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DATA MANAGEMENT SYSTEM BASED VIEWPOINT

S. Naveen[1], Ch. Dhanunjayarao[2]
[1]*M.Tech, CSE Dept, MLRIT, Hyderabad*
[2]*M.Tech, Asst. Professor, MLRIT, Hyderabad*

***Abstract*— the architecture of data management system based on viewpoint is to capitalize on efforts made to design an existing and well-established DMS (a reference system). To extract amounts of data from the reference DMS a piece of schema relevant to the new application needs a module, possibly personalizing it with extra-constraints with respect to the application under construction, and then managing a dataset using the resulting schema.**

We carry out our investigations in the setting of description logics which underlie modern ontology languages, like RDFS, OWL, and OWL2 from W3C. Notably, we focus on the DL-liteA dialect of the DL-lite family, which encompasses the foundations of the QL profile of OWL2 (i.e., DL-liteR): the W3C recommendation for efficiently managing large datasets. In this paper, we extend the existing definitions of modules and we introduce novel properties of robustness that provide means for checking easily that a robust module-based DMS evolves safely with respect to both the schema and the data of the reference DMS.

***Index Terms*—Models and Principles, Database Management, Personalization, Algorithms for data and knowledge management, Artificial Intelligence, Intelligent Web Services and Semantic Web.**

I. INTRODUCTION

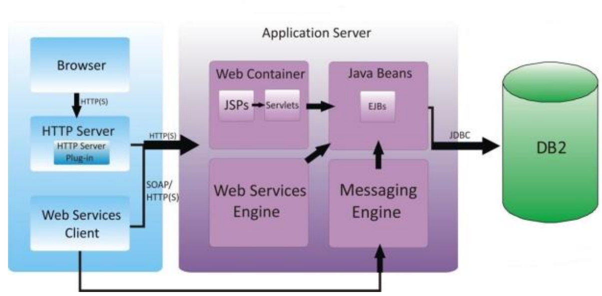
In many application domains (e.g., medicine or biology), comprehensive schemas resulting from collaborative initiatives are made available. For instance, SNOMED is an ontological schema containing more than 400.000 concept names covering various areas such as anatomy, diseases, medication, and even geographic locations. Such well-established schemas are often associated with reliable data that have been carefully collected, cleansed, and verified, thus providing reference ontology-based

data management systems (DMSs) in different application domains. A good practice is therefore to build on the efforts made to design reference DMSs whenever we have to develop our own DMS with specific needs. A way to do this is to extract from the reference DMS the piece of schema relevant to our application needs, possibly to personalize it with extra-constraints w.r.t. our application under construction, and then Recent work in description logics (DLs, [1]) provides different solutions to achieve such a reuse of a reference ontology-based DMS. Indeed, modern ontological languages – like the W3C recommendations RDFS, OWL, and OWL2 – are actually XML-based syntactic variants of well-known DLs.

All those solutions consist in extracting a module from an existing ontological schema such that all the constraints concerning the relations of interest for the application under construction are cap- tured in the module [2]. Existing definitions of modules in the literature basically resort to the notion of (deductive) conservative extension of a schema or of uniform interpolant of a schema, a.k.a. forgetting about non-interesting relations of a schema. [3] formalizes those two notions for schemas written in DLs and discusses their connection. Up to now, conservative extension has been considered for defining a module as a subset of a schema. In contrast, forgetting has been considered for defining a module as only logically implied by a schema (by definition forgetting cannot lead to a subset of a schema in the general case). Both kinds of modules have been investigated in various DLs.

II. ARCHITETURE FLOW

Below architecture diagram represents mainly flow of request from the users to database through servers. In this scenario overall system is designed in three tiers separately using three layers called presentation layer, business layer, data link layer. This project was developed using 3-tier architecture.



III. SYSTEM DEVELOPMENT

Privacy-Preserving Public Auditing:

Homomorphic authenticators are unforgettable verification metadata generated from individual data blocks, which can be securely aggregated in such a way to assure an auditor that a linear combination of data blocks is correctly computed by verifying only the aggregated authenticator. Overview to achieve privacy-preserving public auditing, we propose to uniquely integrate the homomorphic authenticator with random mask technique. In our protocol, the linear combination of sampled blocks in the server's response is masked with randomness generated by a pseudo random function (PRF).

- Setup Phase
- Audit Phase

Batch Auditing:

With the establishment of privacy-preserving public auditing in Cloud Computing, TPA may concurrently handle multiple auditing delegations upon different users' requests. The individual auditing of these tasks for TPA can be tedious and very inefficient. Batch auditing not only allows TPA to perform the multiple auditing tasks simultaneously, but also greatly reduces the computation cost on the TPA side.

Data Dynamics:

Supporting data dynamics for privacy-preserving public risk auditing is also of paramount importance. Now we show how our main scheme can be adapted to build upon the existing work to support data dynamics, including block level operations of modification, deletion and insertion. We can adopt this technique in our design to achieve privacy-preserving public risk auditing with support of data dynamics.

IV. RELATED WORK

The problem to decide for two T Boxes T1 and T2 whether T1 [T2 is a conservative extension of T1 is closely related to the notion of a uniform interpolate. This, in turn, is an extension of the standard Craig interpellants requiring that the interpolate is uniform for all possible formulas in the antecedent (Pitts 1992). As uniform interpolation appears to be the most important notion related to the algorithmic problem we are concerned with in this paper and results on uniform interpolation might be useful for future research on conservative extensions in DLs, we briefly discuss the connection.

(Uniform interpolants for T Boxes). Given a T Box T and a signature □ sig (T), we call a T Box T□ over sig(T) − □ a uniform interpolant of T with respect to □ if the following conditions hold:

• T |= T□; • for every implication C v D such that no symbol from □ occurs in C,D, we have that T |= C v D implies T□ |= C v D.

It is not difficult to see that T1 [T2 is a conservative extension of T1 if and only if T1 is a uniform interpolant for T1 [T2 with respect to sig(T2) − sig(T1). Thus, if it is the case that, for every TBox T and signature □, there exists a uniform interpolant T□ of T w.r.t. □ (and it is computable), then we have a procedure deciding whether T1 [T2 is a conservative extension of T1: compute the uniform interpolant and check whether it is logically equivalent to T1. The most important logics known to have uniform interpolation are intuitionist logic, the G¨odel-Loeb logic, Grzegorczyk-logic, the μ- calculus, and the modal logic K (Visser 1996; Ghilardi 1995; D'Agostino & Lenzi 2005; Pitts 1992). On the other hand, classical first-order logic, modal logic S4 and dynamic logic PDL do not have uniform interpolation (Ghilardi & Zawadowski 2002; 1995). Unfortunately, we show in (Ghilardi, Lutz, & Wolter 2006b) that uniform interpolants for T Boxes need not exist. More precisely, if T is the T Box

> v 8r.¬A A v B

B v 9r.C, C v 9r.B

B v E, C v ¬E. and □ = {B,C}, then there exists no uniform interpolant of T w.r.t. □. Thus, the uniform interpolation approach to conservative extensions fails for ALC with T Boxes.

Recently, (Marx, Conradie, & ten Cate 2006) have established an exponential time procedure for computing uniform interpolants for ALC-concepts without reference to T Boxes (or, in modal logic terms, the local consequence relation of modal logic K). The paper also establishes an exponential upper bound for the size of uniform interpolants. This result is used in (Ghilardi, Lutz, & Wolter 2006a) to show that the following decision problem is co-NEXPTIME-complete: given two ALC-concepts C1 and C2, is C1 uC2 a conservative extension of C1? In other words, does the following hold for every concept D in the signature of C1: if the subsumption relation C1 u C2 v D is valid, then the subsumption relation C1 v D is valid.

We have proposed several reasoning problems that are suitable for providing automated reasoning support when deciding whether a given extension of ontology is well behaved. Still, substantial research remains to be carried out to achieve feasibility of this approach in practice. First, one should try to refine the worst-case optimal algorithms presented in this paper into more practical algorithms that can be implemented and tested on real-world ontologies. Second, the complexity analysis should be extended from ALC to the more expressive DLs currently supported by DL reasoners such as SHIQ. We believe that, as long at the DL under consideration has the tree-model property, modifications of the techniques introduced in this paper can form the basis of such a complexity analysis.

Additionally, the results presented in this paper suggest searching for more pragmatic reasoning problems that are similar to the ones proposed here, but computationally less complex. For example, a developer might be interested in having a conservative extension not for all concepts over a given signature, but only for concepts of a certain form (e.g., positive concepts, existential concepts, and universal concepts). In a similar spirit, when considering DLs with number restrictions, the user might want to achieve a conservative extension regarding concepts not containing number restrictions and, at the same time, intend to obtain a non-conservative extension when concepts containing qualified number restrictions are involved. To see that there is a considerable difference between the two cases, we refer back to the example about web services given in this paper.

EXPERIMENTAL RESULTS

The techniques developed in assume that each party has an internal device that can verify whether they are telling the truth or not.

V. CONCLUSION

The modules introduced in this paper generalize both the modules obtained by extracting a subset of a Tbox w.r.t. selected relations (e.g., [3], [4], [7], [9]) or by forgetting about relations (e.g., [5], [6], [8], [10]). In addition, in contrast with existing work, we have considered the problem of safe personalization of modules built from an existing reference DMS. This raises new issues to check easily that a module-based DMS evolves independently but coherently w.r.t. the reference DMS from which it has been built. We have introduced two notions of module robustness that make possible to build locally the relevant queries to ask to the reference database in order to check global consistency (possibly upon each update), and to obtain global answers for local queries. We have provided polynomial time algorithms that extract minimal and robust modules from a reference ontological schema expressed as a DL-lite Tbox. [5] extracts modules from DL-lite schemas following a forgetting approach. It proposes an alternative to our result about global query answering, which applies under the severe constraints that the dataset of the reference DMS has to be modified (write access is required). Compared to the algorithm developed by [7] for extracting modules from acyclic EL ontological schemas, our approach handles possibly cyclic DL-liteA schemas, while keeping data consistency and query answering reducible to standard database queries [11].

In contrast with the recent work on extracting modules from DL-lite ontological schema [4], we focus on the DL-liteA fragment for which consistency checking and query answering are FOL-reducible. This is crucial when ontologies are used as schemas over large datasets stored and queried as relational databases. Datalog [15] is an extension of Datalog that has also been designed for query answering over ontologies. Since it captures the fragment of DL-lite that we consider, our results can be easily transposed into it. Contrarily to recent works in distributed databases, data replication can be avoided while guaranteeing global consistency. Our approach is a good trade-off between the NoSQL approaches and the SQL approaches for managing distributed data stores (see [16] for a survey). While most of the NoSQL approaches are schemaless, our approach makes possible to handle useful schema constraints. It provides efficient means to check global consistency, a stronger property than eventual consistency that is prevalent in distributed data stores.

On the other hand, we are more flexible than the SQL approaches since global consistency is checked periodically

and not at each update of the reference DMS. In the next future, we plan to evaluate our approach, in particular to compare the size of the modules extracted by our algorithm to the results provided by [17], [18].
We also plan to apply our algorithms to the real use case of the My Corporis Fabrica DMS, mentioned in the introduction, which has been developed manually as a personalization of the (reference) Foundational Model of Anatomy DMS. Finally, we plan to extend our approach to distributed module-based DMSs, where answering queries combines knowledge of several modules associated with possibly several reference DMSs.

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AUTHOR DETAILS:

First Author: ***Sanapala Naveen*** received B.Tech in computer Science and Engineering from Aditya Institute of Technology and Management, Kakinada, in the year 2012. He is currently M.Tech student in Computer Science and Engineering Department from Marri Laxman Reddy Institute of Technology. And his research interested areas are in the field of Networking, Information Security and Cloud Computing, Mobile Computing.

Second Author: ***Chigurukota Dhanunjaya Rao*** working as an Asst. Professor in Marri Laxman Reddy Institute of Technology. He has completed his M.Tech CSE and he has 6 years of teaching experience. His research interested areas are Data Mining, Network Security and Cloud Computing.