Knowledge Base of Research Methods of LIS Academic Papers: Tentative Construction and Experimental Application

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ABSTRACT

This paper aims to better understand the semantic functions of the research methods used in academic papers in the field of library and information science, and to provide users with fine-grained knowledge services based on knowledge units. Firstly, guided by the genre theory, it analyzes the knowledge unit composition of some important research methods, such as citation analysis method, field research method, co-word analysis method, experimental method, comparative analysis method and questionnaire survey method. Secondly, it uses the text analysis method to filter out academic papers using the above six research methods in 18 CSSCI-indexed LIS journals, and carries out a deep indexing of the knowledge units, and makes them act as the corpus of knowledge base. Thirdly, it uses the system design method to construct a multifunctional knowledge base of research methods, with Python's DjangoRestFramework as its framework, and adopts such technologies as front-end html, CSS, Vue and MySQL. Finally, 30 postgraduate students were recruited to use the knowledge base, so as to evaluate its usability and convenience. The results show that the genre analysis can indicate the semantic function of the papers better by using a certain kind of research method, explain the semantic features of the various parts of the research method, and provide a basis for the indexing of knowledge units. It also provides users with a fine-grained retrieval point based on knowledge units. Besides, the knowledge base has good usability. This paper reveals the semantic features of each part of the use of the research methods. The knowledge base of research methods based on the composition of knowledge units can help users to grasp such research methods and provide a deep semantic indexing for the details of research methods in academic papers. It not only lays a foundation for the development of ontology, but also provides users with a fine-grained, multi-dimensional retrieval method for the details of the research methods. Such could be significant for researches on knowledge discovery and knowledge organization.

KEYWORDS

academic paper; research method; knowledge base; knowledge unit; usability evaluation

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1 INTRODUCTION

It is of great significance to understand the components and structure of research methods in academic papers. To reveal the author's writing intention, rhetorical structure and other semantic features and analyze and identify content components from the perspective of linguistics is helpful to realize the deep knowledge organization and resource aggregation. The content of research methods in academic papers has a complex structure, and the semantic attributes of research methods in academic papers can be described and accurately expressed in a standard manner, which is the basis for in-depth semantic indexing, knowledge mining and knowledge discovery in academic papers. Academic knowledge units has caused wide concern of study. The existing research mostly focus on the research method as part of the overall structure. While the research methods have their own semantic function structure on the expression of the ideal, the existing research, to some extent, limits the academic research method to automatically extract the important information and knowledge discovery.

2 RESEARCH METHOD

Based on genre theory, 6 research methods, including citation analysis method, field research method, co-word analysis method, experimental method, comparative analysis method and questionnaire survey method, were selected as the research object to analyze the knowledge unit composition of each method. Secondly, academic papers using the above six research methods were selected from 18 journals in CSSCI mapping field by text analysis method, and the depth index of knowledge unit level was carried out as corpus for knowledge base construction. Thirdly, the sys-

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tem design method is adopted, and the DjangoRestFramework of Python, front-end HTML, CSS, Vue framework and mysql database are used to develop the academic paper research method learning system with four functions. Finally, the experiment method was adopted to recruit 30 graduate students to use the system, and the usability evaluation method was used to verify the usability of the knowledge base according to the user experience.

3 THE CONSTRUCTION OF KNOWLEDGE UNITS OF RESEARCH METHODS USED IN LIS PAPERS

Based on IMRD modeland genre theory[1], the construction of knowledge units of research methods were analyzed, including citation analysis method, field research method, co-word analysis method, experimental method, comparative analysis method and questionnaire survey method.

Table 1 shows the knowledge units of the citation analysis method.

The knowledge base corpus were academic papers selected from 18 CSSCI core journals in the field of LIS. Advanced retrieval functions were used for finding the academic papers using the specification research method. In this research, there are 39 papers using citation analysis, 54 papers using field research method, 109 papers using co-word analysis method, 81 papers using experimental method, 54 papers using comparative analysis method and 89 papers using questionnaire survey method. All of the papers' research methods were tagged according to the knowledge units analyzed.

Table 1: The Knowledge Unit Analysis Of Citation Analysis

Moves	Steps
Move 1: Basic information	Step 1: external feature information of literature
Move 2: research purpose	Step 1: the purpose of citation analysis
Move 3: data sources	Step 1: retrieval method
	Step 2: data volume
	Step 3: time span
	Step 4: citation tools
Move 4: statistical data	Step 1: Statistical object criteria
	Step 2: Description of statistical data
	Step 3: Statistical tools
Move 5: Citation distribution analysis	Step 1: Identify the type of measure objects
	Step 2: Determine the interval of the measure objects
	Step 3: Statistics the frequency of measurement objects
	Step 4: Interpretation of results
Move 6: Self-citation analysis of cited literature	Step 1: Identify measurement objects
	Step 2: Analyze the interval of the measure objects
	Step 3: Statistics the frequency of measurement objects
	Step 4: Interpretation of results
Move 7: Citation network analysis	Step 1: Identify network analysis objects
	Step 2: Establish coupling or co-citation frequency matrix
	Step 3: Data standardization
	Step 4: Citation network analysis tool
	Step 5: Interpretation of results

4 FUNCTIONS OF TARGET SYSTEM

The construction of knowledge base Web system should be based on the requirement users need to learn and master a research method more easily and quickly. There are three steps for users to learn a research method: firstly, to clarify the research method of learning; secondly, acquire the study materials of research methods; finally, study and practice research methods.

Basically, five functions were designed as follows:

- Knowledge units of each research method (Fig 1). For each research method, their knowledge units were displayed in detail, and users can use this function to systematically learn the research method, so as to achieve the goal of mastering the method.
- Cases of academic paper using the research method. Cases of academic papers using certain research method were stored with specific tagging and displayed in details, and users can search by title, journal, subjects, time, etc.
- Search for papers. Users can search for papers directly according to the attributes of the academic papers, including the title, subject, keywords, journal, etc. There is no restriction on the research method, and all the papers in the database could be potential objects that matched the queries.
- Preview of keyword-method. Users can firstly search the subjects to be studied according to this function, in order to preview kinds of research methods that had been used for a certain research topic. And then they can learn a certain research methods following the preview.
- Presentation of papers details. Knowledge units of research methods, the title, and the source journal were displayed, navigating users to learn how each knowledge unit of the research method was used in the academic paper.

Figure 1: Knowledge Units Of Each Research Method

5 USABILITY EVALUATION OF THE KNOWLEDGE BASE

30 graduates of LIS were recruited to test the usability of the knowledge base of research methods of LIS academic papers. Each of them read the functional introduction and operation guidance of the knowledge base, then used the each of its four functions, and evaluated the usability based on user experience. Usability evaluation items is designed according to the system availability scale[2], and five-scale is adopted for measurement (Tab 2). Evaluation results shows that the statistical score is

S=84.5, which is higher than the average value of international public information (66.4), indicating that the knowledge base has good usability.

Table 2: Usability Evaluation Scale

Items	Strongly disagree				Strongly agree
	1	2	3	4	5
I am willing to use the research method knowledge base frequently					
I don't think the research methodology repository needs to be that complex					
I think this knowledge base is easy to use					
I felt I needed someone with experience to help me use this knowledge base					
I think the multiple functions of this knowledge base are well integrated					
I think there is too much inconsistency in this knowledge base					
I think most people can learn this knowledge base quickly					
I find this knowledge base cumbersome to use					
I feel confident about using this knowledge base					
I need to learn a lot in order to manipulate this knowledge base					

6 CONCLUSION

Overall, this study reveals the semantic feature of the research method of academic papers based on the knowledge unit analysis. The knowledge base designed according to the knowledge unit of research method in academic papers can effectively help the user to learn the research methods. The research has implication for the ontology semantic indexing of academic research method content, and also provides users with fine grained, multi-dimensional thesis research method content retrieval service, an effective way of academic knowledge discovery and knowledge mining. It is of certain reference significance to the research of knowledge organization oriented to knowledge discovery.

The following research directions include: building the semantic ontology of research methods based on the composition of knowledge units, adding more research methods, enriching the functions of knowledge base, and further studying the connection between user needs and knowledge units of research methods, so as to provide better interaction experience for users.

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