



ONTOLOGICAL SOLUTION FOR SRI LANKAN LEGAL SYSTEM

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Abstract: - Legal domain is complex as it contains lots of documents like constitution, court cases, parliament acts, ordinances etc. When a need arises to find answers to basic questions, it is required to refer to many legal literatures to find the correct response. This task has become difficult because of the un-structured nature of the legal documents. In this research, solution is provided to find responses to fundamental questions of users. By using Ontology technology, legal documents can be organized in semi-structured and structured formats. When the information is stored in structured or semi-structured format, information can be retrieved fairly easily than un-structured format. This research shows that responses to legal queries can be supplied by using natural language processing, text mining and ontology techniques.

Index Terms — Legal, Law, Ontology, Natural Language Processing, Text Mining.

1. Introduction

Like other countries, Sri Lanka legal domain also consists of lots of documents such as constitution, court cases, incidents, parliament acts and ordinances etc. When there is a simple legal advice required or user needs to query from the knowledge base, user has to refer multiple documents stated above. Since there is large number and different types of documents to refer, it is required a subject matter expert (SME) to verify the content and provide the correct answer to the user. Since the expert knowledge is costly and not available at will in the legal domain, users will find lot of difficulties. Hence, this research was carried out to establish a methodology to retrieve Sri Lankan legal domain content for given questions. Apart from complexities, there are lot of contradictions in the legal domain. For example, in 2005, there was a debate about when to hold Presidential Election in Sri Lanka. Main opposition parties in Sri Lanka argued that it should be held in 2005 taking into account that previous election was held in 1999. However, then government challenged that it should be held in 2006 taking into account that, then president Her Excellency Chandrika Bandaranayaka Kumaranathunga took her oath in 2000 as her second term [Arab News, 2005]. This debate opens the authors' interest about the legal domain in Sri Lanka. Similarly, there are lot of interesting and contradictory cases in Sri Lanka.

First of all, Sri Lankan legal system needs to be analyzed as it is the domain area for this research. Sri

Lankan legal system can be divided into four areas for analyzing purposes depending on the legal areas (Abepala, Y., 2011). They are, The Constitutional Law, Civil Offences & Common Law, Criminal Offences & Law and Commercial & Mercantile Law. Apart from the Roman Dutch law, there are other sub laws which are in practice nowadays. These are Sinhalese Law (Kandyan Law), Buddhist Law, Hindu Law, Tesawalamai Law, Islamic Law, Mukkuvar Law (Coray L.J.M, 2003).

Since legal content is very vast, to verify the possibility of ontological solution for Sri Lankan Legal system, sub section needs to be selected. As constitution law, always is the base for other legal areas, constitution is selected as a sample for this research.

The Constitution of the Democratic Socialist Republic of Sri Lanka has been the constitution of the island nation of Sri Lanka since its original promulgation by the National State Assembly on 7th September 1978. It is Sri Lanka's second republican constitution and its third constitution since the country's independence from Britain (as Ceylon) in 1948. 1978 constitution of Sri Lanka contains twenty-five chapters. As of September 2015, it has been formally amended with nineteen amendments out of which seventeen amendments were passed as 12th amendment was not passed (Jayakar T., 2015).

In this research paper current implementations, Ontology Construction, Question Matching Techniques, Evaluation and Future work are discussed.

2. Current Implementations

There are many other implementations to improve the access of legal documents. Many applications use databases to store information rich capabilities for data storing and retrieving. These are the most useful databases of English law. Several online databases are available for legal domain. Most popular databases are HeinOnline, Justic, Kluwer Arbitration, Lexis and WESTLAW [University of London].

HeinOnline: HeinOnline is a legal database providing a substantial collection of United States and international legal research materials in an online, fully-searchable, image-based format. This means all the images of the documents in PDF format are just as they appear in the original print [Westlaw]. HeinOnline provides subscribed users options of searching for different parameters such as dates, type etc. It provides the option of searching for text or phrase for content or title or author or state or country [HeinOnline].

In a book, titled "Legal Research - in a nut shell" (Cohen M.L. & Olso K.C, 2003) indicates how legal research is done when the case is presented. This book is mainly on United States Law. In this book, most important areas for this research is legal research methodology, Preparing for Trial, How to Find Case Law Using the Digests, Finding Statutes, How to Research American Constitutional Law and Preparing for Trial are the areas covered under this book. By referring this book, what are the basic elements needs for a case can be identified though this book does not cover the modern information technologies.

Web site named LawLanka [Law Lanka] which gives users options of searching by providing key words for legal documents in Sri Lanka. LawLanka consists of all the acts of Sri Lanka which are updated within fifteen days of release of the act. LawLanka has powerful Text Search engine as after searching for a key word, it outputs in three different categories, Act & Ordinances, Consolidated Legislative Enactments and Case Law Reports. This system has the option of viewing the related cases which is one of the objective of the research.

Constituteproject [Constitute Project] is a project implemented to analyze worldwide constitutions. In this project, there are options to compare different constitute with different versions. In this project, classes for the constitution are identified. They are Amendment, Culture & Identity, Elections, Executive, Federalism, International Law, Judiciary, Legislature, Principles & Symbols, Regulation & Oversight and Rights & Duties. For those topics, there are sub topics as well. By using these topics, ontology can be mapped. However, as research is done on Sri Lanka constitute, content in relevant to Sri Lankan Constitute was included. For example, class like Federalism is replaced with provincial councils and local government councils.

Research paper titled "Constitute: The World's Constitutions to Read, Search, and Compare" (Elkins Z., Melton J., Ginsburg T, 2013) describes importance of Ontology driven constitution as shown in figure 1. However, this research does not indicate whether the Ontology technique was used.

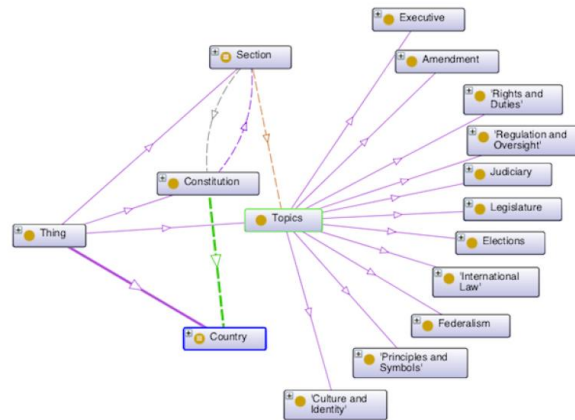


Figure 1: Constitution Ontology

3. Ontology Construction

Ontology is an important emerging discipline that has the huge potential to improve information organization, management and understanding. Gruber defines an Ontology as 'an explicit specification of a conceptualization', i.e. a view onto a system is described by a standardized terminology and relations between entities. In many cases, there is no single ontology but many different and concurrent ones (Gruber, T. R.). An Ontology defines a common vocabulary for researchers who need to share information in a domain. It includes machine-interpretable definitions of basic concepts in the domain and relations among them (Noy N.F., McGuinness D.L, 2000).

Protégé 4.3.0 (Build 304) is used for the research project to build ontologies. However, since Sri Lanka constitution contain lot of documents and classes, protégé may not be better solution when performance is considered. Research paper by Stijn Heymans and others [Heymans S. et all], suggests different methods to store Ontology to the relational database management system structures. There are several methods to store and index ontologies in relational databases by investigating an improved triple store, namely Minerva [Zhou, J. et all, 2006].

In the proposed Ontology, there are question and each question is linked to topics, incidents, cases and answers as shown in Figure 2 below.

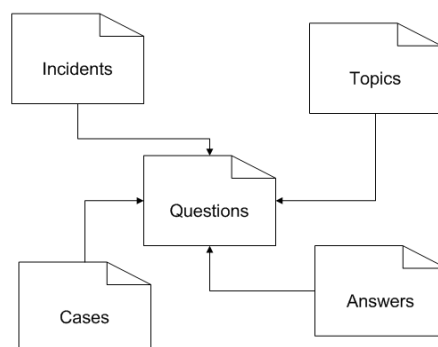


Figure 2: Ontology Design

For example, for question whether members of parliament can be removed answer will be yes. This question is linked to a topic in the constitution which is the Chapter 10 of the 1978 constitution of Sri Lanka, The Legislature – Parliament, sub section 66 – Vacation of Seats in the 1978 constitution. This question is linked to cases which are Dilan Perera against Dr. Rajitha Senarathne in 1999 and United National Party

secretary, Mr. Sirisena Corry Vs Mr. Lalith Athulathmudali, Mr. Gamini Dissanayaka, Mr. G.M. Premachandra and others.

4. Question Matching

As indicated before, this research has two parts, ontology construction and question matching. As the ontology build were discussed in the previous section, this section is dedicated to question matching.

Ontology is transferred to a SQL Server 2014 database to improve performance, since indexes can be introduced in relational database systems. Also, usage of relational database makes it easier to retrieve and update content.

For the question matching technique, method suggested in the research paper, Question Matching Technique to Find Answers (Asanka PPGD, Karunananda A.S, 2015) was implemented.

Terms were extracted using SOUNDEX technique for all the questions in the question bank. Similarly, terms extracted for the question that user entered. Using TF-IDF (Term Frequency-Inverse Document Frequency) technique, terms were calculated. Then the cosine distance was measured and the highest cosine value questions will be displaced, so that users can select the question that they need to ask.

5. Evaluation

As stated before, legal content is vast and complex. After building the ontology, it has to be verified whether it has the correct coverage. Since legal domain is an expert domain where you need subject matter experts to verify. However, there is a knowledge or technical gap in subject matter experts (in this case it is lawyers) between their expert knowledge and the technical knowledge. Therefore, verifying the Ontology has become a tedious task.

Another difficult task was that find out specific subject matter experts. In the legal domain, there are lawyers for different areas. Though this research is on legal domain, constitution is selected as proof of concepts. Therefore, legal experts are chosen from the constitution sector. To analyze this Ontology, constitution lawyers were selected. They were given the option to ask any questions from the researcher and researcher has verified whether those contents exist in the Ontology correctly. There is no quantitative evaluation on this and qualitative assessment was done on the Ontology content.

After every step of evaluation, new set of contents were added or existing contents were modified. For example, Incident class was added to the ontology during one of the evaluation step. Similarly, many contents and questions were also added. Ontology evaluation is also done during the question matching stage. This means, ontology evaluation was done throughout the research. So it can be said the after end of all the steps of the research, high quality ontology was created.

Evaluating answers and other relevant cases and incidents to user entered queries was a qualitative measure. Three lawyers were participated for this evaluation as the case of ontology evaluation. Also, one member from general public also participated to this exercise in order find out whether this product is helpful for the general public.

So the basic question was given to lawyers and law students. Following three question were asked from subject matter experts and law students and the results of the system also compared with the answers.

Question 1: Are there provisions for dismissing members of parliament?

Appendix: Example of a Question has detailed answer to this question which has the answer, constitution details, cases and incidents.

When this was asked from lawyers and law students, all answered correctly. However, no one knew that there are nine reasons to vacate member of parliament's post. No lawyer was able to come up with all the reasons and one lawyer was able to come up with four reasons. Other two lawyers came up with less number of reasons. Anyway, lawyers and students were not able to point to the exact sub section which is very much needed. Also, lawyers were not able to list out the relevant cases and incidents where the system was able to provide accurate results.

Question 2: Are amendments to the constitution attached to the document as a separate part or incorporated?

Though the answer to this question is Yes, one law student and a person from general public said No. System provided the correct answer to this along with the correct incidents and cases.

Question 3: When former president appointed as a member of a parliament, will he lose presidential benefits?

This is a question raised recently due to the current political development whereas former president His Excellency Mahinda Rajapakse is selected as member of parliament from Kurunagala district in 2015 general election. There is no answer can be derived from the constitution however it is needed to refer to Presidents Entitlements Act, No. 4 of 1986. It says, for his life time former president will get the benefits irrespective of his current position. Since the system does not support acts, system could not provide the correct answers to this question.

So when the ability of the system to find answer is measured with respect to sample questions it can be observed that correct answer is obtained with much correct examples and constitution references.

6. Conclusion & Further Work

In the research, knowledge base can be improved. Constitution was selected as proof of concepts. However, legal domain contains lot of documents. Most of the legal issues arises not mainly because of constitution but with other acts. For example, provincial councils were brought to the Sri Lanka from 13th amendment. However, provincial councils are enacted by provincial council act. During the “divinaguna” controversy debate, 2014 was due to intermediate list which is in provincial council act. Also, in 2006 Former President Her Excellency Chandrika Bandaranayake Kumaranathunga Vs Mr. Lalith Weerathunga in decision was made from Presidents Entitlements Act, No. 4 Of 1986 not by referencing the constitution itself. All of this cases indicate that it is essential to include acts and ordinances also into the knowledge base or to the ontology.

Ontology is integrated to other Legal Ontologies so that in case Sri Lankan legal system does not provide any support for the queries, laws of common wealth countries will prevail.

Main task and the challenging task was to critically analyze the current legal system in Sri Lanka. This challenging task was accomplished. Next step was to implement 1978 Constitution of Sri Lanka in an Ontology. This was accomplished using protégé and SQL Server 2012. Next task was to match user queries. This was accomplished using cosine distance and newly introduced question type. Finally, answers and relevant information was retrieved to user by reading the Ontology.

It was evaluated that the system has the capability of finding answers to the preliminary legal domain questions. Though this research has provided its main objectives, there are lot of areas to improve by technically and well as content wise.

REFERENCES

1. Arab News, “Sri Lanka’s Presidential Poll Due This Year: Court”, <http://www.arabnews.com/node/272102>, 2005-08-25, Accessed 2015-01-12.
2. Asanka P.P.G..D., Karunananda A.S., Question Matching Technique to Find Answers, 2015, Yet to be published.
3. Abepala, Y., නීතිය නොදැනීම සමාවට කරුණක් නොවේ. (Ignorantia Juris Haud Excusat), 2011, Saranga Publication, ISBN 978-955-684-005-6.
4. Cohen M.L, Olso K.C, “Legal Research - in a nut shell”, 2003, ISBN-13: 978-0314147073.
5. Constitute Project, <https://www.constituteproject.org/>, Accessed 2014-12-30
6. Coray L.J.M., “An Introduction to the Legal System of Sri Lanka”, 2003, ISBN 995-8733-18-0.
7. Elkinsa Z., Meltonb J., Ginsburgc T., Constitute: The World's Constitutions to Read, Search, and Compare, Journal of Web Semantics, 2013.
8. Gruber, T. R., “A Translation Approach to Portable Ontology Specifications. Knowledge Acquisition”, 5(2):199–220.
9. HeinOnline, Law Journal Library, <http://heinonline.org/HeinDocs/LawJournalLibrary.pdf>, Accessed on 2014-05-06.
10. Heymans S., Ma L., Anicic D., Ma Z., Ontology Reasoning With Large Data Repositories, IBM China Research Lab,
11. Jayakar T., Sri Lankan Constitutes, From Solsberry to 1978 18th Amendment, 2011 January.
12. Law Lanka, A-Z guide to Laws of Sri Lanka and Reported Cases, <http://www.lawlanka.com/>, Accessed on 2015-03-12.

13. Noy N.F., McGuinness D.L., "Ontology Development 101: A Guide to Creating Your First Ontology", Stanford University, Stanford, CA, 94305, 2000.
14. University of London, LAW – DATABASES, Queen Mary, <http://www.library.qmul.ac.uk/subject/law/databases>, Accessed on 2014-05-06
15. Westlaw, Westlaw: quick user guide, London metropolitan university, Library Services, <https://metranet.londonmet.ac.uk/fms/MRSite/psd/ls/subjectGuides/law/Quick%20guide%20to%20using%20Westlaw.pdf>, Accessed on 2014-05-06.
16. Zhou, J., Ma, L., Liu, Q., Zhang, L., Yu, Y., and Pan, Y., 2006, Minerva: A Scalable OWL Ontology Storage and Inference System. In Proceedings of the 1st Asian Semantic Web Conference, volume 4185 of Lecture Notes in Computer Science, pages 429-443, Springer.

I. APPENDIX: EXAMPLE OF A QUESTION AND IT'S ANSWERS

Death of Colombo District MP. Mr. CV. Gunaratne	7-Jun-00	Sri Lanka Cabinet Minister of Industries Development. Minister Gunaratne and his wife along with 20 others were killed by a suicide bomber of the LTTE organization on June 7, 2000.
Death of National List MP. Hon. Mr. Laksham. Kadiragamar	12-Aug-05	He served as Minister of Foreign Affairs of Sri Lanka from 1994 to 2001 and again from April 2004 until his assassination in August 2005.
Resignation of National List MP Hon. Wasantha Samarasinghe	30-Jun-08	Hon. H. M. Wasantha Samarasinghe (JVP-NAT) resigned to contest the North Central provincial council election
Hon. Mahipala Herath (UPFA-KEG) resigned	7-May-04	Hon. Mahipala Herath (UPFA-KEG) resigned to contest the Sabaragamuwa provincial council elections. His replacement Hon. H. R. Mithrapala (UPFA-KEG) was sworn in on 20 July 2004
Hon. Chandrika Kumaratunga (PA-GAM) resigned to take up presidency.	12-Nov-94	
Hon. Sarath Fonseka removed as he didn't participate for three months	2010	
Hon S.B. Dissanayake removed as he didn't participate for three months	2006	

