Legal Knowledge and Information Systems
E. Francesconi et al. (Eds.)

doi:10.3233/FAIA220485

Consumer Dispute Resolution System Based on PROLEG

Shidaka NISHIOKA[a,1], Yuto MORI[b] and Ken SATOH[c,1]
[a] *Japan Advanced Institute of Science and Technology, Japan*
[b] *Hitotsubashi University, Japan*
[c] *National Institute of Informatics and Sokendai, Japan*

Abstract. It is challenging for lay consumers to predict a legal conclusion by applying appropriate law in a consumer dispute. We developed a system that assists consumers to predict a possible legal conclusion. The system enables consumers to identify the type of consumer disputes by using a tree structure, and to apply appropriate legal rules implemented as PROLEG programs. We arranged the system to avoid possible inconsistency between the tree structure and the PROLEG program.

Keywords. PROLEG, ISAI PROLEG, PROLEG Menu, Japanese Ultimate Fact theory, Japanese Consumer Law, Consumer Disputes

1. Introduction

In Japan, disputes between consumers and business operators ("Consumer Disputes") are common. Under Japanese consumer law, there are variations in the types of Consumer Disputes defined by statutes, and applicable legal rules differ depending on the type. It can be challenging for consumers with no legal knowledge to determine the types of Consumer Disputes and to correctly select the applicable legal rules.

Japanese ultimate act theory (yoken-jijitsu-ron in Japanese, the "JUF theory") is the legal rules that Japanese courts apply to civil cases. PROLEG is a logic programming language that can implement JUF theory[1]. The interactive system for arranging issues based on PROLEG ("ISAI PROLEG")[2] provides a user interface that allows users to input values representing the facts of cases into variables in PROLEG programs. PROLEG and ISAI-PROLEG can implement the legal rules of the Japanese consumer law in the form of JUF theory. However, for consumers to take advantage of programmed legal rules, they must correctly identify the type of Consumer Disputes and select a PROLEG program implementing the legal rule applicable to the identified type.

We developed Consumer Dispute Resolution System that assists consumers in identifying types of Consumer Disputes and select applicable PROLEG programs.

2. PROLEG Menu

PROLEG Menu is a software that can implement a tree structure with a user interface. Each node of the tree can have a question and multiple answer choices for the question.

[1] Corresponding Authors: Shidaka Nishioka, shidaka.nishioka@jaist.ac.jp; Ken Satoh, ksatoh@nii.ac.jp

At each node, a user can select one of the choices through the user interface. The next node to be reached is determined based on the user's answer. Each leaf node is associated with a PROLEG program in the form of ISAI PROLEG. When the user reaches any of the leaf nodes, PROLEG Menu calls the PROLEG program associated with the leaf node.

3. Description of System

The system comprises two parts: Tree and Logic, as shown in **Figure 1**.

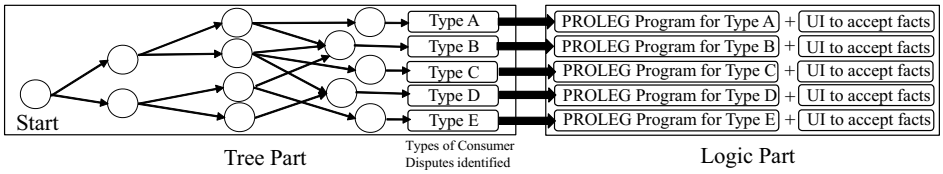

Figure 1. Functions of Tree and Logic Parts.

3.1. Tree Part

The Tree Part enables a user, typically a lay consumer, to identify the type of Consumer Disputes and to select the appropriate PROLEG program. We implemented the Tree Part by using PROLEG Menu such that it has a tree structure. Each node in the tree has a question. The user's answer to the question at a certain node determines which child node the user goes to next. By repeating this process, the user reaches one of the leaf nodes. The questions at each node have been deployed such that the system can identify the type of Consumer Disputes. Therefore, when the user reaches a leaf node, the type of Consumer Dispute is identified. Each leaf node was associated with a PROLEG program which implements the legal rule applicable to the identified type of Consumer Disputes.

3.2. Logic Part

The system transitions to the Logic Part when a PROLEG program is called at the end of the Tree Part. The Logic Part accepts a user's and a business operator's factual assertions and infers the legal conclusion by applying legal rules to those facts. We implemented the Logic Part by using the ISAI PROLEG such that it has a user interface that allows users to input the facts they assert. In the Logic Part, the system requests a consumer and a business operator, the parties to a Consumer Dispute, to input the facts they want to assert in their Consumer Dispute. After the parties complete inputting, the system calculates to reach the legal conclusion inferred by applying the applicable legal rules to the facts input by the parties and displays the results. This enables consumers to predict possible legal conclusions for their Consumer Disputes.

4. Tree Structure for Identifying Types of Consumer Disputes

Generally, each type of Consumer Disputes consists of one or more factors. In the Tree Part, each node has a question that asks to a consumer if there are facts satisfying one of

the factors of Consumer Disputes. To identify the types of Consumer Disputes, we deployed questions about factors common to more types of Consumer Disputes at upper nodes. Questions about factors included only in fewer types of Consumer Disputes are set at lower nodes.

For example, under the Specified Commercial Transactions Act (the "SCTA") of Japan, Consumer Disputes can be classified in three types as shown in the table below:

Table 1. Types of Consumer Disputes and Factors in each type of Consumer Dispute

Types	Consumer	Longer Than 2 Months	More Than 50,000 Yen
1	Y	Y	Y
2	Y	Y	-
3	Y	-	-

In the **Table 1**, "Y" indicates that the type of Consumer Dispute in the same line has that factor. For example, Consumer Dispute Type 2 has Factors *Consumer* and *Longer Than Two Months*. To identify the type of Consumer Dispute, the Tree Part asks the consumer at the initial node if the case has a fact satisfying the Factor *Consumer*, because the Factor *Consumer* is common to all types. If the consumer answers "no," the system can conclude that the SCTA does not apply to the case. If the consumer answers "yes," then the Tree Part asks for the sufficiency of the Factor *Longer Than Two Months*, because it is common to Type 1 and 2. If the consumer's answer is "no," the system can conclude that the case is of Type 3. If the consumer's answer is "yes," the Tree Part further asks at the next node whether the Factor *More Than 50,000 Yen* is satisfied. In this manner, the Tree Part identifies the type of Consumer Dispute.

5. Avoiding Inconsistencies Between Tree and Logic Parts

Previously, PROLEG programs operate independently, not associated with a tree structure. On the other hand, in the system, the PROLEG programs in the Logic Part are associated with the Tree Part where the types of Consumer Disputes are determined by using a tree structure. Since both factors to identify a type of Consumer Disputes and legal requirements of applicable legal rules are defined by the Japanese consumer law, in the system, one of the factors to identify the type of Consumer Disputes appearing as a question at a node in the Tree Part can be identical to one of the legal requirements in the applicable legal rules implemented as a PROLEG program in the Logic Part. Therefore, an inconsistency may occur between the Tree and Logic Parts.

For example, assume that a Consumer Dispute is of Type 1 in the **Table 1**, which has Factors *Consumer*, *Longer Than Two Months* and *More Than 50,000*. Suppose that the applicable legal rule to cancel the contract in Type 1 includes Requirements *Consumer*, *Telling False* and *Belief*. Here, *Consumer* appears as a Factor and a Requirement. Previously, the PROLEG program implementing this legal rule must contain atomic formulae representing all the three Requirements *Consumer*, *Telling False* and *Belief* with the variables representing the presence or absence of facts that satisfy the three Requirements. If the system has this PROLEG program as is in the Logic Part, a user who answered "yes" to the question asking "are you a consumer?" in the Tree Part may input a fact indicating that the user is not a consumer in the Logic Part.

To avoid this inconsistency, we implemented the system such that, if a Factor in the Tree Part and a Requirement in the Logic Part are identical, the PROLEG program in the Logic Part does not contain that Requirement. For example, in the case of Type 1 above, because the Tree Part asks the presence or absence of Factor *Consumer* to identify

the type, the PROLEG program in the Logic Part implementing the applicable legal rule contains only atomic formulae representing Requirements *Telling False* and *Belief* to prevent the user from inputting contradictory facts about Requirement *Consumer*.

Removal of a certain requirement from the PROLEG programs in this manner still maintains the accuracy of the inference for the following reasons. Suppose that, in a certain legal rule, a consumer's Claim X can be established by the presence of Facts *a′*, *b′* and *c′* that satisfy Requirements *a*, *b* and *c,* respectively. This can be expressed in the form of PROLEG as follows:

claim_x(_*a′*, _*b′*, _*c′*) <= requirement_a(_*a′*), requirement_b(_*b′*),
requirement_c(_*c′*).

If the consumer answers in the Tree Part that Factor *a* was satisfied, it means that Fact *a′* exists and the truth value of the atomic formula "requirement_a(_*a′*)" turns out to be true before the PROLEG program in the Logic Part starts. Based on this premise, the following holds:

{claim_x(_*a′*, _*b′*, _*c′*) <= requirement_a(_*a′*), requirement_b(_*b′*),
requirement_c(_*c′*).} ∧ requirement_a(_*a′*) ↔ T
⇔ claim_x(_*b′*, _*c′*) <= requirement_b(_*b′*), requirement_c(_*c′*).

In this manner, the system avoids possible inconsistencies between the Tree and Logic Parts, as shown in **Figure 2**.

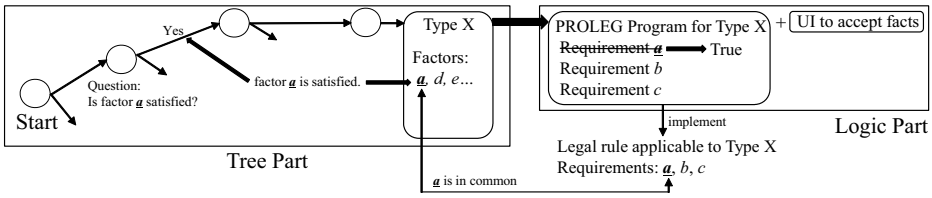

Figure 2. Method to avoid inconsistency between Tree and Logic Parts

6. Conclusion

We demonstrated how the system identifies the types of Consumer Disputes by using a tree structure and avoids possible inconsistency between Tree and Logic Parts. In these manners, the system assists consumers to predict legal conclusions for Consumer Dispute.

This work was supported by JSPS KAKENHI Grant Numbers, JP17H06103 and JP22H00543.

References

[1] Satoh K, et al (2011) Proleg: an implementation of the presupposed ultimate fact theory of Japanese civil code by prolog technology. LNAI6797, pp 153 - 164.
[2] Satoh K, et al (2021) Interactive System for Arranging Issues based on PROLEG in Civil Litigation. Proc. of ICAIL 2021, pp 273 - 274.