DEVELOPING A LEGAL EXPERT SYSTEM FOR THE PALESTINIAN LABOR LAW

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ABSTRACT

Legal expert system has received abundant attention recently from researcher in the artificial intelligence and law areas. Developing such systems for supporting the judges and advocates decisions improve the reliability and the quality of the taken decisions. The Palestinian labor law consists of 141 rules and represent one of the main fuzzy and difficult issues of advocates and judges. Recently, legal labor cases. The rapid growing of the legal labor cases a high pressure on courts and advocates and a frequent long delay. Developing a legal expert system for the labor law in Palestine will help workers to know their rights and the expected results of the court decision. Additionally, it will help to avoid conflicts and save advocates time as well offer another opinion. In this work, we study and analyze the Palestinian labor law (141 rule) and divided it into three different types: instructive laws, laws related to fees and laws related to achievements. The important features from each group is are extracted and converted into mathematical model. Based on the extracted features, a rule-based expert system is developed and built. The proposed system is tested using simulated and real cases that provided by a specialist advocates and the results are compared with the court decision. The system shows a significant results.

KEYWORDS

Artificial Intelligence, AI and law, Legal Expert System, Rule based legal expert system, Case-Based legal expert system.

1. INTRODUCTION

The official records of Palestinian courts have revealed continuing increase in litigants who have prosecution concerning with labor law according to (Palestinian central bureau of statistics, 2014). It has been noticed that prosecutions such as compensation, vacations and permanent partial/total disability have regularly been adjudicated. However, the most recent Palestinian Labor Law (No. 7) was ratified in 2000 and replaced the 1960 Jordanian Labor Law in the West Bank and the 1964 Egyptian Labor Law in the Gaza Strip. It was drafted in line with Arab Labor Organization (ALO) and International Labor Organization (ILO) standards.

For the reason of improving lawyers and courts process and facilitating their job, artificial intelligence IA has been deployed in early eighties, (McCarty L., 1990), by discussing fundamentals issues and basics concepts. However, the research primarily discussed tow basic question, the first was ability of implementing practical legal information system which could add considerable value for both layers and non-layers in legal cases (McCarty L., 1983), and the second was argumentation of the process of reasoning legal cases using computational and non-computational methods and techniques.

Over the almost past thirty years AI in law researchers implemented verity of expert systems which covering different areas of law such as: Worker's compensation (Zeleznikow, 1991), Refugee Law (Yearwood et al, 1999) and improving access to justice (JOHN, 2002). According to (James, 1996) Generally, the variant implemented application in legal expert systems refers to three different categories of development of expert systems including: 1) Rule-based systems which first proposed by Buchanan and

Headrick in 1970, 2) Case-based systems made by Bench-Capon and his colleagues and 3) Hybrid systems which is eligible in which law is compound of both statutes and cases.

Rule based legal expert system approach can be applied when representing set of facts in law cases, it has been used by many researchers such as: McCarty; Bench-Capon, Kowalski and Sergot; Gardner; and Susskind. On the other hand, case based legal expert system applied when the law is not statute but case law, Mackaay and Robillard proposed to use of nearest neighbor analysis in predicting judicial decision, while Ashley and Rissland used hypotheticals in their case based expert system (James, 1996).

In this research, the motives were basically based upon a large number of legislations, rules and statutes in Palestinian labor law which need to be interrupted and legally represented to litigants and open-texture misleading from litigants side. However, the overall objective of this research is implementing and testing eligibility and adequacy of rule-based legal expert system where there is a set of facts, whether law system is a statute law or case based.

2. PROPOSED METHODOLOGY

Research in AI and law goes beyond an applications area, a critical issue such as reasoning and knowledge representation are considered as most augmenting topics in AI and law. In this research, 141 rules have been critically analyzed with advocates, professors in law school and legislators. Some rules were mathematically represented and others were open textured rules and can't be represented in rule based. However, the proposed system will pass through the following methodology which attempts to represent knowledge extracted from labor law rules. The methodology includes: Knowledge elicitation, knowledge representation and models design, Implementation and Testing and accuracy assessment.

Knowledge was primarily extracted from open texture rule in Palestinian labor law, these include: Vacations, Dismissal compensation, a partial permanent disability, a total Permanent disability and work accident consumption.

What comes after knowledge elicitation is a set of logical models and decision tables to represent the acquired knowledge in a way which all labor rules are mathematically represented. In this research, system has been divided into sub-models in which each model represents set of open texture rules. Figure 1 illustrates knowledge sources and sub-models of the proposed system. Figure 1 presents the main parts of the proposed expert system.
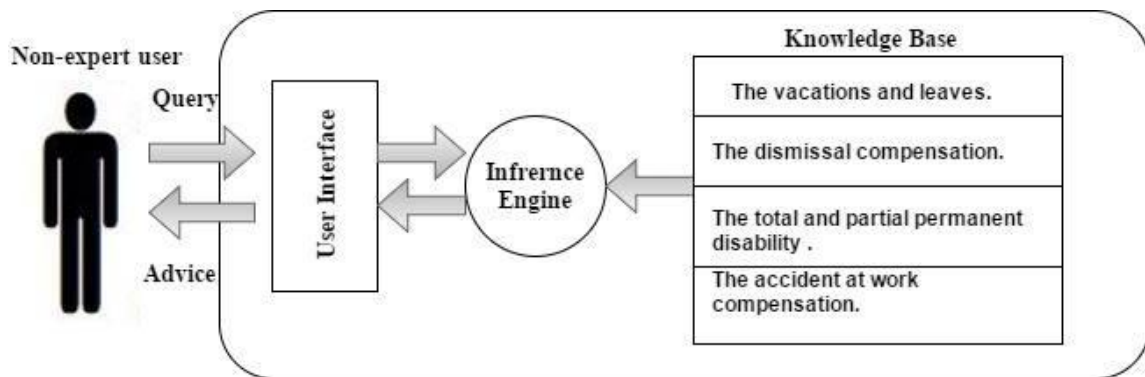

Figure 1. The main components of the proposed expert system.

The following chart is an example of vacations and leaves sub-model. The vacations and leaves rules are analyzed and modeled in the following rule-based model. The proposed model includes rules for annual, sick, bereavement, religious, cultural, pilgrimage and maternity leaves and vacations.
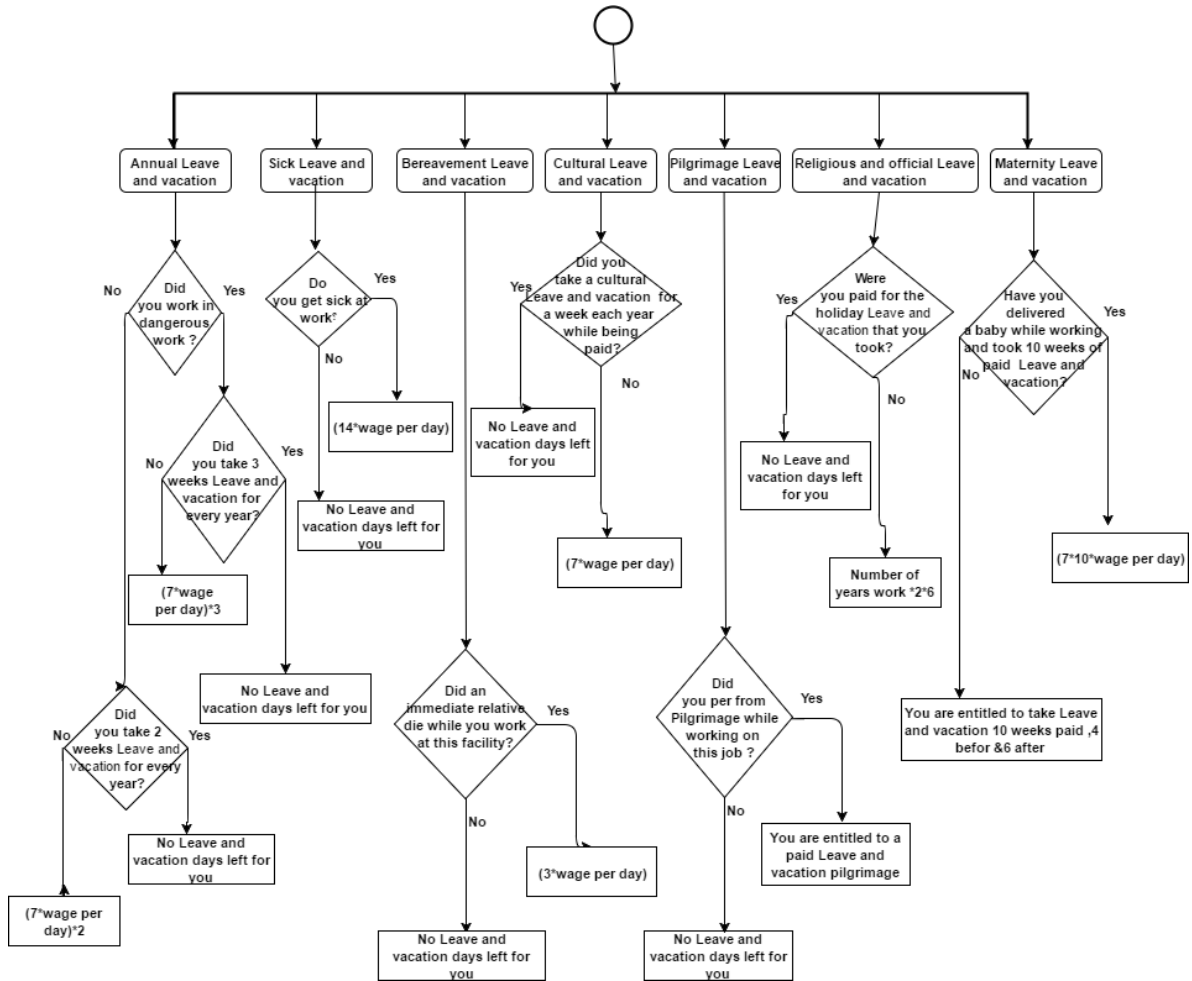
Figure 2: The rule-based flowchart of dismissal compensation

3. RESULTS AND DISCUSSION

The proposed legal expert system is evaluated using real cases from the courts and simulated cases that generated from the advocates. The evaluation is done under supervision of specialist advocates in labor cases. The tested cases contain all the information about the labor, employer, and the court decisions.

For evaluating the system, authors used 40 simulated cases (8 cases for each section) that provided from specialists advocates and 47 real cases from the court. The matching ratio between Court Decision (real cases) or the advocate's decision (simulated cases) and the proposed expert system decision is calculated as follows:

Matching Ratio = 100 - Mean (|Court (Advocate) Decision - System decision| / Court Decision) x 100%.

The results of the proposed expert system are illustrated in table 1.

Table 1: The evaluation results of the proposed system

Matching Ratio	No. of Cases	Section No.
96%	17 (9 real cases), (8 simulated cases)	Vacation
88%	18 (10 real cases), (8 simulated cases)	dismissal Compensation
93%	16 (8 real cases), (8 simulated cases)	Partial permanent disability
96%	17 (9 real cases), (8 simulated cases)	total Permanent disability
83%	21 (11 real cases), (8 simulated cases)	Accident at work claim

Table 1 shows that the highest accuracy ratio is achieved for the vacation law and the Permanent total disability. On the other hand, the accident at work got the less accuracy since the workers enlarge the facts about the accidents. The salary compensation and the permanent partial disability sections has some fuzzy rules and requires some human sense and experience.

Adopting the rule-based expert system approach proved to be a powerful tool for the labor law especially the well described rules. Merging the case-based approach with rule-based approach will enhance slightly the results of the rules requires human sense. The system failed to give the correct decisions for special and complex cases.

4. CONCLUSION

In this work a legal rule-based expert system for the Palestinian labor law is developed and evaluated. The labor law (141 rules) is studied, analyzed and classified into five sections (vacations, total and partial permanent disability, dismissal compensation and accident at work claim). The rules at each section are converted into a rule-base model. The system is tested using real and simulated cases that provided from specialist advocates. The evaluation of the system showed a significant success rate. Merging case-based approach with the used rule-based model would enhance the decision accuracy of complex cases. The proposed system expected to play important role for assisting advocates and judges in related cases, as well as assisting labor for understanding their rights.

REFERENCES

Aleven, V. (2003). Using background knowledge in case-based legal reasoning: a computational model and an intelligent learning environment. *Artificial Intelligence*, 150(1), 183-237.

Ashley, K. D., et al. (2003). Law, learning and representation. *Artificial Intelligence*, 150(1), 17-58.

Bench-Capon, T.,et al. (2003). A model of legal reasoning with cases incorporating theories and values. *Artificial Intelligence*, 150(1), 97-143.

Branting, L. K. (2003). A reduction-graph model of precedent in legal analysis. *Artificial Intelligence*, 150(1), 59-95..

Feigenbaum, E. A. 1982. Forward. In Davis, R., and Lenat, D. B., eds.Knowledge-Based Systems in Artificial Intelligence. McGraw-Hill

Greenleaf, G. (1989, August). Legal Expert Systems-Robot Lawyers?(An Introduction to Knowledge-Based Applications to Law). In Proc. *Australian Legal Convention*, Darling Harbour, Sydney.

Incorporated . VOL. 23, No. 15

J. Popple. 1991, Legal expert Systems: The inadequacy of a rule-based approach. *Australian Computer Society* JOHN, Z. (2002). Using Web-based Legal Decision Support Systems to Improve Access to Justice. *Information & Communication Technology Law*, 1-19.

Jackson, P., Al-Kofahi, K., Tyrrell, A., & Vachher, A. (2003). Information extraction from case law and retrieval of prior cases. *Artificial Intelligence*, 150(1), 239-290.

James, P. (1996). *A Pragmatic Legal Expert System*. England: Dartmouth Publishing Company Limited.

Leondes, C. T (2002). Expert systems: the technology of knowledge management and decision making for the 21st century. pp. 1–22, ISBN 978-0-12-443880-4. [3] Luger & Stubblefield 2004, pp. 227–331.

McCarty, L. (1983). Intelligent legal information systems: Problems and prospects. *Rutgers Computer and Technology Law Journal*, 265,294.

McCarty, L. T. (1990). Artificial intelligence and law: How to get there from here. Ratio Juris, 3(2), 189-200.

McLaren, B. M. (2003). Extensionally defining principles and cases in ethics: An AI model. *Artificial Intelligence*, 150(1), 145-181.

Naik, V. M., & Lokhanday, S. (2012). Building a Legal Expert System for Legal Reasoning in Specific Domain-A Survey. *International Journal of Computer Science & Information Technology*, 4(5), 175.

Popple, J. (1996). A pragmatic legal expert system. APPLIED LEGAL PHILOSOPHY SERIES, Dartmouth (Ashgate), Aldershot.. Available at SSRN: http://ssrn.com/abstract=1335176

Rissland, E. L et al, (2003). AI and law: a fruitful synergy. *Artificial Intelligence*, 150(1), 1-15.

Simon, D., & Scurich, N. (2013). The effect of legal expert commentary on lay judgments of judicial decision making. *Journal of Empirical Legal Studies*, 10(4), 797-814.

Song, L. (2015). Research of key technical issues based on computer forensic legal expert system.

Verheij, B. (2003). Artificial argument assistants for defeasible argumentation. *Artificial intelligence*, 150(1), 291-324.

Yearwood, J. A. (1999). The integration of retrieval, reasoning and drafting for Refugee Law: A third generation legal knowledge-based system. 7th International Conference on ArtiŽcial Intelligence and Law (pp. 117–137). *Australia: ACM* Press.

Zeleznikow, J. (1991). Building intelligent legal tools—The IKBALS project. *Journal of Law and Information Science*, 165–184.

Zeleznikow, J. (2002). Using web-based legal decision support systems to improve access to justice. *Information & Communications Technology Law*, 11(1), 15-33.