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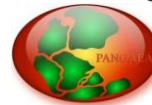


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3D human face description: landmarks measures and geometrical features *

Enrico Vezzetti, Federica Marcolin

Dipartimento di Ingegneria Gestione e della Produzione, Politecnico di Torino, Italy

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Abstract

Distance measures and geometrical features are widely used to describe faces. These features are extracted punctually from landmarks, namely anthropometric reference points. Applications such as face recognition, facial expression recognition, face detection, study of facial growth, and dysmorphologies due to growth, or dysmorphologies. Most of the time, landmarks were extracted with the help of an algorithm or manually located on the faces. Then, measures are computed or geometrical features are extracted to perform the scope of the study. This paper is intended as a survey collecting and explaining all these features, in order to provide a structured user database of the potential parameters and their characteristics. Firstly, facial soft-tissue landmarks are defined and contextualized; then the various measures are introduced and some results are given; lastly, the most important measures are compared to identify the best one for face recognition applications.


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Semantics preserving SPARQL-to-SQL translation

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 query
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ABSTRACT

Most existing RDF stores, which serve as metadata repositories on the Semantic Web, use an RDBMS as a backend to manage RDF data. This motivates us to study the problem of translating SPARQL queries into equivalent SQL queries, which further can be optimized and evaluated by the relational query engine and their results can be returned as SPARQL query solutions. The main contributions of our research are: (i) We formulate a relational algebra based semantics of SPARQL, which bridges the gap between SPARQL and SQL query languages, and prove that our semantics is equivalent to the mapping-based semantics of SPARQL; (ii) Based on this semantics, we propose the first provably semantics preserving SPARQL-to-SQL translation for SPARQL triple patterns, basic graph patterns, optional graph patterns, alternative graph patterns, and value constraints; (iii) Our translation algorithm is generic and can be directly applied to existing RDBMS-based RDF stores; and (iv) We outline a number of simplifications for the SPARQL-to-SQL translation to generate simpler and more efficient SQL queries and extend our defined semantics and translation to support the bag semantics of a SPARQL query solution. The experimental study showed that our proposed generic translation can serve as a good alternative to existing schema dependent translations in terms of efficient query evaluation and/or ensured query result correctness. © 2009 Elsevier B.V. All rights reserved.

1. Introduction

The Semantic Web [7,47] has recently gained tremendous momentum due to its great potential for providing a common framework that allows data to be shared and reused across application, enterprise, and community boundaries. Semantic annotations for various heterogeneous resources on the Web are represented in Resource Description Framework (RDF) [56,58], the standard language for annotating resources on the Web, and searched using the query language for RDF, called SPARQL [59], that has been proposed by the World Wide Web Consortium (W3C) and has recently achieved the recommendation status. Essentially, RDF data is a collection of statements, called triples, of the form (s, p, o) , where s is called subject, p is called predicate, and o is called object, and each triple states the relation between a subject and an object. Such a collection of triples can be viewed as a directed graph, in which nodes represent subjects and objects, and edges represent predicates connecting from subject nodes to object nodes. To query RDF data, SPARQL allows the specification of triple and graph patterns to be matched over RDF graphs.

Explosive growth of RDF data on the Web drives the need for novel database systems, called RDF stores, that can efficiently store and query large RDF datasets. Most existing RDF stores, including Jena [63,62], Sesame [9], 3store [27,28], KAON [54], RStar [35], Openlink Virtuoso [22], DLD8 [38], RDFSuite [3,52], DBOWL [37], PANKA [50], RDFProv [12], and RDFBroker [48] use a relational database management system (RDBMS) as a backend to manage RDF data. The main advantage of the

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 E-mail address: artem@cs.panam.edu (A. Chebotko), shiyong@wayne.edu (S. Lu), fotouhi@wayne.edu (F. Fotouhi).

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g-based semantics relies on mapping domains to detect unbound variables cannot assume that unbound variables are not represented in a deal with this situation.

station of a SPARQL query solution. Second, we define an interpreted representations. Finally, we define our relational algebra based mapping-based semantics.

ry solution). Let a tuple $r: IVL \rightarrow \{IR, \perp\} \cup \{NULL\}$ be a total function, and variables of a SPARQL query, i.e. a URI or a literal is mapped to of set $IR, \perp \cup \{NULL\}$, where $NULL$ denotes an undefined or unbound try solution is a set R of tuples r or simply a relation R . The schema h tuple $r \in R$ is defined; abusing the notation, we denote a tuple r an infinite set of all possible relations, each of which represents a

olution). Following the previous example, consider the same graph the RDF graph (see Fig. 2) is represented as follows:

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$r_1, email, ?e$ against triple $(R_1, email, john@john.edu)$, r_2 is the result and $(?u, web, ?w)$ against triples $(R_1, email, ringo@ringo.edu)$ and

g-based representation, we define an interpretation function λ as

interpretation function $\lambda: \mathcal{R} \rightarrow \Sigma$ as the function that takes a relation tuple $r \in R$ is assigned a mapping $\mu \in \Omega$ in the following way: if $\mu(x) = r(x)$.

tion λ can serve as a tool to establish the equivalence relationship rations are used.

n Ω from Example 3.6 and the solution R from Example 4.2, one can

$$\cdot \Omega = \left\{ \begin{array}{l} ?u \rightarrow R_1, \quad ?e \rightarrow john@... \\ ?u \rightarrow R_1, \quad ?e \rightarrow ringo@..., \quad ?w \rightarrow www.st... \end{array} \right.$$

cs of SPARQL, we need to introduce the following notations: R, R_1 , relation R, \bowtie denotes an inner join, \leftarrow denotes a left outer join, w , and π denote remaining selection, and projection operators of the a new relational operator \dagger and two auxiliary functions, $getCond$

with schema $\Sigma(R)$, two distinct relational attributes $a, b \in \Sigma(R)$, and a $\dagger_{(a,b) \rightarrow c}(R)$ merges attributes a and b of relation R into one single attribute c in the following way: for each tuple $r \in R$, if $r(a)$ is not $NULL$, then $r(c) \leftarrow r(a)$, else $r(c) \leftarrow r(b)$.

We show that \dagger can be derived from existing relational operators.

Theorem 4.6. Relational operator \dagger can be derived from existing relational operators as follows:



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