Pay-as-you-go Matching of Relational Schemata to OWL Ontologies With IncMap

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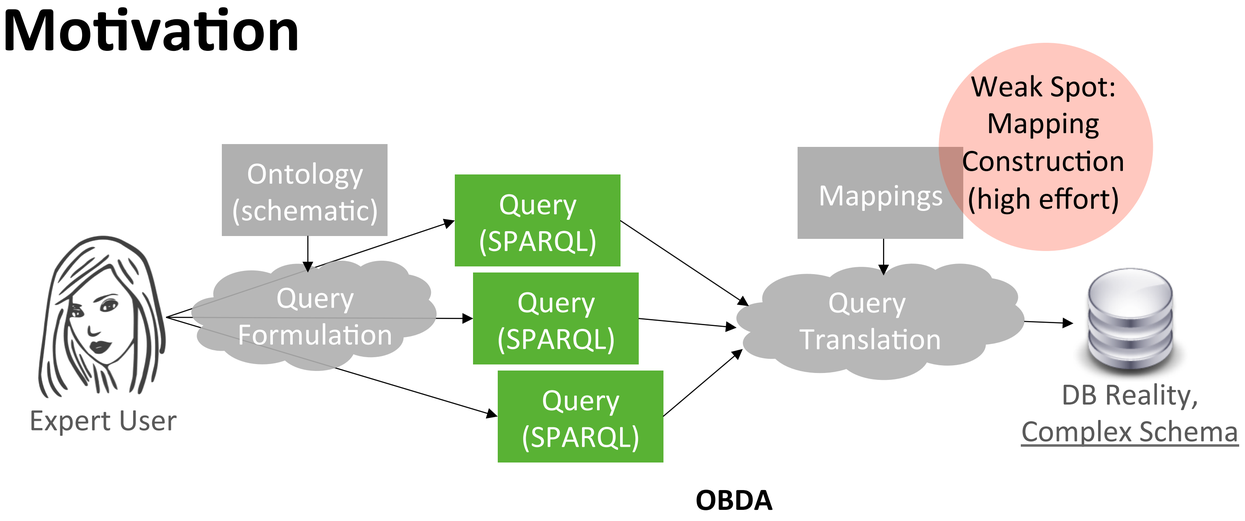
Motivation

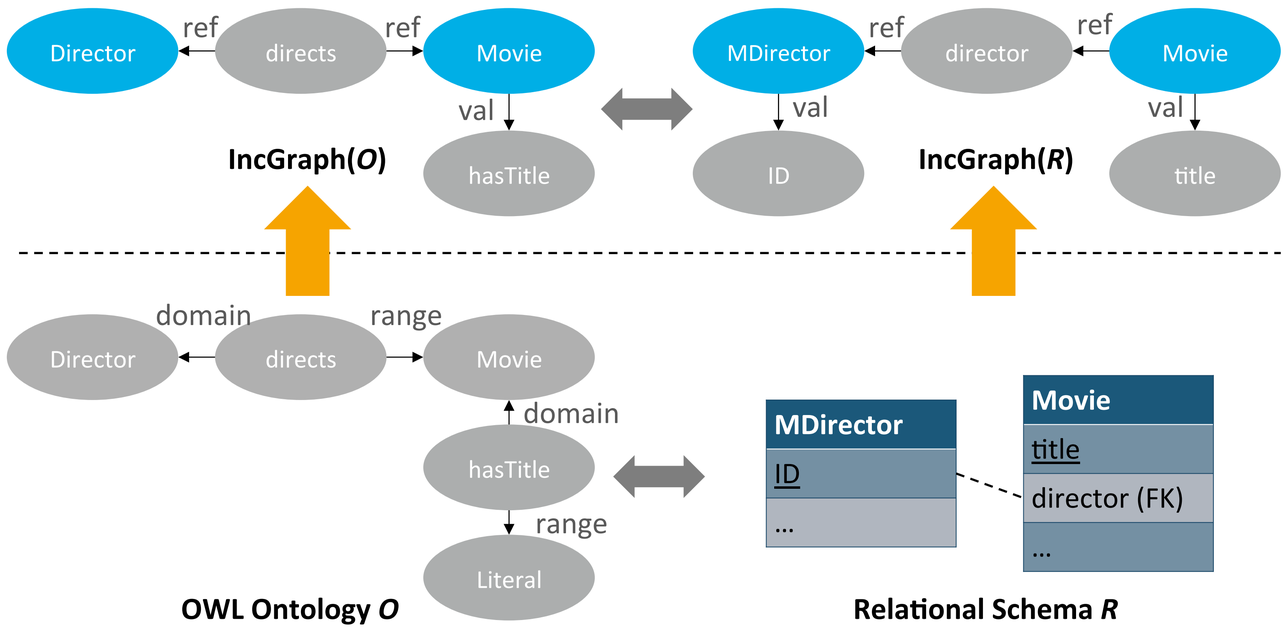


OBDA

Mapping Construction in OBDA – High Human Effort

- OBDA helps at working with complex data where traditional query formulation requires massive human effort.
- You can **formulate queries against an ontology** that represents the users' view of the domain.
- Query translation, however, **requires mappings**.
- Typically, mappings need to be **constructed/maintained manually**.
- Mapping construction becomes then the new weak point in terms of **human effort involved**.
- IncMap reduces effort with **semi-automatic, pay-as-you-go** approach to match ontologies and relational schemata

IncGraph

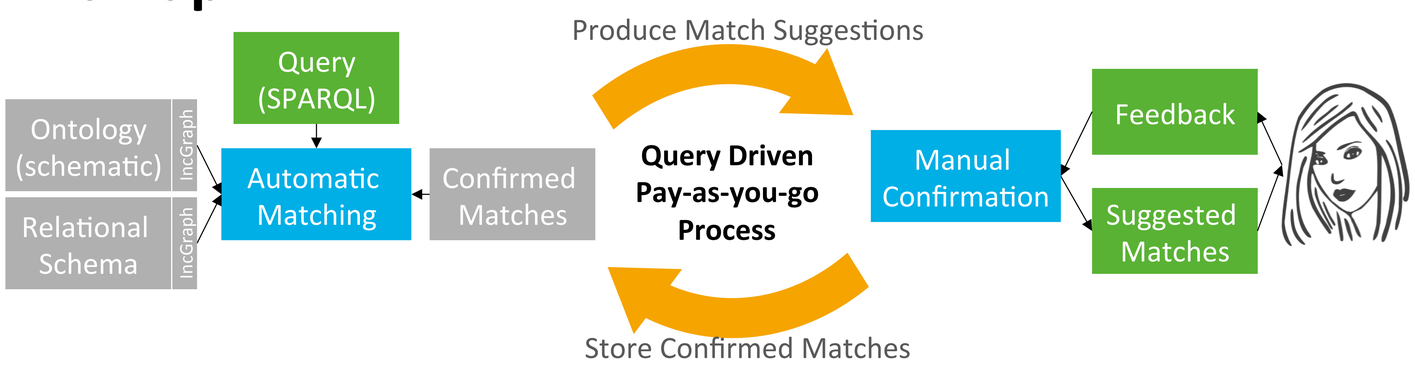


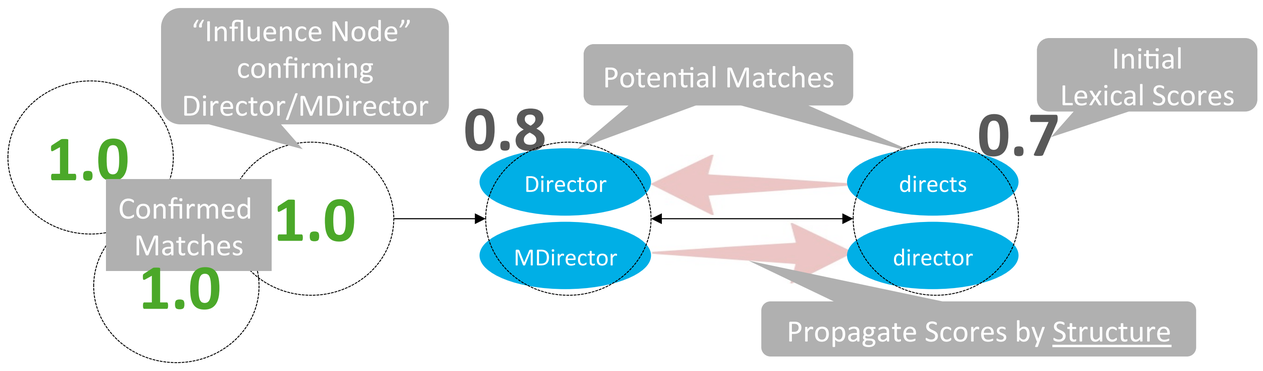
OWL Ontology *O* **Relational Schema *R***

IncGraph: Structurally Unified Data Structure for Matching OWL Ontologies With Relational Schemata

- Build a **simple, directed labeled graph** from the **ontology**
- Cover only structural properties important for matching:
  - **Object properties** linked by "**ref**" edges
  - **Datatype properties** linked by "**val**" edges
- Build a similar graph from the relational schema:
  - **Tables and attributes as nodes**
  - **FK** references linked by "**ref**" edges
  - **Attributes** linked by "**val**" edges
- Now both are sturcturally similar and intuitive to align
  - Increase structural similarity further by adding **inverse edges for "ref" edges**
  - Optionally add further edges (heuristics) to overcome differences in typical design patterns: edges from query workload structure, shortcuts...

IncMap





Exploiting Previous Feedback **Calculation of Basic Match Suggestions**

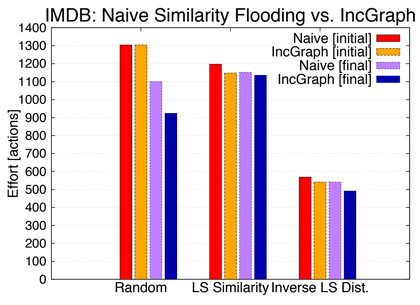
Step 1: Automatic Basic Match Construction

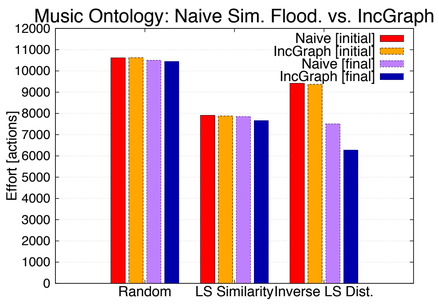
- **Input: IncGraphs** (ontology/schema), **set of confirmed matches** from previous iterations (as can be produced in step 2)
- Match nodes (cross product) Initialize with lexical scores
- Improve scores by considering structure
  - Currently: using Similarity Flooding (Melnik et al.)
  - Distributes initial scores in fixpoint computation using structural communalities between IncGraphs
- **Output: ranked match candidates**

Step 2: Manual Confirmation of Relevant Matches

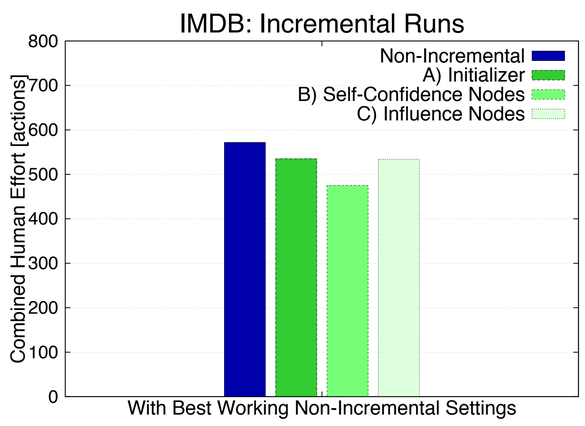
- **Input: ranked match candidates** required for current query
- Ask user to **confirm/reject** suggestions
- **Output: confirmed matches** (used in subsequent iterations):
  - A) "Initializer": replace initial (lexical) scores
  - B) "Self-confidence": force new scores permanently
  - C) "**Influence Nodes**": construct **additional nodes** to influence fixpoint computation

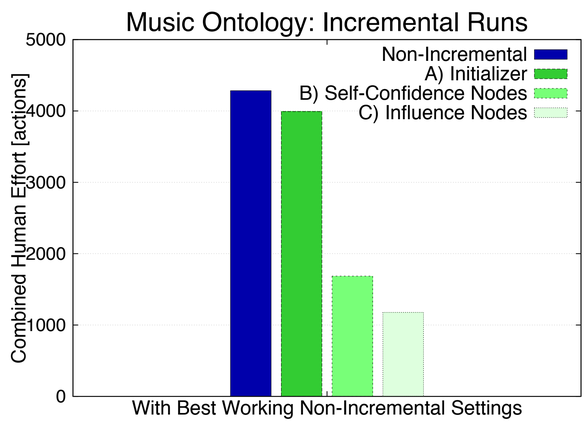
Experiments





Results for Basic Matches (non-incremental)





Incremental Results, Pay-as-you-go