Abstract

This study aims to propose a formalization of a judge's belief change in terms of dynamic epistemic logic (DEL). Belief revision is an important concept for a judge to decide if he/she will believe the received information or not. Reliability among witnesses is usually considered to be a key issue for judgment. That is, when a judge receives a piece of information from a witness, he/she has to decide if such witness is reliable or not. If the judge considers such witness to be reliable, he/she will accept the received information. In order to formalize this situation, we apply the notions of signed information and reliability relation to represent an information source and its reliability, respectively. Furthermore, the judge may change his/her reliability for the other witnesses, when he/she receives a new piece of information from one of them. This process is called reliability change. This shows that the connection between belief change and reliability change is an important aspect. In order to capture changing of both belief and reliability, six dynamic operators are proposed. Three operators including upgrade, downgrade and joint downgrade are used to change the reliability of some agents with respect to a specific agent's perspective. That is, the upgrade operator is employed for making some agents more reliable, while downgrade and joint downgrade operators are applied for downgrading all of them. Belief change can be handled by private announcement, private permission and careful policy. The first operator is used to remove some beliefs, while the second one is used to restore the former beliefs. The careful policy aims to derive an agent's belief from the received signed information.

Since our goal of this study is to realize a judge's changing of belief and reliability in a judgment process by DEL, we need to consider two difficulties for applying DEL to a legal case. First, since a key feature of DEL is that possibilities in an agent's belief can be represented by a Kripke model, our question is how we can construct the model from a legal case. Second, since this study employs several dynamic operators, our question is how we can decide which operators are to be applied for changing belief and reliability. In order to solve these difficulties, we propose an analysis method and then implement a computer system which provides two functions. First, the system can generate a Kripke model from a legal case. Second, the system provides an inconsistency management policy which can automatically perform several operations in order to reduce the effort needed to decide which operators are to be applied. By our analysis method and implementation, the above questions can be adequately solved. In addition, six legal cases are analyzed to demonstrate our implementation.

Keywords: Belief change, Belief revision, Reliability change, Legal case, Judgment, Dynamic epistemic logic