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A rule based knowledge transaction model for mobile environments

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Abstract

In this paper, we propose and formalize a rule based knowledge transaction model for mobile environments. Our model integrates the features of both mobile environments and intelligent agents. We use logic programming as a mathematic tool and formal specification method to study knowledge transaction in mobile environments. Our knowledge transaction model has the following major advantages: (1) It can be used for knowledge transaction representation, formalization and knowledge reasoning in mobile environments. (2) It is knowledge oriented and has a declarative semantics inherited from logic programming. (3) It is a formalization that can be applied to general problem domains. We show that our model can be used for knowledge transaction representation, formalization and knowledge reasoning in mobile environments.

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Keywords: Knowledge transaction model; Mobile environments; Logic programming

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1. Introduction

Study on knowledge base and intelligent agent in mobile environments is a very new and meaningful research topic. As a practical scenario in this research area, a company manager may use mobile host to do the rule based decision making and negotiation. We believe that the investigation on intelligent agent and knowledge base in mobile environments is critical because this will help us to find a way to significantly improve current mobile systems. Comparing to the stationary environment, the mobile environment has a few specific properties such as mobility and disconnection. The issue of data and knowledge transaction has presented new challenges for researchers in mobile environments, such as knowledge representation, reasoning and knowledge transaction processing in this kind of environments. Currently, there is a separation between intelligent agents community on one side, and the mobile systems community on the other side [23,29,36,38]. Various proposals and systems have been developed in order to deal with data transaction processing in mobile environments [1,6,22,30], but these approaches concentrate on data not knowledge transaction under mobile environments. The current knowledge representation, reasoning and problem solving languages and models are discussed most in conventional environments [4], and no much formal study has been conducted to the issue of knowledge transaction in mobile environment. As the first step, this paper addresses the accounts of knowledge transaction processing language and model in mobile environments by developing a new knowledge transaction model for mobile environments. In comparison with previous work, the formalized knowledge transaction model has the following major advantages: (1) It can be used for knowledge transaction representation, formalization and knowledge reasoning in mobile environments. This extends the application domains of knowledge representation and reasoning for problem solving in conventional environments, such as logic programming, extended logic programming, stable model, SMODEL, DLV and XSB [4,14,18,31,34]. (2) It is knowledge-oriented and has declarative semantics inherited from logic programming so it can be used to study knowledge transaction at a high level. This is different to all the works that only deal with data transaction [1,8,13,22,30]. (3) It is a formalization that can be applied to general problem domains, which is different from most previous approaches that suffer from a lack of formal specification and, thus, only can be ad hoc for specific systems and environments [1,6,22,30].

The motivation we use extended logic programming [19,26] as a mathematical tool to study knowledge transaction in mobile environment is that (1) this method can represent knowledge related domain information; (2) it can represent incomplete information explicitly and can conduct knowledge reasoning using inference rules; (3) some systems have been implemented using logic programming such as SMODEL, XSB and DLV, therefore our formalization

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