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Robust Module-based Data Management

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Abstract: **The current trend for building an ontology-based data management system (DMS) is to capitalize on efforts made to design a preexisting well-established DMS (a reference system). The method amounts to extracting from the reference DMS a piece of schema relevant to the new application needs – a module, possibly personalizing it with extra-constraints w.r.t. the application under construction, and then managing a dataset using the resulting schema. In this project, 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 w.r.t. both the schema and the data of the reference DMS. 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.**

Keywords: DMS, DL-liteR, QL, ALC, RDFS, EL, OWL, OWL2

1. 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 to manage our own dataset using the resulting schema. 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 captured in the module. Existing definitions of module sin the literature basically resort to the notion of (deductive) conservative extension of a schema or of uniform interplant of a schema, a.k.a. forgetting about non-interesting relations of a schema. 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, e.g., DL-lite EL and ALC. In this paper, we revisit the reuse of a reference ontology-based DMS in order to build a new DMS with specific needs. We go one step further by not only considering the design of a module-based DMS (i.e., how to extract a module from a ontological schema): we also study how a module-based DMS can benefit from the reference DMS to enhance its own data management skills. We carry out our investigations in the setting of DL-lite, which is the foundation of the QL profile of OWL2 recommended by the W3C for efficiently managing large RDF datasets.

2. PROPOSED SYSTEM

Here, 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 w.r.t. both the schema and the data of the reference DMS. 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. Advantages of proposed system This is very useful to maintain Data, Search and retrieve the data is very easy.

3. MODULES

3.1. Main Modules:-

3.1.1. *User Module:* In this module, Users are having authentication and security to access the detail which is presented in the ontology system. Before accessing or searching the details user should have the account in that otherwise they should register first.

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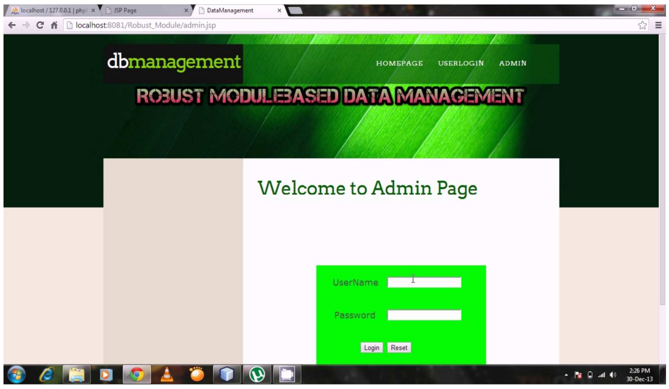
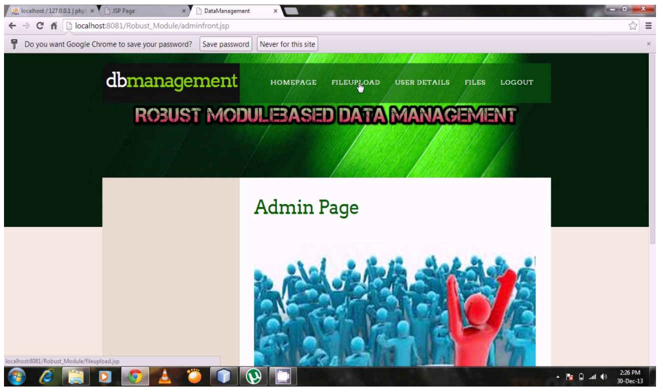
3.1.2. *Global Answer Illustration:* Suppose now that our DMS can answer conjunctive queries (a.k.a. select-project-join queries), e.g., Q(x):- JournPaper(x) ^ hasAuthor(x; "AH") asking for the journal papers written by Alon Y. Halevy. In some situation, it is interesting to provide answers from our DMS together with the reference one, called global answers, typically when our own DMS provides no or too few answers. To do so, we extend the notion of module to robustness to query answering, so that global query answering can be performed on demand. We ensure that the module captures the knowledge in the reference schema that is required to answer any query built upon the relations of interest. Then, at global query answering time, this knowledge is used to identify the relevant data for a given query within the distributed dataset consisting of the dataset of the module-based DMS plus that of the reference DMS.

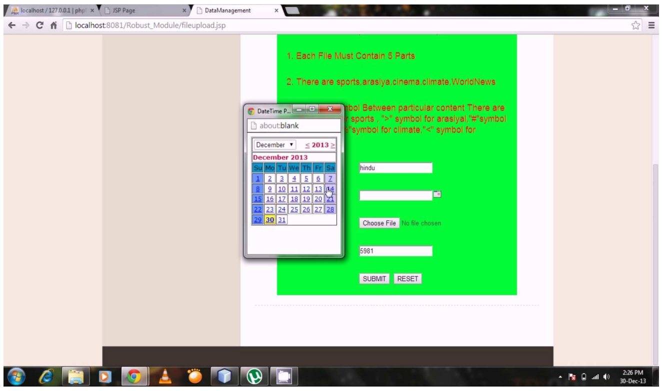
3.1.3. *Reducing Data Storage Illustration:* Computing edit distance exactly is a costly operation. Sev- eral techniques have been proposed for identifying candidate strings within a small edit distance from a query string fast. All of them are based on q-grams and a q-gram counting argument. For a string s, its q-grams are produced by sliding a window of length q over the characters of s. To deal with the special case at the beginning and the end of s, that have fewer than q characters, one may introduce special characters, such as "#" and "$", which are not in S. This helps conceptually extend s by prefixing it with q - 1 occurrences of "#" and suffixing it with q - 1 occurrences of "$". Hence, each q-gram for the string s has exactly q characters.

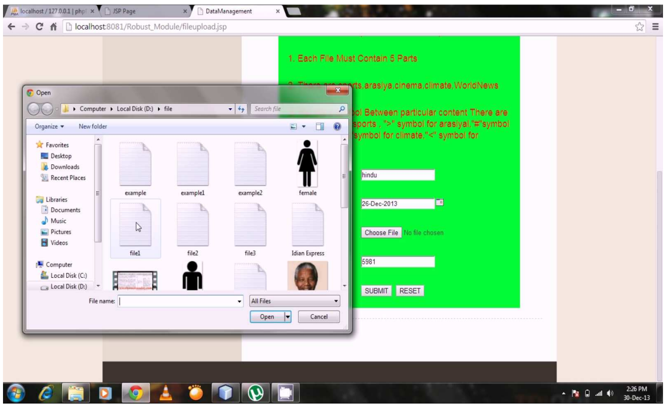
3.1.4. *Module-Based Data Management:* The main idea underlying the notion of module of a Tbox is to capture some constraints of the Tbox, including all the (implied) constraints built upon a given signature, and denoted the signature of interest. Our definition of module extends and encompasses the existing definitions. In contrast with we do not impose modules of a Tbox to be subsets of it. For a module to capture some constraints of the Tbox, it is indeed sufficient to impose that it is logically entailed by the Tbox. In contrast with, we do not impose the signature of modules to be restricted to the signature of interest. In fact, as we have shown through the illustrative example, the robustness properties may enforce the signature of modules to contain additional relations that are not relations of interest but that are logically related to them.

4. SCREEN SHOTS









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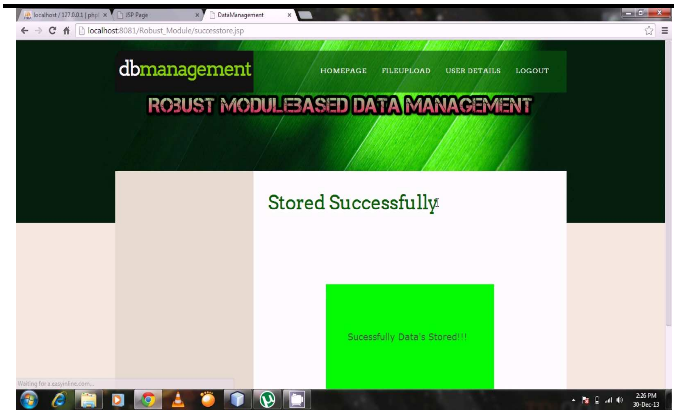

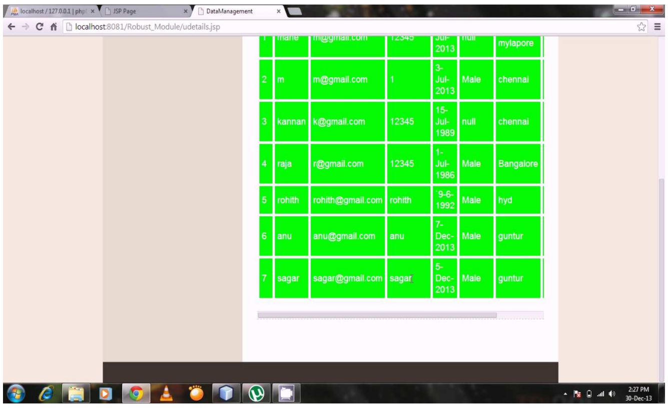

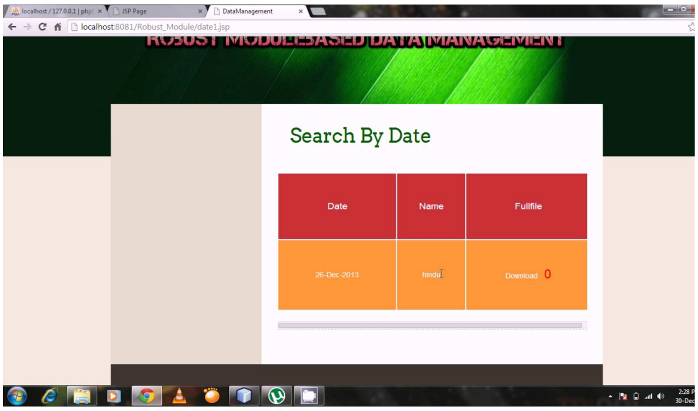

5. CONCLUSION

The modules introduced in this paper generalize both the modules obtained by extracting a subset of a Tbox w.r.t. selected relations or by forgetting about relations 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 tobuild locally the relevant queries to ask to the referencedatabase 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. 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 for extracting modules from acyclic EL ontological schemas, our approach handles possibly cyclic DL-liteA schemas,while keeping data consistency and query answeringreducible to standard database queries.

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