Legal Argument in Fuzzy Legal Expert System (FLES)

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Abstract

A fuzzy legal case-based reasoning system has been developed for CISG (United Nation Convention on Contract for the International Sale of Goods). Since law is adversarial, there are usually at least two opposing viewpoints. Although either side may be quite reasonable, only one side wins in the end. An argument between two agents, such as the plaintiff and defendant, in a legal domain is very useful for classify a vague concept, because it can provide an explanation from the two sides. On the basis of the proposed structural similarity measure approach, a fuzzy legal argument is developed. This approach simulates the cognitive process of human beings in the legal argument. It can be used for students to learn the skill of the legal argument, or provides an advice for the attorneys in practice.

1 Overview

The fuzzy legal argument module is a part of the legal reasoning in FLES[1, 5]. The legal argument model in the fuzzy legal argument is composed of the following argument moves including: Claim of Side 1, Objection of Side 2 and Rebuttal of Side 1 (Figure 1).

The other functional parts of FLES that are related to FLA are simply introduced as follows;

In user inference, judgment on the existence of the factors of the query case are made, and the argument moves in every stage are also displayed.

In case base, besides the precedent are represented in text, they are also represented by a list of atomic factors, and the related abstract factors.

The legal argument model is the key part of this approach. It is based on the structural similarity measure process organized by the argument moves.

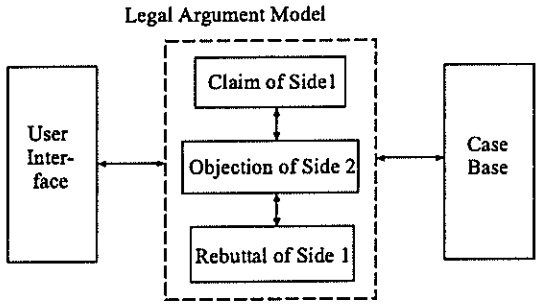

Figure 1: The Structure of the Fuzzy Legal Argument Module

2 Legal Argument and Structural Similarity

The FLCBR that combines case-based reasoning and fuzzy theory is introduced in [1, 4]. The similarity measure is based on the comparison between the exist-degrees of the features, and between the antecedents of the case rules. The explanation on the similarity is based on the case rules. This module just answers the question such as "Whether is the query case similar to the precedent ?" The deep explanation based on the different viewpoints of the plaintiff and defendant is not able to be obtained.

In legal argument, explanation-based knowledge representation of a vague legal concept is related to the argument made by the plaintiff and the defendant. Whether a query case is similar to a precedent, usually is also argued by these two sides. In legal reasoning, legal argument is an important reasoning approach. This method answers not only the question: "What are the similarities and distinctions ?" but also the question: "Why are they similar or distinctive ?" It supports the plaintiff or defendant not only to make

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a claim to support own viewpoint according to the similarity, but also make a claim to object opponent's viewpoint according to the distinction.

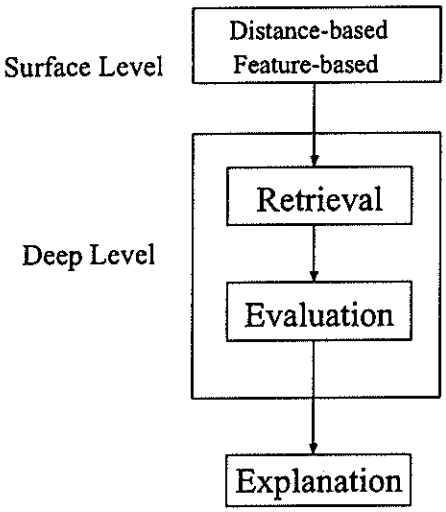

Figure 2: The Relation Between Surface Similarity and Deep Similarity

The similarity measure is involved in the legal argument. If one side analogies the query case to a precedent, the other side will distinguish them. Usually, if one side analogies the query case to a precedent, and emphasizes the similarity between them in order to make a claim, the other side will downplay it, namely, emphasizes the distinction between them. So both similarity and distinction should be measured. It has been said that the current similarity measures are not sufficient to measure the similarity in the legal argument. The current similarity measure[3] made by the Tversky model is a combination of similaritics and distinctions by *Addition* and *Subtraction* and *Weight*. It is difficult to use it in the legal argument. The proposed structural similarity measure: factor-based similarity is composed of surface level similarity and deep level similarity. The surface level similarity is an input of the deep level similarity (Figure 2). Based on the fuzzy factor hierarchy, the information related to the input is retrieved or evaluated in terms of the context and the viewpoint that are controlled by a mechanism related to the domain knowledge. In the legal argument, it can be structured by the movement of legal argument. The similarities and distinctions are emphasized or downplayed by the different viewpoints of the plaintiff and defendant, respectively. So,

- *Weight* corresponds to the strength of the relation between factors,
- *Addition* and *Subtraction* correspond to the emphasis and downplay, respectively.

The final result is a set of the factors including the atomic factors and abstract factors organized by the different claims of the plaintiff and the defendant.

3 Computations of Similarity and Distinction

The three steps in the legal argument model, that are discussed in the last section, are computed in the followings, respectively.

1. Side 1's Claim

In this step, the similar cases are retrieved from a set of precedents. The precedent that has the most high similarity degree of facts to that of the query case is as the most on point case P_{mopc}. If the conclusion of case P_{mopc} favors the side 1, the conclusion is regarded as the side 1's claim.

I_{claim}={ The conclusion of the case P_{mopc}} ∪{ The factors that support the conclusion of the case P_{mopc}}.

The similar precedent is retrieved from the case base by using the retrieval in similarity.

$$R_{case}(CB,\ Q,\ FSS,\ VP) = O_{claim}, \qquad (1)$$

where CB=$\{P_1, P_2, ...P_i...P_n\}$ is the case base, Q is the query case, VP denotes the viewpoint of the Side 1, and FSS defined in [3] is the context, O_{claim} is the output. When FSS satisfies :

$$FSS = Max\{f(Q,\ P_i)\}_{i=1}^{n},\ P_i \in CB, \qquad (2)$$

it is known that $O_{claim} = P_{mopc}$, $f(Q \cap P_i)$ is computed by equation (3.6).

2. Side 2's Objection

Another side finds the distinction between the query case and the case P_{mopc}, and emphasizes it. The distinction includes the difference between the shared factors, and the unshared factors. The former is to find the difference between the values of shared factors.

$I_{objection}$={ The factor O_{df}^{Q} that has the most high dissimilarity degree $FSDS_Q$ in the query case}∪{ The factor O_{df}^{P} that has the most high dissimilarity degree

$FSDS_P$ in the precedent P_{mopc}}∪{ The shared factor O_{dv} that has different factor values}

They are decided by the Factor-based similarity.

$$R_{factor}(P_{mopc},\ Q,\ FSDS_Q,\ VP) = O^Q_{df}, \quad (3)$$

$$R_{factor}(Q,\ P_{mopc},\ FSDS_P,\ VP) = O^P_{df}, \quad (4)$$

$$R_{factor}(P_{mopc},\ Q,\ FVDS,\ VP) = O_{dv}. \quad (5)$$

The similarity measures should satisfy the following equations.

$$FSDS_Q = f(Q - P_{mopc}), \quad (6)$$

$$FSDS_P = f(P_{mopc} - Q). \quad (7)$$

$FVDS$ means the Factor Value Dissimilarity.

If $I_{objection}$ cannot be found out, side 1 wins.

3. Side 1's Rebuttal

The first side downplays the dissimilarity by finding the factors that can disregard the difference emphasized by the other side by the evaluation function introduced in the last chapter. The distinction found by the side 2 is evaluated by the side 1.

$I_{rebuttal}$={ The abstract factor O_{sf} that can downplay the differences }

$$E_{factor}(P_{mopc},\ O^Q_{df},\ CX,\ VP) = O^{P_{mopc}}_{sf}, \quad (8)$$

$$E_{factor}(Q,\ O^P_{df},\ CX,\ VP) = O^Q_{sf}, \quad (9)$$

where CX is a set of abstract factors of the fuzzy factor hierarchy, $O^{P_{mopc}}_{sf} \in CX$ and $O^Q_{sf} \in CX$ are outputs, and VP is the viewpoint of the Side 1.

If $I_{rebuttal}$ cannot be found out, side 2 wins.

In these 3 steps, if there are relevant cases supported each side, then they should be cited.

By these 3 steps, the legal argument model is structured as shown in Figure 3. A context-sensitive interpretation $I_{inference}$, namely, the output of the proposed argument model, can be obtained by the following formula.

$$I_{inference} = I_{claim} \cup I_{objection} \cup I_{rebuttal}. \quad (10)$$

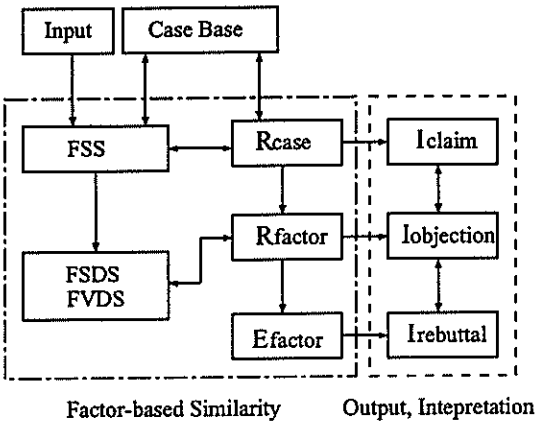

Figure 3: The Legal Argument Model in FLA

4 Experiment

This experiment is based on the vague concept and the cases of the CISG. The vague concept "*The proposal is sufficiently definite*" in the CISG is employed to illustrate how to make a legal argument by the proposed approach.

The query case *Cultivator Case* mentioned in [4, 5] is used again here.

The description of "The proposal is sufficiently definite" concerning the price in the query case is the following:

The price of the tractor is fixed.
The price of a set of *Cultivator* is not fixed.
The *Cultivator* contains a rake.

Students can at first decide the degrees that this query case has the factors by referring to the atomic factors of the fuzzy factor hierarchy, then in the light of of the output of the legal argument to learn the argument skill and further comprehend the meaning of the vague concept and the query case by comparing with the argument made by himself.

In the case base that is used in this module, there are 8 precedents that are the same as the precedents in FLCBR module. They are represented again by the fuzzy factor hierarchy, for example, the atomic factors of *Jet Engine Case* related to the issue are as follows:

f_1: The important part has a price
f_2: The attachment has no price
f_3: The attachment is not sold in market
f_5: There is an important part in the goods

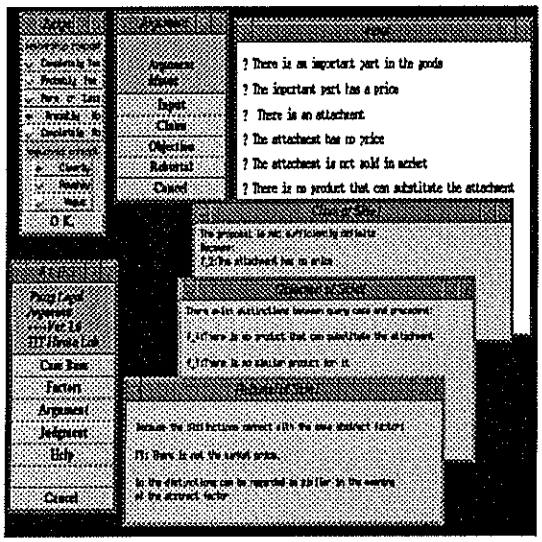

Figure 4: An Example of the Legal Argument

f_6: There is an attachment
f_7: There is no similar product for the attachment

If the following atomic factors are considered to be the properties of the query case *Cultivator Case*, an example of the output of this system for the query case is shown in Figure 4.

f_1: The important part has a price
f_2: The attachment has no price
f_3: The attachment is not sold in market
f_4: There is no product that can substitute the attachment
f_5: There is an important part in the goods
f_6: There is an attachment

The explanation for the process of the argument is as follows.

Plaintiff's Claim

The proposal of the query case is not sufficiently definite, because it has the most high similarity degree with the *Jet Engine Case* that has the conclusion: the proposal is not sufficiently definite, because the query case has the factors f_2, f_3.

Defendant's Objection

Jet Engine Case case is not applicable to the query case, because there is f_4 in the query case, and f_7 in the precedent.

Plaintiff's Rebuttal

Jet Engine Case case is still applicable to the query case, even though there is f_4 in the query case, but it is the same as the f_7 in the *Jet Engine Case* under the meaning of the abstract factor F_7. They both support the abstract factor F7: there is not the market price. So, the proposal is not sufficiently definite.

The output of the system is different with the judgments selected by the user. It is helpful for users to know that results are changed by the different inputs. It also helps users to learn the skill of making legal argument. And, it is also helpful for students to understand the meaning of the statutory rules of the CISG and the meaning of the precedents and query case from the viewpoints of plaintiff and defendant.

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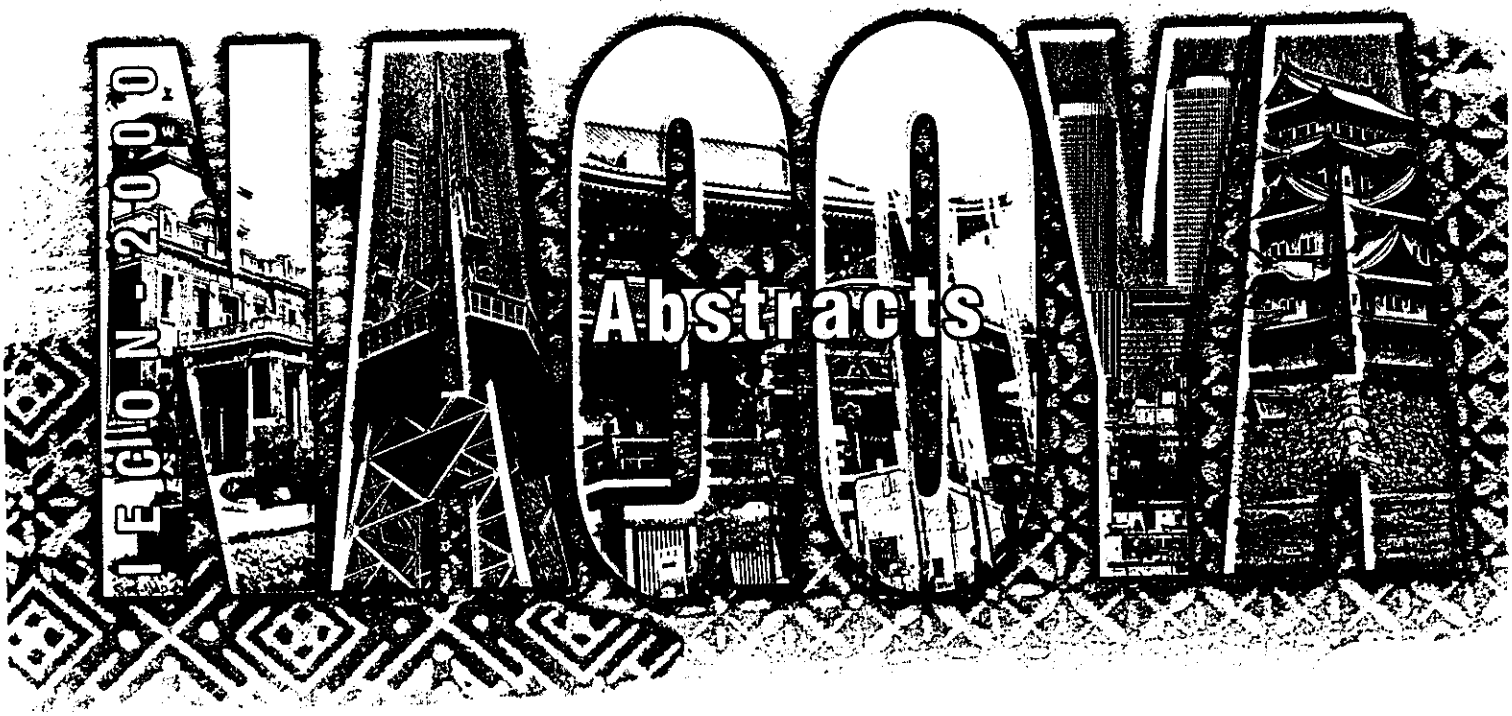

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