Chapter 16
Fuzzy Querying of RDF with Bipolar Preference Conditions

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ABSTRACT

To solve the problem of information bipolarity in fuzzy querying of RDF, we propose an approach of RDF fuzzy query with bipolar preference. We use linguistic variables to describe preference conditions, and realize an extended SPARQL syntax by adding bipolar preference conditions to FILTER clauses. We identify three types of bipolar information, dividing the bipolar preference query into univariate bipolarity and bivariate bipolarity, and provide a method for converting fuzzy SPARQL queries to standard SPARQL queries. For optimizing results, we use bipolar preference satisfaction degrees to calculate priority parameters of results for sequencing. Finally, the feasibility of the proposed approach is proved by the experimental system and results.

INTRODUCTION

Users are willing to describe negative and positive preferences in information retrieval. A Positive preference is a kind of expectation, which means that the expectation of an object property or value is greater than other properties. A negative preference is a kind of rejecting, denoting a mandatory condition. This kind of bipolarity is the inner subjective inclination of people, which evaluates an object from its positive and the negative aspects. When the positive and negative preferences coexist, it is called the bipolar preferences. The bipolar information and bipolar preferences are getting more and more attention as it can effectively express the varieties of user demands. The bipolar preference relation is firstly mentioned

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in (Dubois and Prade, 2002), and a series of bipolar preference queries have been proposed. In particular, the bipolar preferences query with fuzzy winnow operator is introduced in (Zadrozny and Janusz, 2006). In (Ludovic, 2009; Tamani, Lietard and Rocacher, 2011), fuzzy set theory and relational algebra are used to describe bipolar preference conditions in SQL. The flexible bipolar query approach based on database is discussed in (Destercke, Buche and Guillard, 2011). The method in relational databases is based on the satisfaction degrees (Matthé, de Tré, Zadrozny, Kacprzyk and Bronselaer, 2011; Matthé and de Tré, 2009; de Tré, Zadrozny, Matthé, Kacprzyk and Bronselaer, 2009). The flexible method of fuzzy matching is to realize bipolar preference query (Zadrozny and Kacprzyk, 2009; Zadrozny and Kacprzyk, 2012; Zadrozny, Kacprzyk and de Tré, 2012).

With the development of the semantic Web, the RDF is sharply increasing, and this results in a large number of searching problems. So far, there have already been plenty of studies focusing on this field, such as the method of matching RDF graph model (Renzo, A. and Claudio, G., 2005; Stocker, Seaborne, Bernstein, Kiefer and Reynolds, 2008), the method based on SPARQL (Simple Protocol and RDF Query Language) (Unger, Bühmann, Lehmann, Ngomo, Gerber and Cimiano, 2012; Castillo, Rothe and Leser, 2010; Jarrar and Dikaiakos, 2012), and the method based on Zadeh's fuzzy set theory (Guéret, Oren, Schlobach and Schut, 2008; Hai, Liu and Zhou, 2012; Bahri, Bouaziz and Gargouri, 2009). Since natural language expression applied in real life has fuzziness and preferences, it is necessary to support fuzzy preference query for realizing RDF retrieval. Siberski, Pan and Thaden (2006) analyzed the disadvantages of expressing preference through sequencing. It added the qualifier (PREFERRING) in SPARQL to describe preference queries. Dolog, Stuckenschmidt, Wache and Diederich (2009) extended SPARQL language to describe preference conditions. It realizes a preference query through converting. Jin, Ning, Jia, Wu and Lu (2008) considered the preference problem of fuzzy and multiple conditions in practical query, and provided the relevancy computational formula, which realized preference query through sequencing. Halder and Cortesi (2011) provided a retrieval method, which is based on the preference satisfaction and structural similarity. User queries uses tape mark as annotated graphs and combine linguistic variables to express fuzzy preference conditions. It synthesized the weighted value of structural similarity and computational preference satisfaction for being sequencing parameters, and then realizing preference query through sequencing.

The existing fuzzy query methods supporting preference are focused on unipolarity preference model (only considering the preference of user's hope). In order to solve the coexist problem of positive and negative preferences in user retrieval demands, we propose an appoach to querying RDF with bipolar preference conditions. We identify three types of bipolar information. It permit user to use the natural language to express preference query request, extending SPAROL language to describe bipolar preference conditions, then removing fuzziness by calling linguistic variable. It defines a priority function to optimized results. The output is obtained by making the returned priority as the sequencing parameters, which is the sequence of users' satisfaction.

The rest of the chapter is organized as follows. The second section introduces the theory of bipolar information and preference query. The method of RDF fuzzy query with bipolar preference conditionis proposed in the third Section, which defines a priority function based on preference satisfaction and realizes result sequencing. The experimental system and results are built and analyzed in the fourth section, while the conclusions and further work are found in the final section.