Hypothetical (What-If) Queries

Example from Balmin et al. VLDB 2000: "An analyst of a brokerage company wants to know what would be the effect on the return of customers' portfolios if during the last 3 years they had suggested Intel stocks instead of Motorola".

Example: "An analyst wants to figure out how to achieve a 10% return in customer portfolios, with the least number of trades".

TiQL Semantics

- **Deduction Rule**: HP(\(x\)) :- body
  - Similar to repair semantics
  - Expresses KPIs

- **Reduction Rule**: HP(\(x\)) :- body
  - Subset of relation

- **Constraint Rule**: [arithm-pred] <- body
  - Definition of hypothetical table

**Example:**

\[\text{HChoose}(\text{ok, pk, sk, sk'}) \text{ :- PartSupp}(\text{pk, sk'}) \& \text{LineItem}(\text{ok, pk, sk, qnt})\]

**Possible worlds:**

- **HChooseS-1**
  - \(\text{ok, pk, sk, sk'}\)
  - \(\text{ok, pk, sk, sk'}\)

- **HChooseS-2**
  - \(\text{ok, pk, sk, sk'}\)
  - \(\text{ok, pk, sk, sk'}\)

- **HChooseS-3**
  - \(\text{ok, pk, sk, sk'}\)
  - \(\text{ok, pk, sk, sk'}\)

- **HChooseS-4**
  - \(\text{ok, pk, sk, sk'}\)
  - \(\text{ok, pk, sk, sk'}\)

**Partitioning Optimizer Evaluation**

**Model Optimizer**

- **Scaling Potential**

**Reverse Data Management**

- **How-To Queries**

- **Key Performance Indicators (KPI)**

- **Normalization**

- **Indexing**

- **Partitioning**

- **Reduction**

- **Deduction**

- **Model Optimizer**

- **Scaling Potential**

**Tiresias Architecture**

- **TQL program**
  - TQL parser
  - TQL generator

- **CORE tables**

- **MIP solver**

- **DBMS**

- **Tiresias**

**TQL to MIP Translation**

- **Key Constraints**
  - \(\sum_{i,k,y(i)=k_j} x_i \leq 1\)

- **Provenance Constraints**
  - \(\forall_i, y \leq x_i\)
  - \(\forall_i, y \leq x_i\)
  - \(\forall_i, y \geq x_i - (n-1)\)

**Front-end**

- **TQL (Tiresias Query Language)**

**Back-end**

- **MIP solver**

**The easy way**

- **The hard way**

**Integration of Tiresias and MIP**

**How to Solve a How-To Query**

- **Tiresias**

**Semantics**

- **Formal Semantics**

- **Logical Equivalence**

- **Query Transformations**

**Implementation**

- **Model Extractor**

- **Model Optimizer**

- **Solver**

- **Kernel**

**Evaluation**

- **Comparison with Other Approaches**

**Discussion**

- **Conclusion**

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- **References**

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http://db.cs.washington.edu/tiresias