Operators

- Π Table \rightarrow Table
- σ Table \rightarrow Table
- \bowtie Tables \rightarrow Table

SQL: + Group By (Aggregation) MINUS NOT EXISTS "antijoin"
 E.A. γ : Table \rightarrow Table

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Red. DB Datalog:

conty('D', 'germ', ...)
 $\hat{=}$ tables
 no named columns, but positions
 ?- conty(C, N, P, ...) \wedge P > 1000000
 \rightarrow { {C/D, N/germ, P/1000000...},
 {C/F, N/fran, P/60000000},
~~{C/H, N/ital, P/300000...}~~,
 ... }

C	N	P
D	germ	1000000
F	fran	60000000

Result: $\hat{=}$ tables, column names are variables

\rightarrow happy to relational algebra
 $\Pi, \sigma, \bowtie, \dots$ antijoin, γ
 implementations: grouping, ...

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SPARQL: input: set of triples
 output: table of any arity,
 names of columns are variables
 not a closed lg: $triple \rightarrow rel$
 $triple \rightarrow rel$ } rel...

basic level: o/triple patterns
 $triple \rightarrow rel, \text{arity} \leq 3, \text{columns: variables}$

• basic graph patterns (BGP)
 $triple \rightarrow rel \text{ arbitrary arity, variables}$

• BGP + Filters σ

\cup
 \cap via join variables conjunction
 $\neg, \text{NOT EXISTS}$ (NOT BOUND SPARQL1.1)
 OPTIONAL (NOT EXISTS SPARQL1.1)
 "antijoin"

grouping: "result modifiers"
 e.g. DISTINCT
 LIMIT n

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algebra: \mathcal{G} reasoning
 SQL: select

Closed languages:
 SQL: tables \rightarrow table
 XQuery: XML \rightarrow XML \leadsto construction

SPARQL: $\{ \text{triple} \}$ \rightarrow like a table NOT CLOSED
 $\{ \text{graph} \}$
 graph \rightarrow graph ? (CLOSED)

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