A Legal Reasoning System new HELIC-II

ICOT
Second Research Department

Tsuyoshi Sakata

Contents

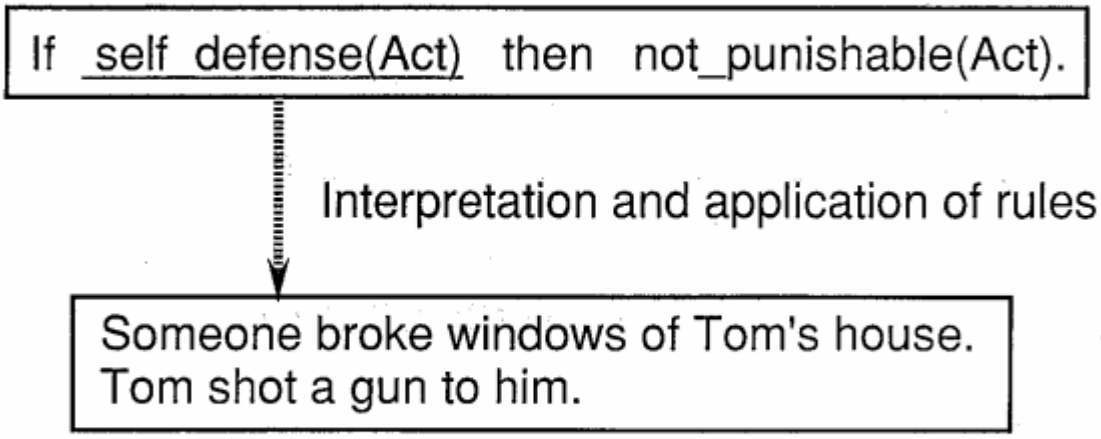
1. Analysis of Legal Reasoning

2. A Legal Reasoning Model

3. Overview of the new HELIC-II
   - Function of argumentation
   - Function of debate
     Example of Debate

1. Analysis of Legal Reasoning

(1) problem of legal rule = vague concept

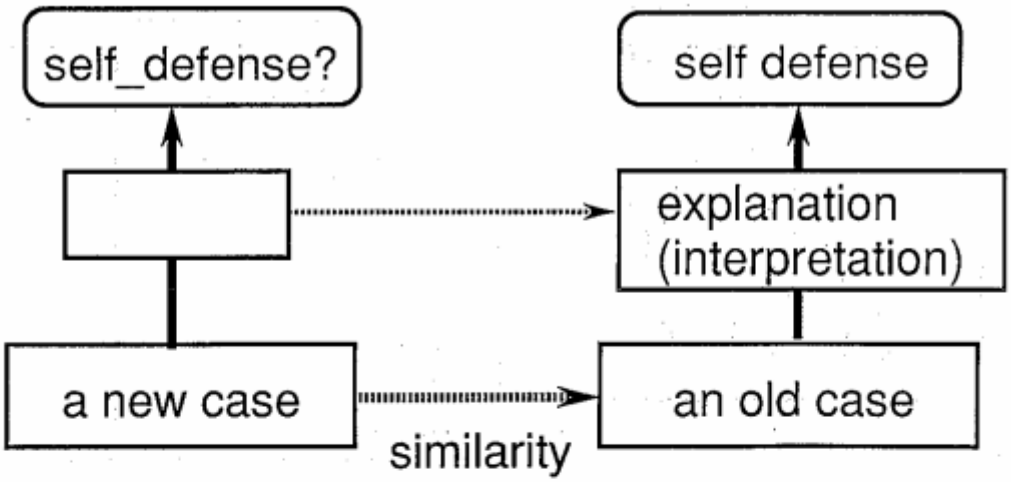


(2) Interpretation of legal rules

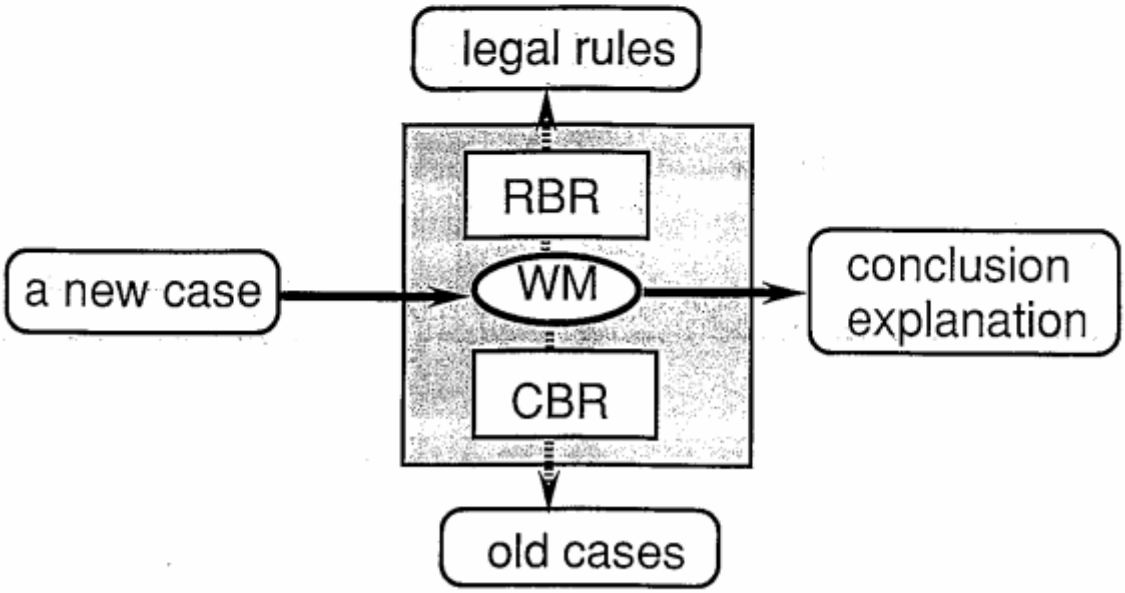
rules of interpretation
- legislative intent theory
  - vs. literal interpretation theory
  - vs. free interpretation theory

various knowledge is used for interpretation
- Social customs
- Morals
- Criminal policy
- .....

(3) Interpretation and judicial precedents

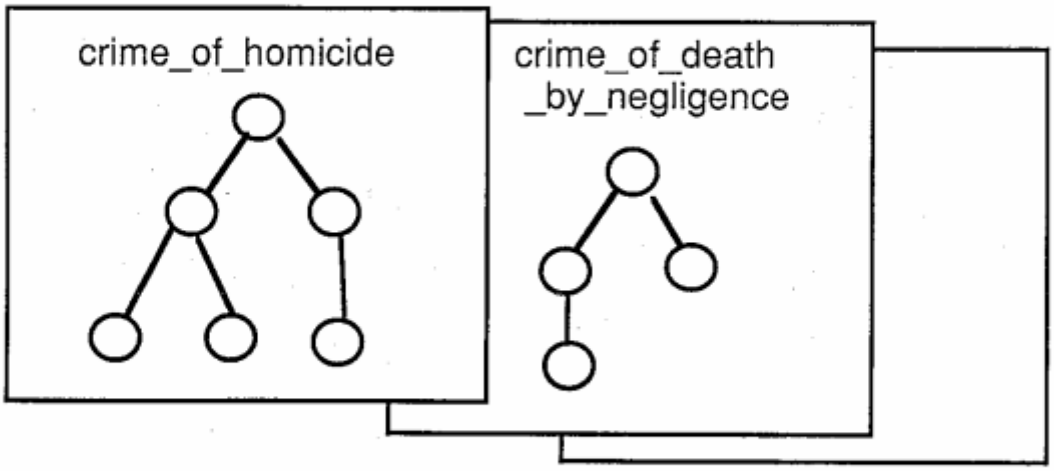


(4) (old) HELIC-II system

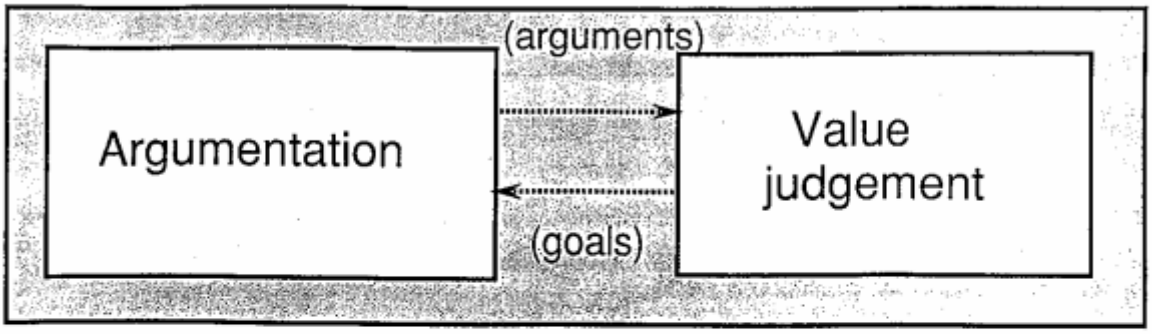


(5) Output of (old) HELIC-II

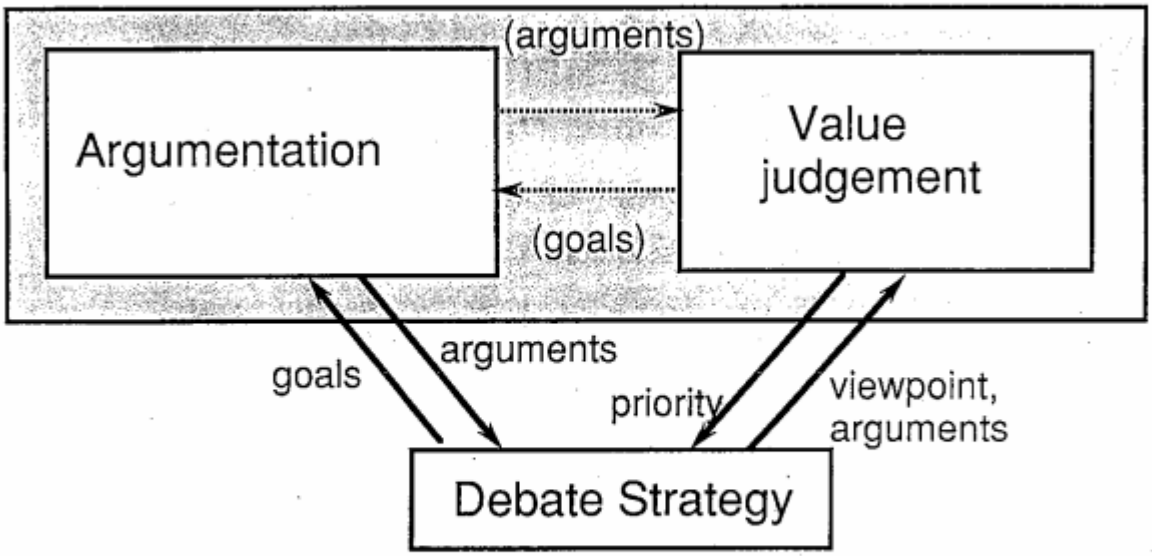
inference trees = conclusion + explanation



(6) Reasoning of the judge

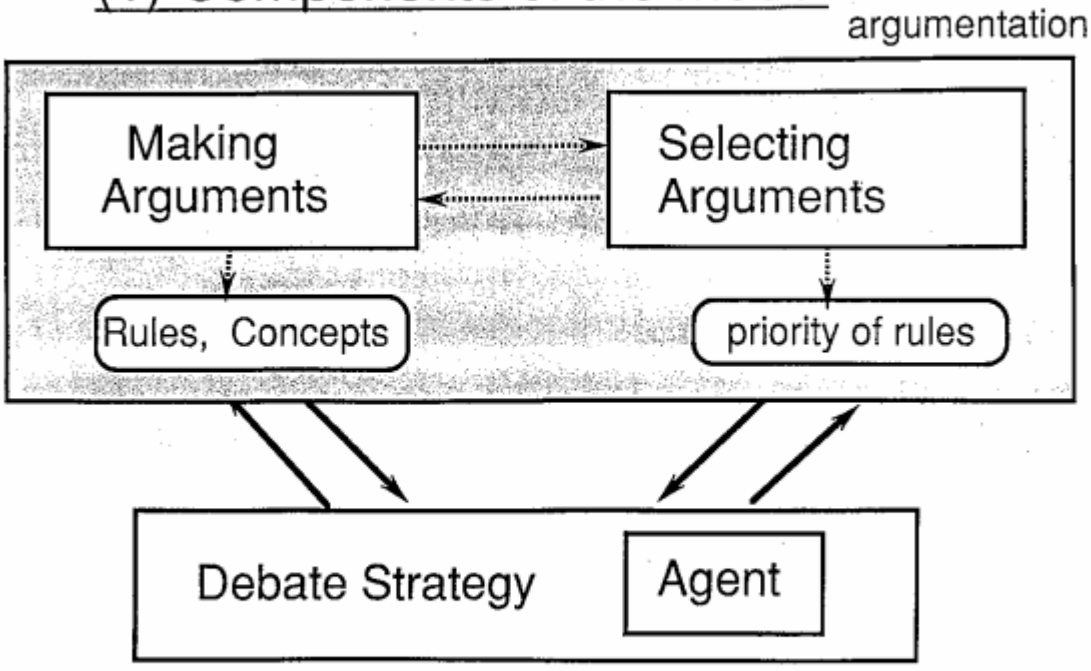


(7) Reasoning of both parties



2. A Legal Reasoning Model

(1) Components of the model



(2) Components and reasoning methods

Making Arguments

Deductive Reasoning

Generalization of rules

Selecting Arguments

Defeasible Reasoning

Debate Strategy

Hypothetical Reasoning

3. Function of Argumentation

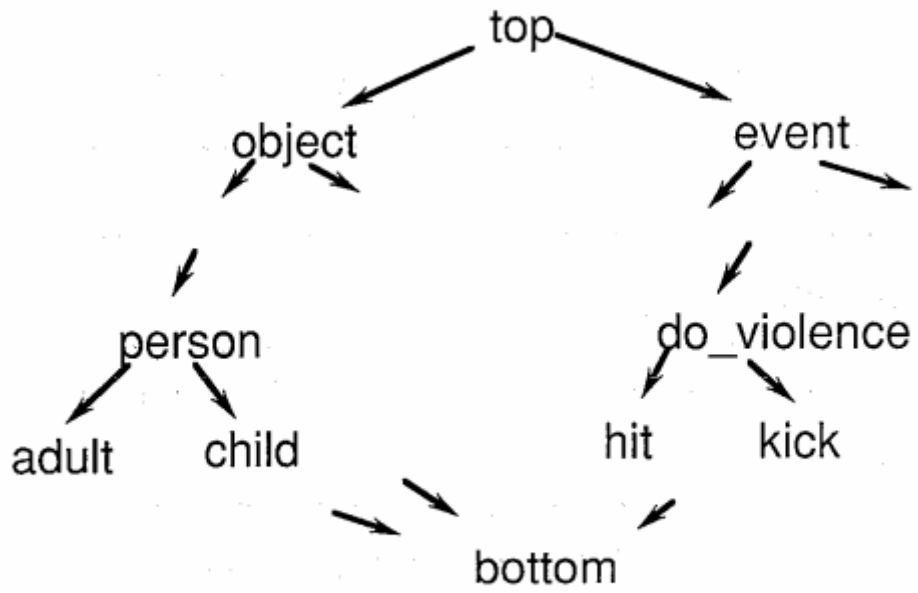
(1) knowledge representation

type-based logic programming language

generalization of rules

defeasible reasoning based on priority of rules

(1.1) type



(1.2) rule

```
- punishable(a_object= @act)
        <-  act(agent=person[age=>[0...14]).

crime_of_robbery(a_object= #act)
        <-  hit(agent=tom, object=bill)¦#act,
            - with_intent(a_object=#act,
                          goal=robbery),
            injured(a_object=bill, cause=#act),
            .....
```

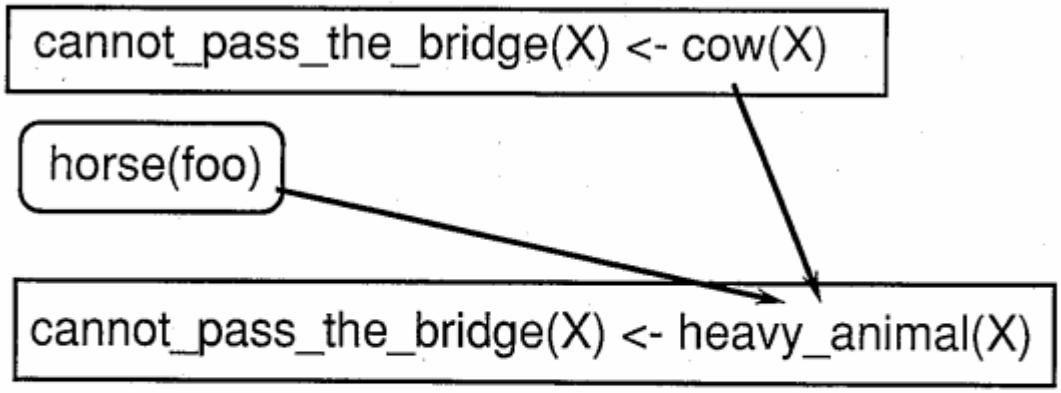
(1.3) viewpoint

Tom's viewpoint:=
{ public_order > freedom_of_press}.

public_order:=
{ inhibit_obscene_literature > protect_art }

protect_art:= { case1, case3,.....}

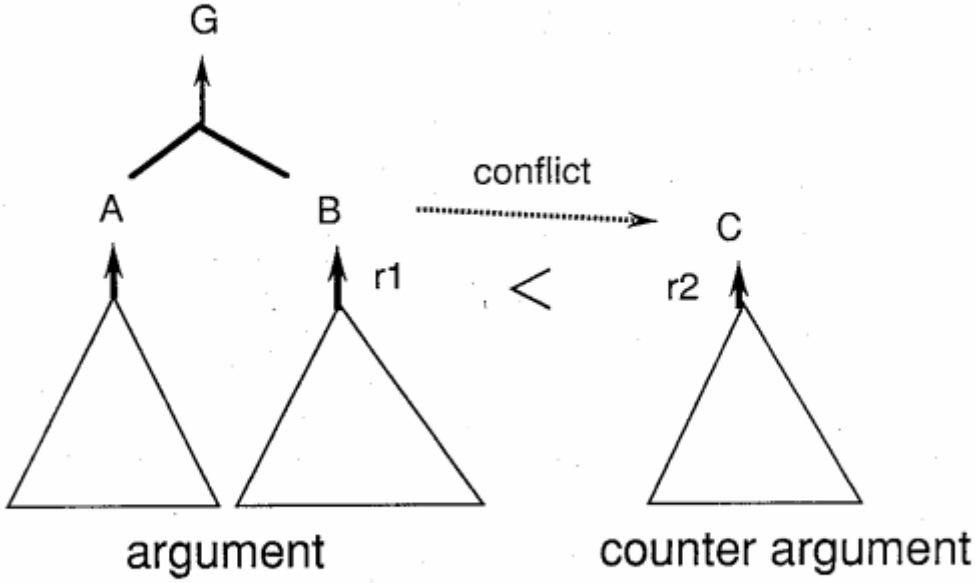
(2) generalization



- widening interpretation
- similarity based matching

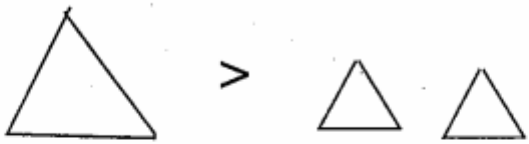
(3) Defeasible Reasoning

(3.1) counter argument

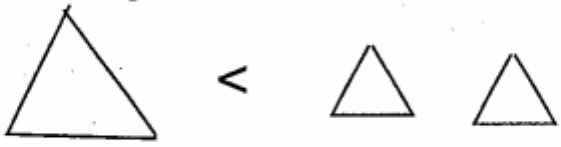


(3.2) Types of arguments

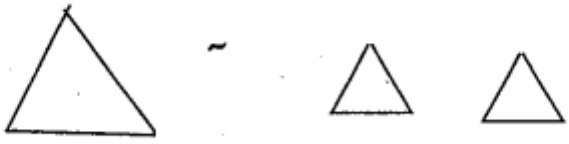
Justified Argument



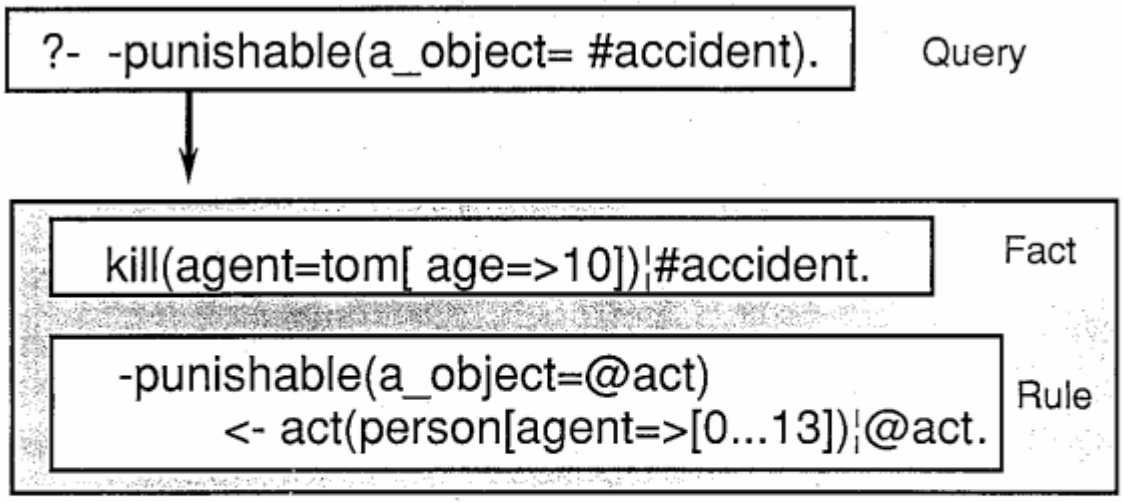
Defeated Argument



Merely Plausible Argument

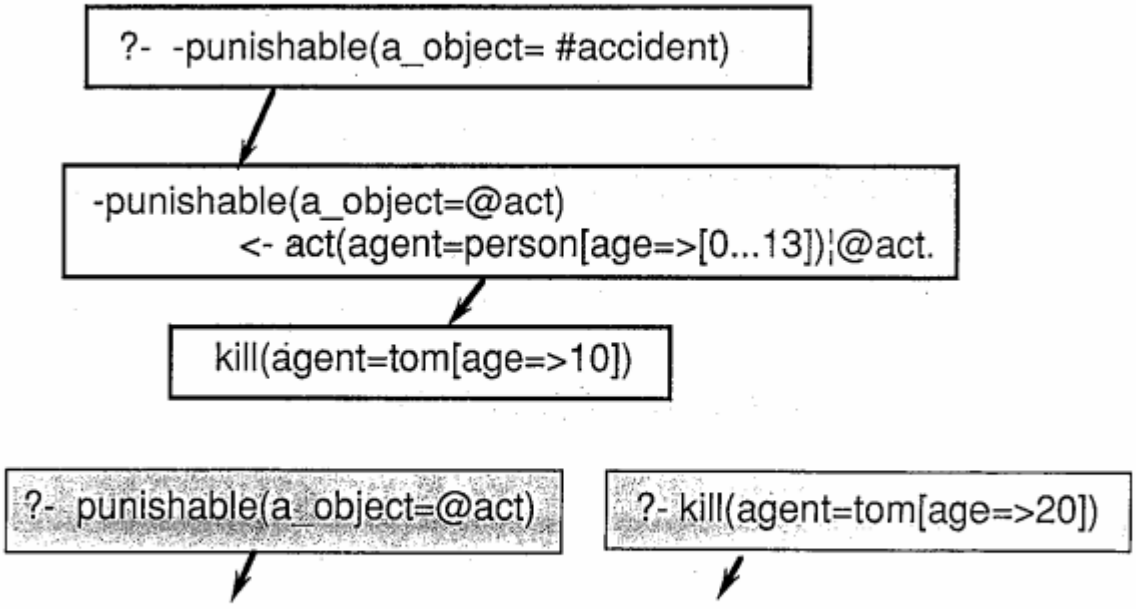


(3.3) Query mode



Normal Mode and Analysis Mode

(3.4) Resolution



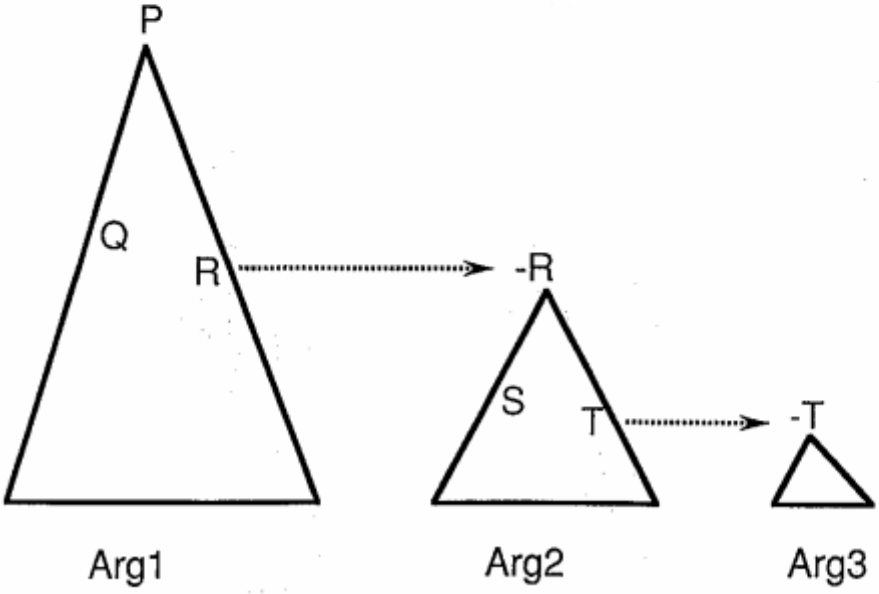
4. Function of Debate

(1) Assumption

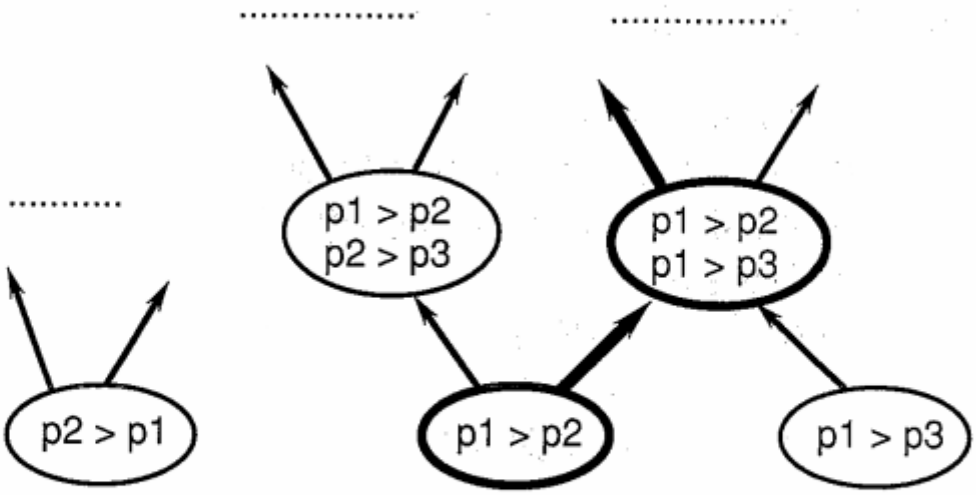
Two agents game.
Both agents have different viewpoints.
Arguments are compared by defeasible reasoning
Possible actions

- make (counter) arguments
- find issue points
- modify viewpoint

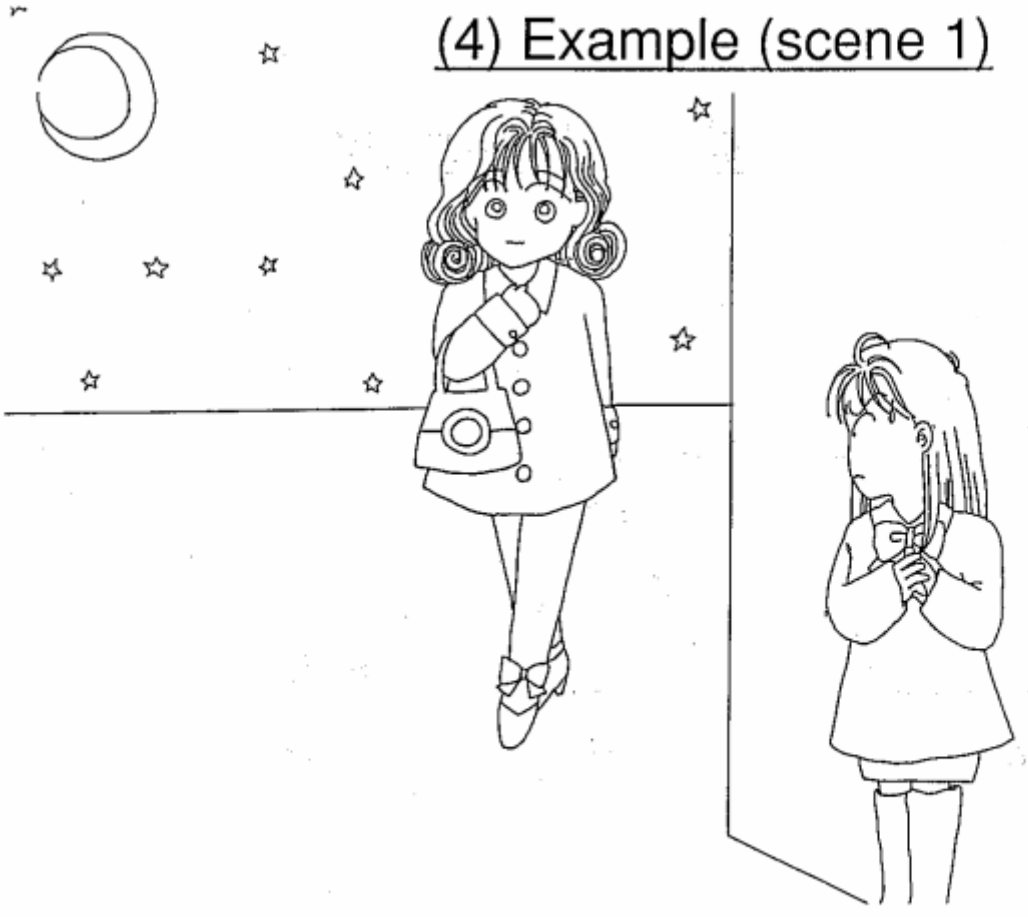
(2) Depth First Strategy



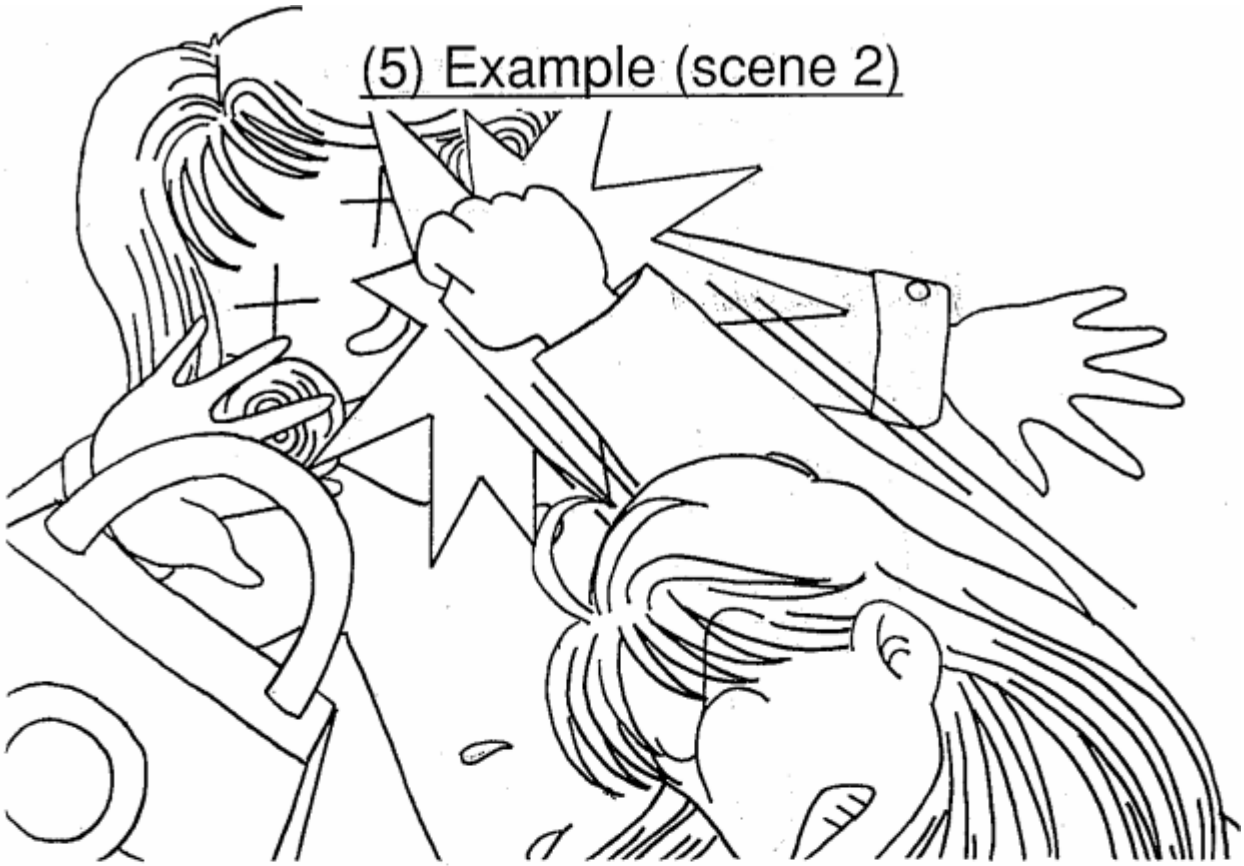
(3) Modification of Viewpoint



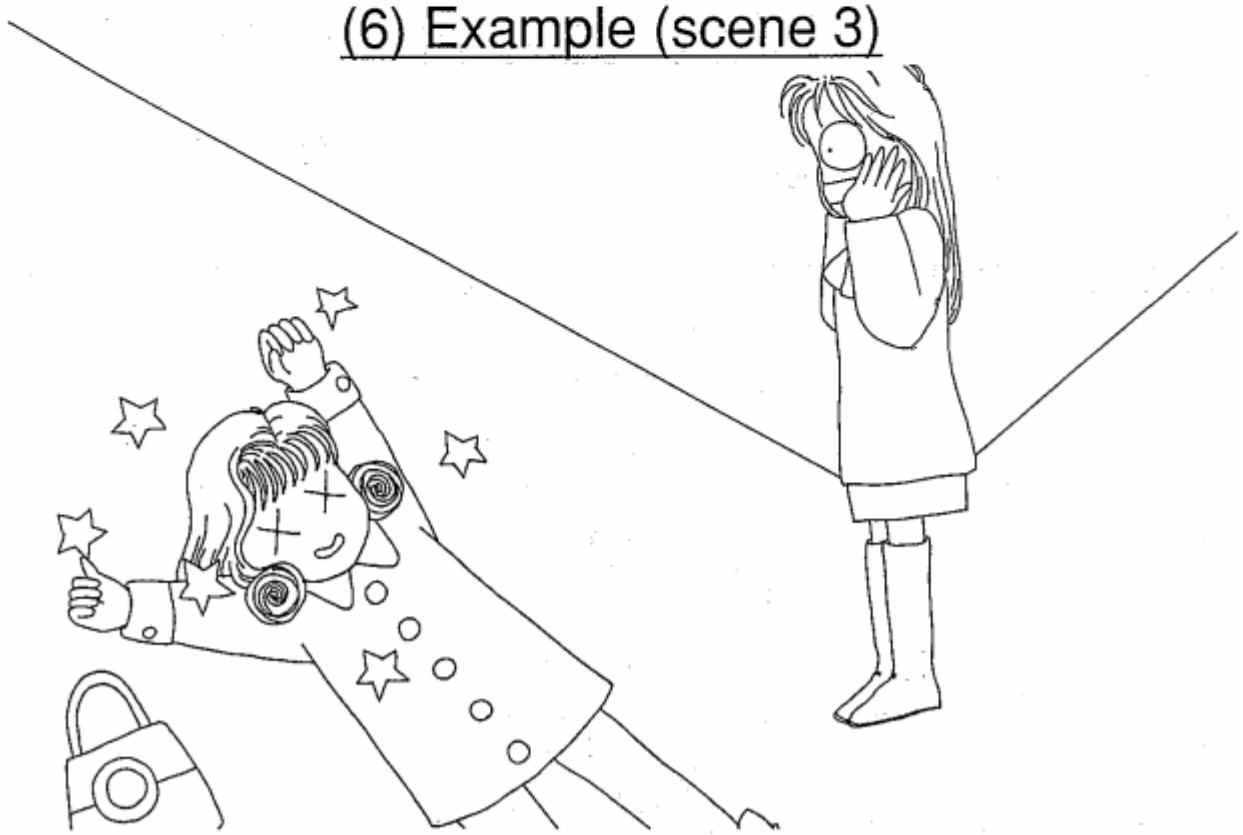
(4) Example (scene 1)



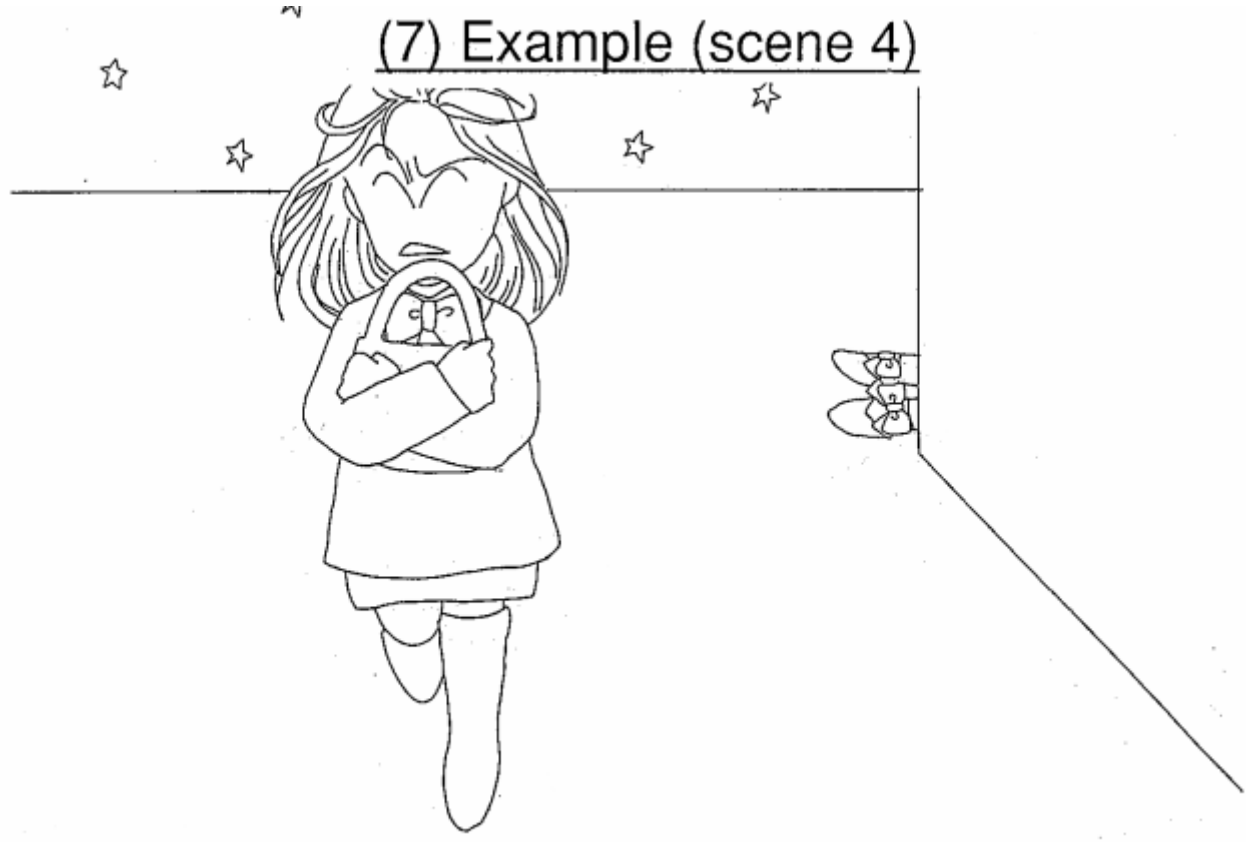
(5) Example (scene 2)



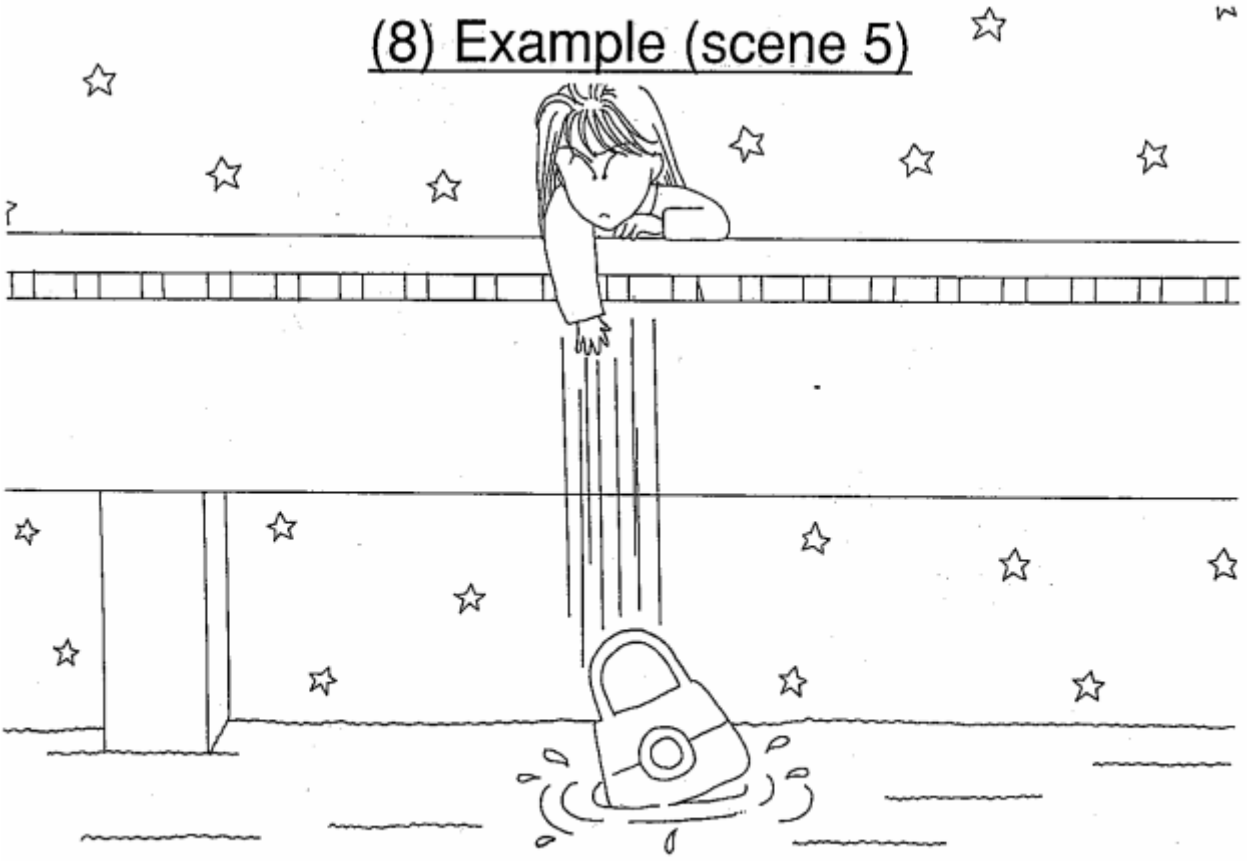
(6) Example (scene 3)



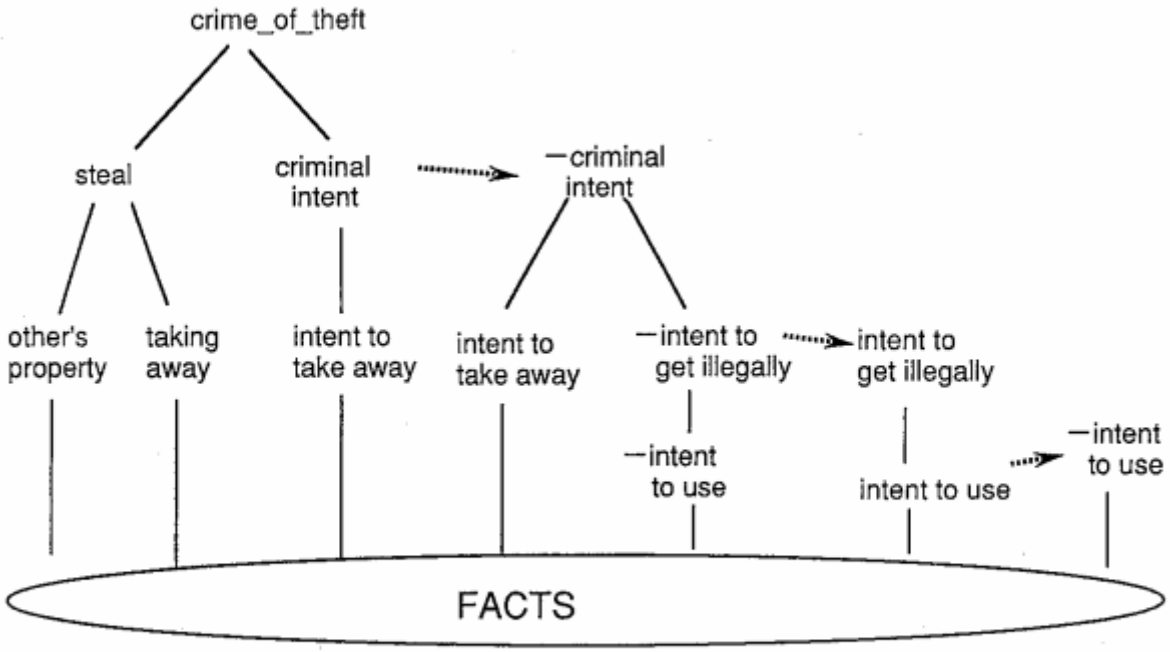
(7) Example (scene 4)



(8) Example (scene 5)



(9) Example of Debate Process



5. Conclusion

A legal reasoning model
- making arguments
- selecting arguments by value judgement
- debating

the new HELIC-II system
- an experimental tool on Unix environment
- knowledge base of criminal law
- knowledge representation for legal reasoning