Datalog extensions

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22 de janeiro de 2014

Article	Authors	Little abstract	Objectives/Highlights	Year
Sets and Negation in a Logic Database Language (LDL1)	Catriel Beeri, Shamim Naqvi, Raghu Ramakrishnan, Oded Shmueli, Shalom Tsur	This paper extend LDL (Logic Basid Database Language) to include finite sets and negation. It shows how the technique of magic sets can be extended to translate LDL1 programs into equivalent programs which can often be executed more efficiently.	A precise semantics has been provided for LDL1. It was defined the notion of a model on a non-Herbrand universe, and a non-standard notion of minimality of models	1987
Non-deterministic languages to express deterministic transformations	Serge Abiteboul, Eric Simon, Victor Vianu	This paper focus on the use of non-deterministic languages to compute deterministic queries and updates ("transformations"). It examines languages which include non-deterministic extensions of Datalog and of fixpoint logics. It considers the ability of such languages to compute deterministic transformations.		1990
Disjunctive Datalog	Thomas Eiter, Georg Gottlob, Heikki Mannila	Disjunctive Datalog is a variant of Datalog where disjunctions may appear in the rule heads. It was investigated three different semantics for disjunctive Datalog: the minimal model semantics, the perfect model semantics, and the stable model semantics. It was also investigated the expressive power of a query language where the database queries are syntactically given by disjunctive Datalog programs (questions on the article).		1994
The ROL Deductive Object Base Language	Mengchi Liu	A novel deductive object-base language that integrates important features of object-oriented databases and deductive databases into a uniform framework.		1996

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Complexity and Expressive Power of Logic Programming	Evgeny Dantsin, Thomas Eiter, Georg Gottlob, Andrei Voronkov	This article surveys various complexity and expressiveness results on different forms of logic programming. The results include logic programming with different forms of negation, disjunctive logic programming, logic programming with equality, and constraint logic programming.		1997
Enhancing Disjunctive Datalog by Constraints	Francesco Buccafurri, Nicola Leone, Pasquale Rullo	This paper presents an extension of Disjunctive Datalog (model incomplete knowledge) by integrity constraints. Besides classical integrity constraints, we introduce the notion of weak constraints, that is, constraints that should possibly be satisfied. The proposed language is well-suited to represent commonsense reasoning and knowledge-based problems arising in different areas such as planning, graph theory optimizations and abductive reasoning.	- Disjunctions in the head of the rule; - The semantics of weak constraints minimizes the number of violated instances of constraints (Preferably). - Constraints can be profitably used for knowledge representation and reasoning.	1999
Universal Temporal Extensions for Database Languages	Cindy Xinmin Chen, Carlos Zaniolo	It proposes an approach based on a point-based explicit-time model and on temporal aggregates to support interval-based reasoning. It demonstrates the universality of the approach, by proposing parallel designs for SQL, QBE, and Datalog.		1999
Nondeterministic, Nonmonotonic Logic Databases	Fosca Giannotti, Giuseppe Manco, Mirco Nanni, Dino Pedreschi	Datalog++, an extension of Datalog with mechanisms for temporal, nonmonotonic and nondeterministic reasoning. This article aims at illustrating the expressiveness and flexibility of Datalog++; a declarative semantics for Datalog++; the basis for query optimization.		2001
On the Semantics and Expressive Power of Datalog-like Languages for NP Search and Optimization Problems	E. Zumpano, S. Greco, I. Trubitsyna, P. Veltri	This paper analyzes the power of Datalog-like languages in expressing NP search and optimization problems. It studies the expressive power of several languages obtained by extending positive DATALOG (stratified negation, constraints and disjunction), and also the language called NP Datalog, which uses disjunction only to define partitions of relations and captures the power of DATALOG¬ in expressing search and optimization problems.		2004

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Declarative Networking	Boon Thau Loo, Tyson Condie, Minos Garofalakis, David E. Gay, Joseph M. Hellerstein, Petros Maniatis, Raghu Ramakrishnan, Timothy Roscoe, Ion Stoica	Declarative Networking is a programming methodology that enables developers to concisely specify network protocols and services, which are directly compiled to a dataflow framework that executes the specifications.	- Network Datalog (NDlog) language for declarative networking; - Interest in the design of new network protocols; - Declarative networking is an application of database query language and processing techniques to the domain of networking; - Recursive query languages studied in the deductive database literature are a natural fit for expressing the relationship between base data, derived data, and the associated constraints; - NDlog provide control over the storage location of tuples explicitly in the syntax via location specifiers by "@"; - The BOOM project is exploring the use of declarative languages in the setting of Cloud Computing;	2006
A general datalog-based framework for tractable query answering over ontologies	Andrea Calì, Georg Gottlob, Thomas Lukasiewicz	This paper proposes and studies variants of Datalog that are suited for efficient ontological reasoning, and for tractable ontology-based query answering. Datalog$^{\pm}$ is a family of Datalog variants with many goals such as (i)make a better connexion between database query language ans Description Logics (DL), (ii) transferring important concepts and proof techniques from database theory to DLs, and (iii) studying new tractable query languages. - **Datalog$^{\pm}$: A Unified Approach to Ontologies and Integrity Constraints (2009)** - **Well-Founded Semantics for Extended Datalog and Ontological Reasoning (2013)**	- The article illustrates how queries can be posed and answered in DL-Lite (Description Logics), that uses existential quantifiers. - Datalog can neither directly express DL-Lite disjointness constraints, nor the functional constraints used in DL-LiteF - The lack of value creation makes plain Datalog not very well suited for ontological reasoning with inclusion axioms either. - Possibility of having existentially quantified variables in rule heads as the main Datalog extension enabling ontological knowledge representation and reasoning.	2009
The Declarative Imperative - Experiences and Conjectures in Distributed Logic	Joseph M. Hellerstein	- Invited lecture ACM PODS 2010 Reflexions on the author group's experience over seven years using Datalog extensions to build networking protocols and distributed systems.		2010

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Dedalus: Datalog in Time and Space	Peter Alvaro, William R. Marczak, Neil Conway, Joseph M. Hellerstein, David Maier, Russell Sears	This article presents Dedalus, a foundation language for programming and reasoning about distributed systems. It is a subset of Datalog with negation, aggregate functions, successor and choice, and adds an explicit notion of logical time to the language. **- A Declarative Semantics for Dedalus(2013)**	- Dedalus provides a model-theoretic foundation for the two key features of distributed systems: mutable state, and asynchronous processing and communication; - Incorporation of time as an attribute of Datalog predicates;	2011
Extending the power of datalog recursion	Mirjana Mazuran, Edoardo Serra, Carlo Zaniolo	Supporting aggregates in recursive logic rules represents a very important problem for Datalog. To solve this problem, this paper proposes a simple extension, called Datalog^{FS} (Datalog extended with frequency support goals), that supports queries and reasoning about the number of distinct variable assignments satisfying given goals, or conjunctions of goals, in rules.		2012
SociaLite: Datalog Extensions for Efficient Social Network Analysis	Jiwon Seo, Stephen Guo, Monica S. Lam	SociaLite is a high-level graph query language based on Datalog. As a logic programming language, Datalog allows many graph algorithms to be expressed succinctly. However, its performance has not been competitive when compared to low-level languages. With SociaLite, users can provide high-level hints on the data layout and evaluation order; they can also define recursive aggregate functions which, as long as they are meet operations, can be evaluated incrementally and efficiently. **- Distributed SociaLite A Datalog-Based Language for Large-Scale Graph Analysis (2013)**	- The large performance gap with imperative languages makes Datalog not competitive for solving fundamental graph algorithms. - Introduce a new representation designed expressly for graphs, tail-nested tables (adjacency lists); - It supports recursively-defined aggregate functions (Java functions); - It enables users to hint at an efficient evaluation order; - The SociaLite compiler accepts a SociaLite program, with additional Java functions, and translates it into Java source code.	2013

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String-Oriented Databases	Arcot Rajasekar	Development of an extension to the relational algebra augmenting it with the concept of a string expression with a rich structure of string variables, mapping functions, interpreted string operations and approximate evaluations. It also studies properties of such expressions and show that many of the well-known properties of relational algebra hold in the extension. There is also a discuss about an extension to Datalog(String) and an implementation of a proto-type system called S-log. S-log integrates pattern-matching in Datalog framework.	- Relational databases and Datalog view each attribute as indivisible, this views does not provide a powerful database system for applications in genetic sequence querying, iconic image processing, textual processing, etc; - Extension to relational algebra and Datalog that provides primitive level string operations in the database framework; - In this approach strings are viewed as database objects that can be compared, divided, subsumed, interpreted and approximated;	2013
A rule-based language for Web data management	Serge Abiteboul, Alban Galland, Meghyn Bienvenu, Émilien Antoine	This paper introduces a model for distributed computation where peers exchange messages (i.e. logical facts) as well as rules. A contribution of this work is a study of the impact on expressiveness of delegations (the installation of rules by a peer in some other peer) and explicit timestamps. The language introduced, called Webdamlog, is tailored to facilitate the specification of data exchange between autonomous peers.	- The management of modern distributed information; - A new model for distributed data management that combines in a formal setting deductive rules as in Datalog with negation (to specify intensional data) and active rules as in Datalog¬¬(for updates and communications); - We therefore believe that there is a need to continue investigating novel language features adapted to modern data management and to formally study the properties of the resulting new models. - A natural direction for future work is the extension of our study of the power of delegation and related issues (e.g. possibility of electing a leader) to diferent variants of the model.	2011
Aggregation in Datalog under Set Semantics	Abhijeet Mohapatra, Michael Genesereth	Extension of Datalog that supports aggregates under set semantics and is as expressive as the previous extensions of Datalog which use *bag semantics* to represent aggregate programs. In this proposed extension, complex aggregation predicates can be built modularly using simple predicates.	- The evaluation of the Datalog programs under bag semantics presents problems. First, every derivation of a goal or a sub-goal is tracked. This is inefficient, since we cannot leverage efficient techniques such as pipelined semi-naive evaluation to evaluate the Datalog programs. Second, in order to decide the equivalence of Datalog queries with aggregation, we have to separately study the equivalence under the set, bag-set and bag semantics. ??? - Introduce Datalog sets as first class citizens.	2012

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The Webdamlog System: Managing Distributed Knowledge on the Web	Serge Abiteboul, Émilien Antoine, Julia Stoyanovich	This article studies the use of WebdamLog, a declarative high-level language in the style of Datalog, to support the distribution of both data and knowledge over a network of autonomous peers. The main novelty of WebdamLog compared to Datalog is its use of delegation, that is, the ability for a peer to communicate a program to another peer. **- A rule-based language for Web data management (2011) - Introducing Access Control in Webdamlog-shortpaper (2013) - Rule-Based Application Development using Webdamlog (2013)**		2013