Automated Analysis and Interrelation of Legal Elements Based on Text Mining

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ABSTRACT

One of the most promising developments comes with the use of innovative technologies and thus with the availability of novel services. The combination of text mining with legal elements may contribute to the development of many innovative legal IS. Moreover, in the case of public administrations and governments, the distribution, availability, and access towards legal information are essential and urgent. On the other hand, legal data and law texts are a potential open government data category in order for innovation to be achieved, regarding the development of new, better, and more cost-effective services for citizens. Those data need to be available 24/7 basis and compliant towards a standard. Yet, there exist some severe issues at the moment regarding this access. This, in turn, makes the use of automated crawling and analysis more than difficult. This paper describes the “Peri Nomou” system: an innovative legal information system for Greek laws utilising text mining techniques to indexing legal documents, identifying correlations and dividing legal documents into their articles.

KEYWORDS

Automated Codification, Automated Interrelation, Laws/Connecting Graphs, Legal Elements Intercon-Nections, Legal Text Mining, Parsing Legal Texts

INTRODUCTION

Information and Communication Technology (ICT) is being triggered by the vision of different concepts, such as digital transformation, smart cities, data-intensive policymaking, etc., providing new opportunities for the public sector and societies to solve major problems and issues of everyday life. The new era of Government 3.0 which combines the established ICTs with the use of disruptive ICTs (Pereira et al., 2018), such as artificial intelligence, is trying to develop innovative solutions to create public value and improve citizens’ quality of life. Text mining techniques (Loutsaris et al., 2018), Machine Learning Algorithms and Big Data (Alexopoulos et al., 2019) are some of the technologies or trends (Alexopoulos et al., 2019), which can be used either to modernize the previous government services or to develop new and innovative ones. Additionally, users’ expectations have risen along with the new capabilities of technology (Lachana et al., 2018) and the ongoing development of new information systems (Bhardwaj & Madhusudhan, 2016).

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Furthermore, significant advancements in the ‘legal informatics’ research field are observed since governments have started to promote the development of legal information systems (Casanovas et al., 2016). The legislation of each state is very important to be open and available online in order for every part of society to have free and unhindered access (Fulton, 2011). Financial and legal services of academia and research institutions are constantly dealing with laws and their interpretation. All new and already existing procedures have been designed or will be designed based on the analysis of legal documents. The proposed legal information system has been focused towards this goal since it can extract automatically information from unstructured legal data by using text-mining techniques.

The Legal documents have specific characteristics which differentiate them from the “normal daily-used” documents due to their length and complexity (Nguyen et al., 2011). The complexity of the legislation is identified in the comprehending of the legal terminology, in other words, legal language, in combination with the existence of correlations as references among laws or other kinds of legal documents. There are different types of legislative documents such as laws, presidential decrees and ministerial decisions and every type contains a specific form including specific structural elements (components). Each reference may amend one or even more different laws and, in many cases, an in-depth search of previous years’ laws is required in order to detect which component is in force.

Generally, the legislation network is a multi-relational network that accommodates the hierarchy among the sources of law and represents relationships of various categories among legal documents (Koniaris et al., 2017). The above reference type is called “dynamic reference”. There are also “static references” which affect only a specific law (Winkels, 2015). The complexity of legislative documents is intense when the use of dynamic references is more often than the use of static references.

Also, the use of dynamic references leads to the generation of a large amount of legal information which poses significant barriers in developing proper legal information systems since each country consumes a significant amount of business resources to follow the current legislation and only legal experts are being capable of following the latest legislation (Louitsaris et al., 2018). Although it is clear that tools for mass customization can help to filter, reduce the flood of legal information and make it understandable by businesses and citizens without legal expertise (Louitsaris et al., 2018) there is still not a clear and consistent understanding of the requirements of such a system.

As it is mentioned above, the current study contributes towards this purpose, aiming at filling the above gap by enlightening the requirements of such a system. Greece is selected as the case study for this research since the complexity of Greek legislative documents is intense due to the use of dynamic references. Based on the findings a legal information system is developed by utilizing the power of text mining. The proposed system consists a free, useful and innovative legal tool for the Greek society since it is capable of retrieving automatically all the correlations among Greek laws, tags of legal documents, as well as, it is capable of decomposing a law into its articles.

The rest of this paper is organized as follows. Initially, the methodology is described followed by the background information on associated domains as well as the identified existing legal infrastructures and methods (mainly Greek including also a few more cases of countries which use dynamic references in their national legal system). The section System Architecture describes the architecture of the developed system based on the results of the previous section pursued by an application scenario of the system. The final section includes a discussion of the research findings and the study limitations for future research steps.

**METHODOLOGY**

The methodological approach for the development of the proposed system was based on the design theory (Gregor & Jones, 2007; Gregor & Hevner, 2013; March & Smith, 1995). In particular, the followed approach consists of the following five steps as shown in Figure 1.
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