Real-Time Knowledge Map Services on National R&D Data

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***Abstract*—The National Science & Technology Information Service (NTIS) provides knowledge map services with an integrated information of national R&D information and science & technology information. In order to solve the request of the users in real time, this paper presents a real-time knowledge map service that retrieves and aggregates the needed data and creates the map services on the fly. To select and aggregate the needed information on the fly, we used the slice and dice method, which is one of the most widely used methods in data warehousing and on-line analytical processing (OLAP) approach. In addition, we show some examples of knowledge map services, which analyze and visualize the status and the topic-trend of the national R&D information based on the real-time data selection and aggregation.**

Knowledge Map; Map Service; NDSL-NTIS; Real-Time Analysis ; Slice and Dice

I. INTRODUCTION

Knowledge maps can be divided into two types: one is a knowledge map used in the area of knowledge management to store, manage and process the organizations' data as knowledge, the other is a knowledge map for analyzing and representing knowledge extracted from the science & technology documents. The knowledge map in the knowledge management area is focused on designing and structuring the organizations' internal knowledge and processes to enhance the knowledge management and business processes [1]. On the other hand, the main purpose of the knowledge map in the science & technology area is to represent the science & technology knowledge by allowing users to navigate the knowledge [2] the same way a general map allows users to browse and navigate a region and an area in the map. In this research, we focus on the knowledge map of representing the science & technology knowledge as our goal is to integrate the R&D data and to assist users to browse and navigate the R&D data in terms of such knowledge-based approach.

National Science & Technology Information Service (NTIS) [3] provides such knowledge map services with an integrated information of national R&D information and science & technology information obtained from NTIS and National Digital Science Library (NDSL) [4]. In this research, a real-time knowledge map service, which selects and aggregates a part of knowledge map data and creates the knowledge map services on the fly, is introduced.

II. KNOWLEDGE BASED KNOWLEDGE MAP SERVICE

In this section, the knowledge-map service system in NTIS is introduced. As shown in Figure 1, the NDSL-NTIS Knowledge base is created based on a national R&D ontology for integrating the national R&D data, such as research projects, research papers, patent, and project reports. The system has as goals 1) to integrate the national R&D data obtained from NDSL and NTIS, which are two major repositories and service of national R&D data servicing in Korea, 2) to provide a topic-based information search on the integrated data, and 3) to provide knowledge map services based on the analysis and knowledge processing.

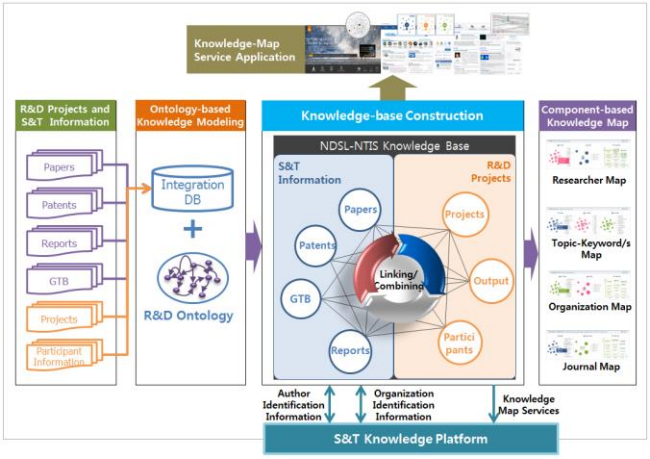

Figure 1. Overall System Architecture

III. REAL-TIME KNOWLEDGE MAP SERVICES

As described in Figure 2, users can select (Slice) a part of knowledge map data using a filtering-based search. Then, the part of the data are selected (Dice) and aggregated into a knowledge map on the fly applying the slice and dice method, which is one of the widely used methods in on-line analytical processing (OLAP) approach [5]. Lastly, the knowledge map services, such as R&D output analysis and trend analysis map services could be created based on the

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aggregated data in real time using ‘d3’ Java script Library for visualized graph.

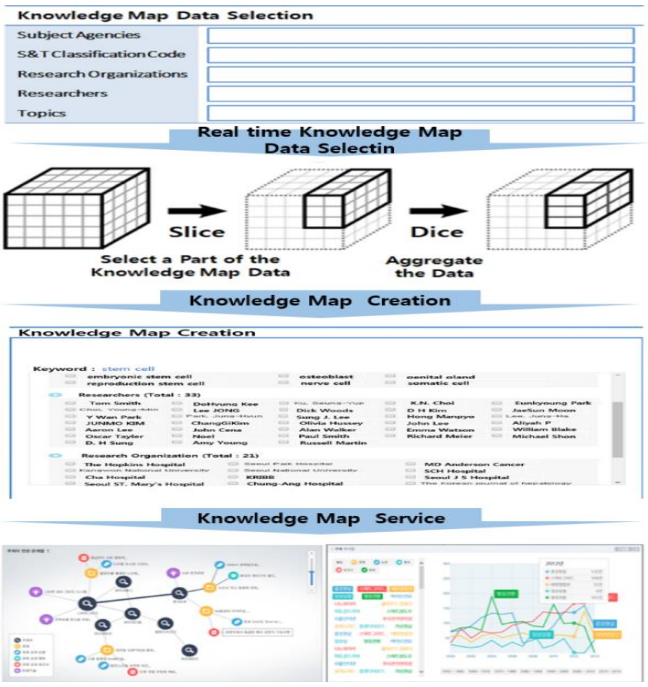

Figure 2. Real-Time Knowledge Map Creation

A. *Real-Time R&D Output Analysis Map Service*

Figure 3 shows a real-time R&D output analysis map service. Basically, the national R&D project data is filtered and retrieved from the filtering-based search. Then, the project data is firstly clustered based on the topics, and the clustered data is aggregated with the number of the related R&D projects and the total amount invested for the R&D projects. Lastly, top N topics are selected based on the number and the amount of the related R&D projects. Based on the selection and aggregation, the R&D output analysis map service is created with the selected topics and their related R&D output data.

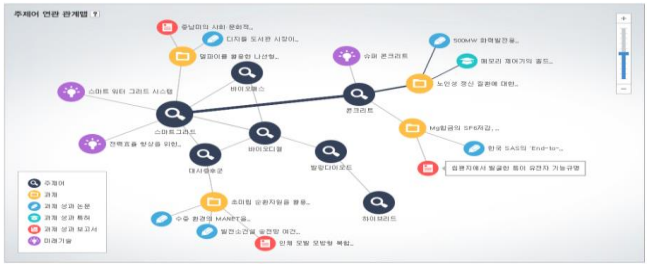

Figure 3. Real-Time R&D Output Analysis Map Service

B. *Real-Time R&D Trend Analysis Map Service*

Figure 4 shows a real-time R&D trend analysis map service. As similar with the R&D output analysis map service, the R&D project data is selected and filtered by users and the data is aggregated based on the topics. The aggregation can be done in two ways: the first is aggregating by the number of R&D output data, and the second is aggregating by the total amount of R&D investment. In addition, the aggregation can be performed by the number of each R&D output data at the user’s request. After the aggregation is done, the R&D trend graph is created with the aggregation by year.

Figure 4. Real-Time R&D Trend Analysis Map Service

Ⅳ. CONCLUSIONS

In this paper, we introduced the real-time knowledge map services, which select and aggregate the knowledge map data and create the knowledge map service upon the user request. To select and aggregate the knowledge map data, the slice and dice method is used. We also introduced the examples of the knowledge map services, which represent and visualize the knowledge map data in the form of network and graph. In future research, we will elaborate on the keyword focused processing methods to minimize user interaction for the knowledge map construction.

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