Semantic Data Model and Service for Supporting Intelligent Legislation Establishment

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Abstract. This paper describes a system which is an intelligent legisltive system developed by Ministry of Justice in Republic of Korea (MOJ) and Korea Institute of Science and Technology Information (KISTI). The system(iLaw) with semantic technologies-based platfoms which is from gathering information to newly introducing 4 new services (international legislation information map service, dynamic paper information tracking service, related term-based associated legislation information service, and realtime Japanese-Korean translation service) is not for just legislation portal service including diverse legislative information but for more semantic legislation service. These new semantic services are also applied to mobile iLaw service based on smart mobile platform. We expect that iLaw service can contribute to high-quality legislation establishment and high-level user's understandability and usability continuously.

Keywords: intelligent legislation system, semantic data model, semantic service

1 Introduction

As the amount of legislation information, has been increased exponentially, it makes us more difficult to retrieve legislation information precisely [1-4]. What is worse, even experts about legislation information even spend much more time and efforts to get exact legislation information which they need.

For overcoming above limitations, many legal information system provides related service such as LawnB, LawMarket, FindLaw, etc [5-10]. Korean Minstry of Justice (MOJ Korea) [11] and Korea Institute of Science and Information Technology (KISTI) [12] also have developed intelligent legislative system(as it is named "iLaw") with semantic web technologies. In phase I (2007~2008), the project was concentrated on verifying the feasibility of an intelligent legislative system by using OntoFrame which was an ontology-based service platform. In phase II (2009~2010), the project focused on developing more practical services to accept various demands from real users[13,14].The main purposes of iLaw system are as follows.

- ✓ To improve legislative process more efficiently through an intelligent legal information system Intelligent semantic search system regarding legislation information

(To search international legal information with semantic technology
(To develop an intelligent system which can infer or extract the specific information from vast legal information

Law, turning into public service from July 2011, was recently amended in order to accept user's need concerning various legislation information resources such as domestic and foreign ordinances, legislation cases, academic papers, civil complaints, and administration literatures.

In this paper, we introduce a system which is wholly new in providing enhanced intelligent services based on semantic data modeling. The suggested system has 4 new semantic services international legislation information map service, dynamic paper information tracking service, related term-based associated legislation information service, and real-time Japanese-Korean translation service. By newly adopted 4 semantic services, the system can support more high-leveled intelligent service and maximize user's semantic service experience and understandability with various kinds of legal information.

Fig. 1 iLaw Main page

2 Semantic Data Model

For the complete semantic service regarding legislation information, we construct ontology-based semantic model. This ontology includes not only law information such as legislations, precedents, and civil compliants but also academic information such as legislation papers and literatures.

Ontology design for legislation information is based on OWL DL and we build up the ontology by using Protege [15, 16]. Fig. 2 shows our ontology model for legislation information. This model contains 14 classes: Literature, Legislation, Precedent, Paper, Civil Compliaint, PublisherInfo, Author, Department, Institute, Topic, TopicRelation, PublicationInfo, ConferenceInfo, and JournalInfo. The

Literature class has 4 subclasses: Legislation, Precedent, Paper, and Civil Complaint. Each paper has title, abstract, date, and filename instance and has relationship with topic, publisher information, and publication information classes.
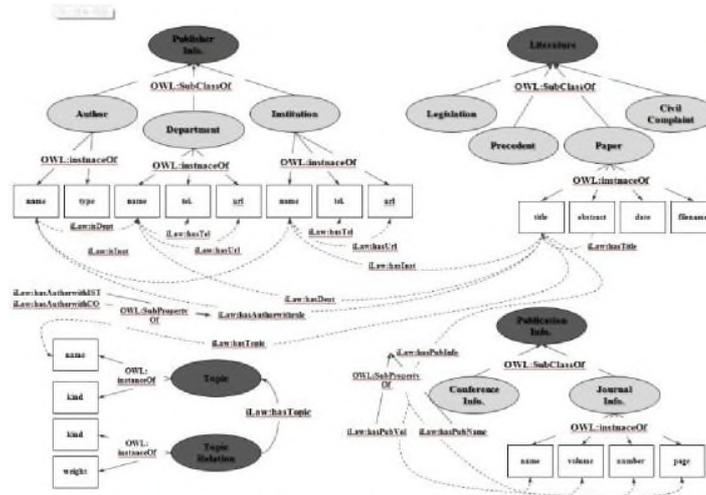

Fig. 2 Semantic Data Model in Suggested Service

3 Intelligent Semantic Legislation Service

In the suggested System, we design 4 new semantic services. Conventional iLaw supported some low-leveled intelligent services and simply searching legal information like a search-engine portal. However, low-leveled intelligent services and simple searching legal information didn't touch users and they asked us to introduce higher leveled services into iLaw.Therefore, we need more intelligent service for satisfying with diverse needs of useres.

Fig. 3 Role of Intelligent Semantic Services

Fig. 4 International Legislation Information Map Service

The first service is an international legislation information map service. As shown Fig. 4, this service compares similarity of legislation information in various country such as US, Japan, UK, France, Germany, and EU. In the first step of this service, iLaw automatically extracts 10 related terms from Korean Law by pre-established logics which are consists of relationship to user's keyword, value of Topic class, and co-occurrence analysis. In second step, the terms are translated into 6 languages and translated terms are used for checking whether those are or not in 6 national legislations. If a related term is in some national legislation, iLaw gives the term 1 score. After gathering all scores, iLaw shows International legislation Map and we can get specific information that some national legislation is similar to us within user's keyword field.

Fig. 5 Dynamic Paper Information Tracking Service

The second intelligent service is a dynamic paper information tracking service as Fig 5. This service is based on the semantic data model and uses relationship between Paper class and Author class / Paper class and Department or Institute class. The relationship between Paper class and Author class is represented by 'hasAuthorwithRole' property. The 'hasAuthorwithRole' property has a 'hasAuthorwith1ST' subproperty and 'hasAuthorwithCO' subproperty. Given keyword, first we search paper lists which include the given keyword in title or abstract. Then we track information based on relationships such as 'hasAuthorwith1ST', 'hasAuthorwithCO', and 'hasDept'/ 'hasInst' in the semantic data model. By this service, we can acquire information about all related paper panoptically based on author and institution information.

The third intelligent service is a related term-based associated legislation information service as Fig. 6. This service shows n:m mapping information among legislation information and related term lists. Basically, we extract related terms to the given keyword through value of Topic class and co-occurance analysis. In the multi-layered service included in conventional iLaw service, the service represents related term lists for each literature such as legislation, precedent, civil compliant, and paper. This service provides not only related term list to the given keyword but also the reason why the related term is extracted and which legislation is related to the extracted related term. That is, we can get not only legislation information as search result of the given keyword but also legislation information about related term lists comprehensively.

Fig. 6 Related Term-based Associated Legislation Service

The last intelligent service is a real-time Japanese-Korean translation service Fig 7. The Suggested System service include legislation and precedent information of Japan, Germany, France, US, UK, and EU. In addition, Suggested System service provides international search result for a given keyword. Therefore, translation function of search result is very important in this system. Firstly, we apply Japanese-Korean translation service to Suggested System service. As shown in Fig 7, search results

about Japanese legislation are represented in Japanese and also translated in Korean. Detailed search result is also illustrated in Japanese and Korean simultaneously.

Fig. 7 Real-time Japanese-Korean Translation Service

4. Conclusion

In this paper, we introduced newly implemented intelligent services in Suggested System service: international legislation information map service, dynamic paper information tracking service, related term-based associated legislation information service, and real-time Japanese-Korean translation service. By these services, we can retrieve comprehensive information from various kinds of legislation information.

For future works, we will define the semantic data model in more detail for more intelligent and semantic services. In addition, we will add translation modules for other languages such as French, German.

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