International Semantic Mapping of Copyright Law
A Conceptualization Supporting System with Capability of "Intention" and Ontology

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ABSTRACT

The copyright issue is very important in education industry all along. Especially while coming into contact with global sharing of educational resources, mutual well-understood of the copyright laws is worthy of attention. However, there is a lack of systemic knowledge management methodology for the issue; closely connected to this problem is that most of intelligent laws systems are undesirable and ineffective for international semantic mapping of laws knowledge. Hence, this research aims to design a conceptualization supporting system with the capability of "Intention" and ontology for searching and mapping laws from different nations based on senamtic component of law.

We focus on the intention behind the different copyright laws because the semantic similarity among the laws can be well recognized based on the intention, and we propose a "*I*ntention *O*riented " *M*odel ("*IOM*"). The value of "intention-oriented" prespective is obviously not noly in formulating intention behind the law, but also in providing a uniform criterion for integrating laws component from different national laws. The capability of *IOM* makes this system to take on verifiable reasoning.

Meanwhile, we adopt ontological engineering approach for appropriately representing among different national laws and international treaties. Ontology clarifies systematic semantics of the vocabulary with which queries and assertions are exchanged among agents. The capability of ontology is provide "subclass-link" to identify concept subsumption relationship, which facilitates this system flexible matching. Moreover, in this research the copyright law ontology provides well-organized concept to clarify the commonality and the difference among different national laws and internatioanal treaties.

Keywords: conceptualization supporting system, intention-oriented, copyright right ontology, semantic mapping

1. INTRODUCTION

The educational resources sharing takes on an inevitable tendency to globalization, especially regarding the university-level e-Learning contents. However there is a lack of the awareness about the copyright issue in e-Learning development; closely connected to this problem is a lack of systemically knowledge of different national law related to e-Learning development and effective management. In this study, we aim to develop a conceptualization supporting system that takes a model of "law-intention" as its principal axis. We call it "intention-oriented" model, which is expected to support the faculty and administrator worldwide who are collecting, creating and delivering learning resources in the course of the e-Learning development.

We have been adopting ontological engineering technique to establish shared understanding about the model of the "intention-oriented" different national legal knowledge for education, especially for e-Learning development, which facilitates to search and map the relevant laws, statutes, international conventions and to catch the updating of them. We claim that such the conceptualization supporting system is desirable and feasible, because ontology clarifies systematic semantics of the vocabulary with which queries and assertions are exchanged among agents [1]. Motivation for using ontologies can be applied to the domain of law: the inter-relation of the law makes it a natural area for the knowledge sharing; the importance of legal decision argue for a high level of verification; the rate of change of law argues for readily maintainable system [2], [3].

There have been two parallel lines of research in ontological engineering and law, and the roles and importance of ontologies has in recent years been a recurring topic on the development of models of the legal domain [4]. These fruitful researches include the McCarty's LLD (1989), Stamper's NORMA (1991), Valente's functional ontology (1995), Van Kralingen and Visser's frame-based ontology (1995) and so on. However, just as [5] argues that most of these research finding are no agreement on the level of the detail an ontology should be specified at and assessing the

adequacy or suitability of an ontology can only be done given the purpose the ontology is created for.

The goal of our research is develop a conceptualization supporting system to provide international semantic mapping of copyright law and then identify the validity and legality of various behaviors related to education, which includes the commonality and the difference. The communities our copyright ontology is created for are mainly teaching staff, including the educator, pedagogue and educational administrator, and a part of educatees and all parties who are related to education. We focus on the intention behind the law to capture the essential meaning of law and design a conceptual framework of copyright laws from different national law resources.

Next we present the conceptualization supporting system, then describe the capablity of "*I*ntention *O*riented *M*odel" and ontology respectively in section 3 and 4. At the end of paper, we draw a brief conclusion and show future work.

2. CONCEPTUALIZATION SUPPORTING SYSTEM

This research aims to design a conceptualization supporting system with *IOM*, which is the storage of copyright laws rooted in both different nations and international treaties related to education field. We have been adopting ontological engineering approach for appropriately representing primitive concept, which makes the system powerfulness of flexible matching. At the same time, we focus on the intention behind the law for capturing the essential meaning of law, which makes the system powerfulness of verifiable reasoning.

2.1. The structure of conceptualization supporting system

In conceptualization supporting system, the copyright laws knowledge derived from different nations are visualized and systemized at the conceptual level from the "intention-oriented" viewpoint. The analysis consultation process is supported to include three typical tasks:

- Controlling law choice;
- Classification elements match;
- Behaviour direction.

An overview of this system with *IOM* is shown in figure1. Basically, *IOM* provides copyright law ontology for semantically organizing laws document repository rooted in different national laws and international treaties. The meaning of primitive concepts that may appear in *IOM* is systematically specified by ontology. The system provides the following two basic support functions to its end users:

- Intention-oriented retrieval of laws: It provides the laws relevant to the users' question, based on semantic matching between users' question and *IOM*.
- Guidance information generation: It helps clarify the users' problems by modeling user's situation and suggests the typical procedure to solve them by providing copyright law information. Ontology and *IOM* lay the conceptualization framework for modeling the users' problems and provides semantic tags for finding the law information relevant to solving the problem.

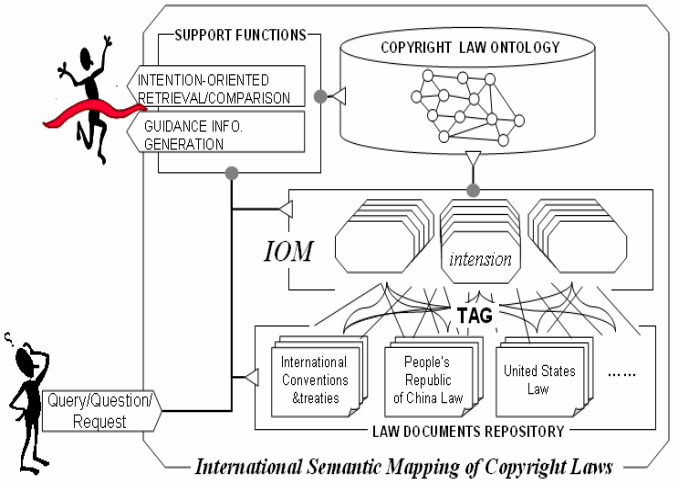


Figure 1 An overview of conceptualization supporting system with *IOM*

2.2. The laws resources repository

To fulfill the goal, we choose a prototype set of the copyright laws relevant to education. It mainly includes following law documents so far:

International conventions/treaties:

- Berne Convention;
- WIPO Copyright Treaty;
- WIPO Performances and Phonograms Treaty;
- GATT/Trade-Related Aspects of Intellectual Property Rights (TRIPs) Agreement;

United States:

- U.S. Copyright Law;
- Digital Millennium Copyright Act;
- Technology, Education and Copyright Harmonization ("TEACH") Act

Japan:

- Copyright law of Japan

People's Republic of China:

- Copyright law of the People's Republic of China;
- Regulations for the Implementation of International Copyright Treaties

Since the requirement of consistence, English translation version is just considered as standard text files instead of each native language representation.

3. *I*NTENTION *O*RIENTED *M*ODEL (*IOM*)

3.1. Motivations

In the traditional intellectual property right field, there exist many similar regulations of rights exemption to education industry in most national laws. Especially in copyright, which is one kind of intellectual property right, principles have been developed to balance the exclusive controls given to copyright holders against the broader interests of society [6]. For instance, the "fair use" doctrine plays an important role for long time to entitle the education field with exemption of right. However, with the e-University or e-Learning programs arise and develop rapidly, traditional education character, nonprofit-making, is step by step fading. The copyright issue gets more complex in e-Learning environment. Most of the latest developments in copyright law are a direct response to changing educational needs and innovative technologies [7]. On the other hand, the academic intercommunication becomes increasingly frequent and connection increasingly close all over the world. Most of the teaching staff do not expert at the domestic law, say nothing of foreign law or the international conventions. To refer the relevant law document or consult with one law expert is process both time-consuming and labor intensive, which is doubtless a bottleneck of valid educational activities and rapid education development. Moreover due to a lack of methodology for systematic orgagnazation and effective search law component, most of the law systems hardly provide the semantical information on the mapping among different national laws. Hence, we address that modeling "intention-oriented" is a key principle of establishing mutual understanding on the copyright laws among different nations.

3.2. The capability of *IOM*

The intention is modeled from the following two viewpoints:

- To characterize the copyright law based on jurisprudence theory

  We denote the legal knowledge provided by this intellectual system should be utilized as general background information. Copyright regimes thus have a long history in international terms and in the domestic laws and practices [8]. As what we have awakened, although different counties and international organizations have different laws, statutes, regulations or conventions, they implicate the similar tenet and similar standpoint for copyright protection, such as the "fair use" tenet and "first sale" tenet. These tenets are key points to distinguish potential intention behind the law relevant to certain special scenarios. Based on "intention-oriented" model we can set out some of the functional and common features of national copyright regime, especially compared to some issues relevant to e-learning contents.

- To capture essential meaning of law with a systematic primitive concept which represents commonality and difference of different national laws

  There are many other ways of searching and organizing the law articles, such as based on the corresponding objects of cases or the main behaviors in situations. However, the terms of representing objects and behaviors are used heavily depending on the culture or custom in each nation. So it is quite hard to express the essential meaning of law with such terms. We need more primitive concept to represent the essential meaning of law, and we call it "intention". The "intention-oriented" is a robust approach for formulating intention behind the law. We'll present a detailed example of *IOM* in next section to illustrate how to seek and map intention behind the law using common concept defined in ontology.

Suppose that there have two details of law items describing the legal behaviors, which are rooted in the Chinese Law and Japan Law respectively. And two items both claim a kind of prohibiting dictate in similar situation. The law knowledge system hardly matches the domain-specific terms in documents between Chinese Law and Japan Law for diverse expression in different countries. However, we have noted that the same intention existing behind of two items, that is "prohibit", which can be extracted as the abstraction sharing component for matching and connecting different domain terms in two items. The system facilitates the procedure of searching and locating related to "prohibit" intention items depending upon such "intention-oriented" model, and then provides relatively more exact information acquisition for meeting users'

requirements. The intention-oriented approach has an advantage in touching and integrating different forms of documents of different national law into one framework.

Indeed, the value of "intention-oriented" prespective is obviously not only in formulating intention behind the law, but also in providing a uniform criterion for integratating laws component from different national laws. Based on law knowledge of *IOM*, each user's case can be reasoned and provided the appropriate articles for user's need. This capability makes conceptualization supporting system to take on verifiable reasoning.

3.3. The features of *IOM*

IOM as an instrument applied in special e-Learning environment is much pertinence for education field. *IOM* is composed by two layers. One is the knowledge layer for copyright conceptual and relation framework, which is document layer; the other is the philosophy layer for the clarification of principle and standard of ownership of copyright, which is intention layer. The detail will be discussion in section 3.4 based on a real legal example. In the following the overall features of model are presented:

- Efficient combination of abstract legalization principle and controlled law
  IOM divides legal knowledge over two distinct entities: abstract principle and concrete contents. For each of these entities the ontology defines a frame structure that lists all attributes relevant for the entity. We argue that this model should describe the environment of e-Learning course that is being regulated and delineates the possible behavior of (people, and institutions) in this environment and thereby it provides a framework to define what behavior ought (and ought not) to be performed in different national intellectual exchange.

- Operational and extensible
  The model should be represented declaratively in order for the system to update and interpret [9]. We try to make this intellectual model operational, which provides mechanisms to solve inconsistency between instances of copyright knowledge in e-Learning. At the meantime, it also is extensible, which is aligned with the trend of the incessant law amendment process.

3.4. An illustration

In this section, a more detailed example of *IOM* is proposed in order to illustrate how to seek and map the intention behind of the article, and then extract the common concept as primitive node in ontology based on such intention obtained. In figure 2, here is shown two legal articles partially derived from the current copyright law of People's Republic of China [10]. As stated above, consider that the diversity of language of the law among multination, we just refer to the English translation as the resource documents.

Article 45 (CN)

Anyone who commits any of the following acts of infringement shall bear civil liability for such remedies as ceasing the infringing act, eliminating its ill effects, making a public apology or paying compensation or damages, etc., depending on the circumstances:

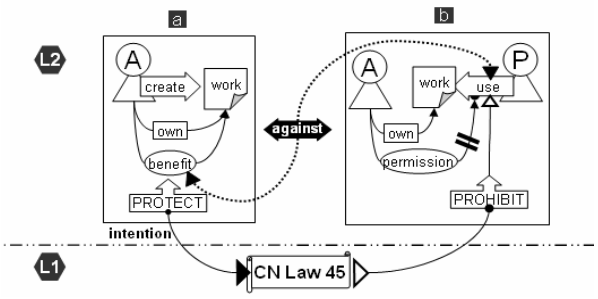
(1) publishing a work without the permission of the copyright owner;
.....
(6) exploiting a work by ....., adaptation, translation, annotation, and compilation, or by other means, without the permission of the copyright owner, unless otherwise provided in this Law;
(7) exploiting a work created by others without paying remuneration as prescribed by regulations;
.....

Article 22 (CN)

In the following cases, a work may be used without permission from, and without payment of remuneration to, the copyright owner, provided that the name of the author and the title of the work shall be indicated and the other rights enjoyed by the copyright owner by virtue of this law shall not be prejudiced:
.....
(6) translation or reproduction in a small quantity of copies, of a published work for use by teachers or scientific researchers, in classroom teaching or scientific research, provided that the translation or reproduction shall not be published or distributed;
.....

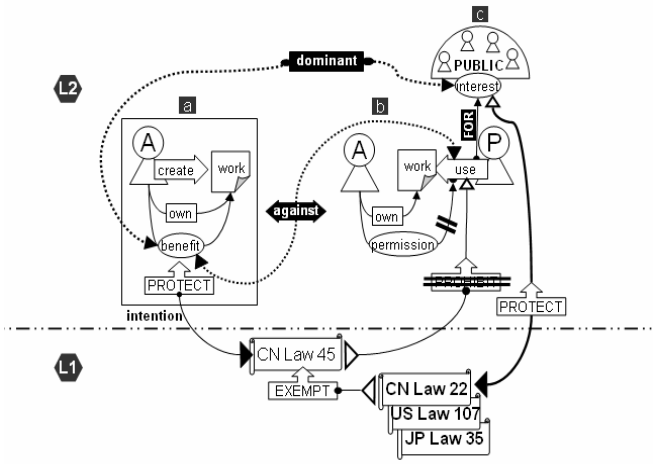
Article 45 claims the legal liability of infringement; Article 22 states the limitation of right.
Figure 2 Real legal articles derived from CN

We choose two legal articles (22 & 45) from the current copyright law of China. Article 45 represents a legal claim that anyone cannot perform activities like "publish" or "exploit" other's work without owners' permission or payment to them, otherwise he/she should bear the corresponding legal liability. Article 22 exempts article 45, where the users can "exploit" other's work without permission in teaching and scientific research. Indeed this meaning is identical to the limitation of the owner' right. It is very obvious distinct standpoints between two articles.



"*L1*" stands for document layer, "*L2*" for intention layer; "*a*" for owner' situation, "*b*" for user' situation.
Figure 3 *IOM* of CN Law 45

We can catch the core intention of article 45 in figure 1. The figure 1 is divided into two layers. Layer 1 L1 is the document layer which includes most appropriate laws relevant to e-Learning. Layer 2 L2 is core of the model, the intention layer. It is composed of part "a" (owner's situation) and part "b" (general user's situation). If the person uses copyrighted work without owners' permission, his/her use would infringe against the owner's benefit. The intention of this article is "protect" the copyright owner's right for his/her creation and "prohibit" the general users use the work for his/her private interest without the owner's permission.



"*c*" stands for public's situation; "*L1*" is infused new copyright laws
Figure 4 *IOM* of interaction between CN Law 45 and CN Law22

Contrast with figure 3, in figure 4 Layer 2 shows the different intention between article 22 and article 45. Because public interest is dominant to the private benefit in article 22, intention here is that public interest should be protected and the use in teaching or scientific research should not be prohibited. As can be seen from the figure 4, intention of "protecting" public interests entirely comes into existence instead of intention of "protecting" the owner individual interest or "prohibiting" the use without permission.

The well-understood of the commonality and the difference among different national law is necessary for end users. In the case noted above, the commonality is more important. In figure 4, we infuse the new articles current copyright laws from United States and Japan in Layer1. Despite of the diversity of literary representation every country in figure 5 [11][12], the uniform intention behind the law can facilitate searching and mapping similar tenet and standpoint of laws. We can identify the similarity by using *IOM*. Article 107 (US) and article 35 (JP) both implicate the intention to protect public interest, which can be matched with the article 22 (CN) based on the "protect", "public interests" semantic components to search and organize the appropriate domain terms in articles.

Article 107 (US)

Notwithstanding the provisions of sections 106 and 106A, the fair use of a copyrighted work, including such use by reproduction in copies or phonorecords or by any other means specified by that section, for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright.

.....

Article 35 (JP)

(1) A person who is in charge of teaching and those who are taught in a school or other educational (except those institutions established for profit making) may reproduce a work already made public if and to the extent deemed necessary for the purpose of use in the course of lessons, provided that such reproduction does not unreasonably prejudice the interests of the copyright owner in the light of the nature and the purpose of the work as well as the number of copies and the form of reproduction.

.....

Article 107 and article 35 both make a statement of exemption of right
Figure 5 Real legal articles derived from US and JP

4. THE CAPABILITY OF ONTOLOGY

4.1. The capability of ontology

Ontology was taken from philosophy concerned with the study of systematic explanation of being. Ontologies have emerged as an important research area in artificial intelligence from the end of the 20th century. Guarino and Giaretta [13] propose to use the "Ontology" (with capital "o") and "ontology" to refer to the philosophical and knowledge engineering senses respectively. Guarino and Guarino argue that an ontology is a logic theory which gives an explicit, partial accout of a conceptualization. While ontologies are defined as an explicit specification of a conceptualization, following Gruber [14]. Ontologies have been shown to have benefits in a number of areas:

- Knowledge sharing;
- Knowledge reuse;
- Verification and validation;
- Domain theory development;
- Knowledge acquisition.

Many important projects such as CYC [15], KACTUS [16], TOVE [17], SENSUS [18] use ontology for knowledge representation. The knowdge representation ontologies capture the representation primitives used to formalize knowledge under a given knowledge

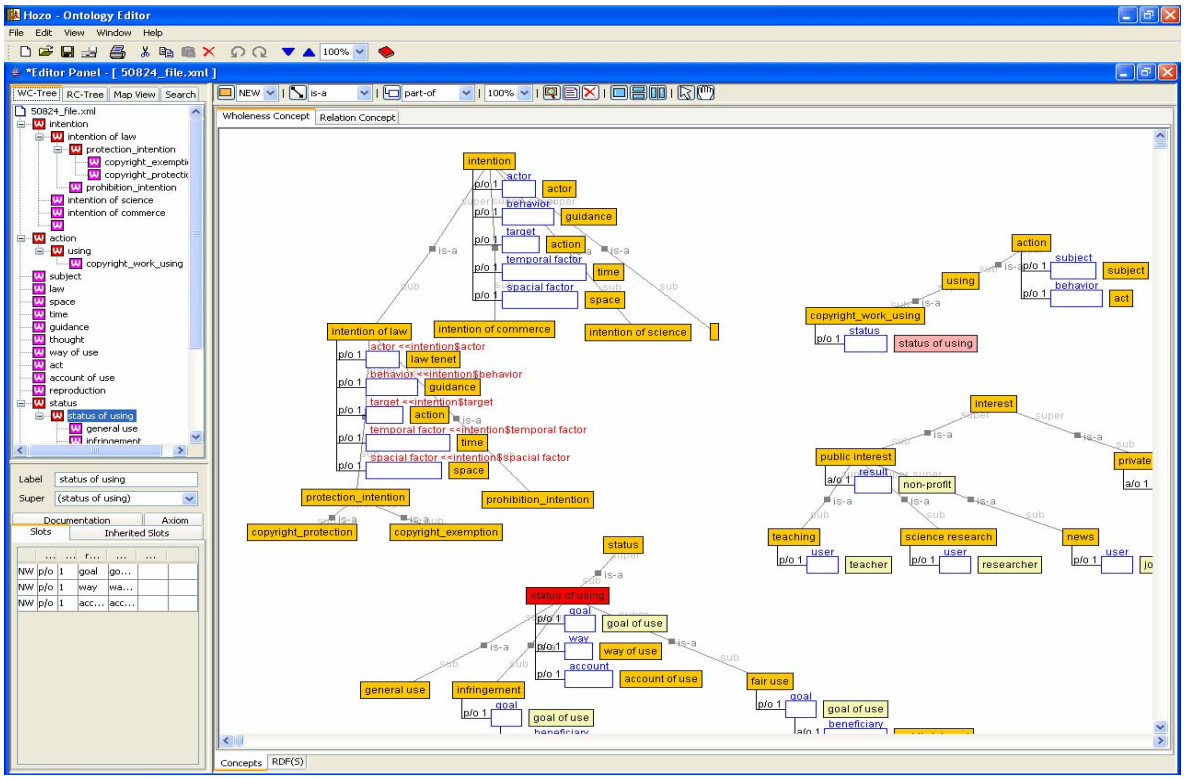


Figure 6 The screenshot of the conceptural framework of copytight law in HOZO

representation paradigm [19]. Just as this important reason, there are such efforts in the legal domain. Ontologies form the foundation of legal knowledge system in knowledge representation. Many outstanding law ontologies have been noted aboved.

This study focus on an international semantic maping of different national laws. The copyright law ontology provides well-organized concept to clarify the features of the commonality and the difference among different national copyright laws. The conceptualization supporting system can map law concept component accorrding to the query of end user based on the meaning of primitive concepts systematically specified by copyright law ontology. The advantage of this ontology is its primal capability of “subclass-link” to identify concept subsumption relationship, which facilitates this system flexible matching.

4.2. HOZO : An ontology editing tool

We use the HOZO [20] for ontology development of concepts and relationship that represent the legal domain and store the copyright knowledge derived from different countries. HOZO is an ontology editing tool based on a frame-based knowledge representation. The ontology and the resulting model are available in different formats, such as Lisp, Text, XML/DTD, DAML+OIL, which make it portable and reusable.

The most important reason why we choose HOZO as editing tool is that it can treat the concept of role clearly. According to Mizoguchi [21], when an ontology is seriously used to model the real world by generating instances and then connecting them, users have to be careful not to confuse the Role such as teacher, mother, fuel, etc. with other basic concepts such as human, water, oil, etc. Three different classes are identified to deal with the concept of role appropriately:

- Role-concept: A concept representing a role dependent on a context;
- Basic concept: A concept which does not need other concepts for being defined;
- Role holder: An entity of a basic concept which is holding the role

Knowledge of legal domain implicates complicate relationship among humans and combines diverse social disciplines, such as ethical, economical, psychological, and philosophical researches. As a result, unambiguous classification and defination are required in the representation of legal knowledge and in the constrution of legal arguments. Using the concept of role in HOZO,

it is quite helpful to clarify intricate legal relationship among legal subjects.

4.3. The conceptual frame in HOZO

After clarifying intention behind the law, the conceptualization should be done. Basically, *IOM* provides a copyright law ontology (result of the conceptualization) for semantically organizing different national law document repository. The meaning of primitive concepts that may appear in *IOM* is systematically specified by ontology. The semantic concept of law and relationship of them could be shown in figure 6. This is a partly conceptural framework of copyright law ontology in HOZO.

We briefly here illustrate the terms such as “intention”, “action”, “status of using”, “fair use” etc. as common concepts mounted on the copyright law ontology. Based on this part of hierarchy the potential relationship among the objects can be clarified. And these domain-dependent terms are often used in an approximate situation based on intention. From an “intention” perspective the complex and dynamic relation of laws can be clarified and as the basic to map and organize the appreciate concepts or terms rooted in different national copyright laws.

5. CONCLUSION

It is quite difficult to search and map the exact article of laws they need for most users in education field because of lacks of systemic knowledge management methodology and intelligent management system. We attempt to design a conceptualization supporting system for international semantic mapping of copyright law.

Legal knowledge can be represented in language ranging from very informal (such as a variety of natural language law texts) to very formal (such as executable law knowledge components). The former is usually well-understood in mind and easy to use for humans; while the latter is computational and facilitates machine handling. The essential part of this research is modeling copyright law by an appropriate method and representing them in well-organized IT framework for certain community sharing and reusing.

This system is initiated with two supporting functions depending on the “intention-oriented model” and copyright law ontology. The intention behind the law can facilitate recognizing the commonality and the difference among different national laws and international organization’s laws. And the capabilities of *IOM* and copyright law ontology make the system efficient for reasoning and matching.

In this paper, firstly we show an overview of conceptualization supporting system, which is expected to take on two primal support functions to its users. The one is intention-oriented retrieval of laws; the other is guidance information generation. And we give a detailed explanation about the “intention-oriented” model (*IOM*) from several perspectives and conceptualization and forming primal copyright ontology with *IOM*. This model will realize the shared and reuse normalization of the copyright law knowledge for e-Learning. Then we illustrate how to represent intention behind the law using common concept defined in ontology with the capability of “intention” and ontology.

To develop conceptualization supporting system is on going work and we hope that *IOM* can take effect in most of intelligent laws system for international semantic mapping, not only limited in for mapping of copyright law. We’ll finally provide this system for end users relevant to e-Learning development, furthermore evaluate and improve it by interviewing domain experts and experienced customers.

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