A Semantic Matching Method of E-Government Information Resources Knowledge Fusion Service Driven by User Decisions

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ABSTRACT

This study focuses on the knowledge fusion model of e-government information resources that supports user decision-making information needs, it discusses the user decision-making information needs model, the knowledge fusion service model, and the relationship between them. The inter-layer mapping matching mechanism realizes the ultimate value of knowledge fusion. Therefore, this paper analyses and studies the mapping mechanism between the user information demand model and the knowledge fusion service model. A semantic, similarity-based knowledge fusion service matching method for e-government information resources is proposed to address the problem of lack of semantics in traditional web service matching methods. This method uses the ontology description language OWL-S to map information requirement documents of user decisions and knowledge fusion service function documents into an ontology tree structure. The authors then use this as the basis to calculate the concept similarity and relationship similarity measures, and the service matching based on semantic similarity can be realized.

KEYWORDS

e-Government Information, Knowledge Fusion, Semantic Similarity, Service Matching, User Decision

INTRODUCTION

With the development of e-government and the increase of government information transparency, the amount of information available through e-government is increasing. State administrators release these web-based native digital resources related to economic, social management, and public services. They are authoritative, original, public, time-sensitive, and shared. The real-time dynamics of government work that characterize them enhance their important role in promoting social development and

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economic growth. As an important basis for user decision-making, they involve such materials as government documents, government bulletins, work reports, meeting minutes, and plans. They are the actual record of the government's online activities, an increasingly important basis for decision-making for the public, business units, research institutions, and government departments (Huang, 2017). However, because of the hierarchical nature of government organs and the different subordination and division of labor of administrative organs, e-government information shows the effects of hierarchy, regionality, and fragmentation. These massive isolated, scattered fragments of information often create obstacles for the public to access effective and useful information, hampering its use of e-government information. In short, coping with the rapid increase in information and users' complex and diverse information needs has become a fresh problem facing e-government implementation. The massive amount of government information keeps most users from finding it accurately or even expressing their genuine needs in a standardized way, with a dramatic increase in government information on the one hand and difficult-to-meet user needs on the other. This contradiction has become a major bottleneck in managing e-government information resources, directly affecting the current construction of 'digital government'. Therefore, an urgent need exists for a new service model that can automatically organize and adjust information and services according to their characteristics.

A single information object cannot reflect knowledge. The expectation for information that user decision-making requires is for high-quality, refined, and validated knowledge objects, rarely readily available and single-sourced. Fusing multiple sources of information from different perspectives to observe, compare and understand the same user decision-making problem results in users obtaining what they need. The multi-source feature of e-government information resources determines it has more dimensions at the information-service level. Thus, providing information services requires fusing the vastly distributed resources in different dimensions to get knowledge objects that meet users' decision-making needs. A suitable solution lies in knowledge fusion, by which information from multiple sources becomes new knowledge objects that provide users with more accurate knowledge services and help them make correct decisions more efficiently (Smirnov & Levashova, 2019). Knowledge fusion is a new concept based on and advancing information fusion (Dong et al., 2014). It enables accurate and intelligent analysis and extraction from massive, isolated, and scattered e-government information resources based on such semantic technologies as the Semantic Web, Linked Data, and domain ontologies. It processes, manipulates, and utilizes information from a machine-understanding perspective to reveal, share, correlate, and discover knowledge units. User decision-making requires complete and accurate information. Also, it can realize knowledge services at the knowledge level, which benefits the realization of such functions as accurate information services and value-added information. It improves the efficient retrieval and utilization of e-government information resources.

In a user decision-driven knowledge fusion service for e-government information resources, the key problem is achieving a semantic-level match between the user query and the description text of the retrieved government-information resource. The semantic knowledge-retrieval method that e-government information retrieval currently uses still suffers from the following deficiencies (Maree, 2021): (1) it cannot truly express user needs; (2) accurately describing the retrieval problem is difficult; (3) it does not accurately match the retrieval results; (4) the concept includes lexical silos; (5) the number of retrieval results is too huge. These problems exist mainly because traditional semantic knowledge retrieval algorithms lack a systematic understanding and organization of user information needs and retrieved information. One of the best ways to solve the problem emerges from realizing the knowledge fusion of massive government information resources. Representing both the user retrieval problem and the retrieved information resource knowledge object as semantic information, formal knowledge that the computer can understand enables judging the extent of the match between them using rigorous logical reasoning and algorithms. Calculating the similarity between the user query question and the knowledge object description text enables ranking the candidate's knowledge object resources by similarity value, after which the user receives the top-ranked resources (Xu & Wang, 2017). The ontology has a normalized concept expression and knowledge system, so it can provide

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