AGENT-ORIENTED DECISION MAKING FRAMEWORK, CONCEPTUAL SEMANTIC MODEL, AND ARCHITECTURE DEVELOPMENT FOR INTELLIGENT FINANCIAL DECISION SUPPORT SYSTEMS

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APRIL 2010
Agent-oriented decision making framework, conceptual semantic model, and architecture development for intelligent financial decision support systems

Submitted to
Department of Information Systems
for the Degree of Doctor of Philosophy

By

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April 2010
The demand for computer-based decision support services is rising dramatically in modern financial world. Human life is heavily dependent on technology, as people are facing all kinds of complicated, dynamic and distributed problems all the time. Under this circumstance, numerous different kinds of decision support systems (DSSs) have been researched, designed and implemented in almost every financial aspect, including portfolio risk management, automated securities trading, family financial planning, anti-money laundering, target selection in hedge fund activism and etc. However, existing financial DSSs (FDSSs) are suffering from certain drawbacks such as ineffective thresholds, insufficient data processing capability, lack of popularity, flexibility, adaptability and collaboration, and insufficient data processing capability. Some existing intelligent financial decision support systems (IFDSSs), which are claimed to be intelligent enough to overcome these common problems, are constructed without solid theoretical foundation. In order to solve these problems, intelligent agent technology is applied in this research to deal with the complex, uncertain, and inevitable real world financial problems. Agent-oriented conceptual models are proposed for providing a unified framework for analysis, design and implementation of IFDSSs. Furthermore, a multi-agent system architecture is also designed by applying the model.

Modeling is an essential aspect of information systems development. Indeed, an information system can be viewed as a representation, or a model, of another system (usually termed the real system). Modeling is especially important in the analysis stage of systems development when abstract models of the represented system and its organizational environment are created. A conceptual model should reflect knowledge
Abstract

about the application domain rather than about the implementation of the information system. Conceptual modeling has been defined as a formal description of “some aspects of the physical or social reality for the purpose of understanding and communicating” (Mylopoulos, 1992). This study depicts the conceptual models for IFDSSs, including the more general and high-level decision making process model, and the derived conceptual model for IFDSSs in semantic schema containing the overall knowledge representations.

To demonstrate the usability and effectiveness of the model and the system architecture proposed, and possible development mechanism is discussed. Moreover applications in two applicable financial domains are presented in the study, including family financial planning system (Gao, Wang, and et al., 2004; Gao, Wang, and et al., 2005; Gao, Wang, and et al., 2006a; Gao, Wang, and et al., 2006c), anti-money laundering system (Gao, Wang, and et al., 2006b; Wang et al., 2006; Wang et al., 2007; Wang et al., 2008), and target selection in hedge fund activism (Lai, Wang, and et al., 2009). In each application domain, mapping model and architecture are provided and discussed in detail, and prototype system is designed and implemented, and evaluated.

The major contributions of this research are the theoretical investigations of the decision making process in different financial domains and the general framework for design and implementation of intelligent financial decision support systems. This study starts from the high-level conceptual modeling of the domain knowledge, on basis of the knowledge representation and in-depth understanding of the general financial problems, and then develops the system architecture. Afterward, applications in different applicable domains are discussed so that the conceptual models and system architecture are validated and evaluated.
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