Chapter 1
A Clustering Approach Based on Cooperative Agents to Improve Decision Support in ERP

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ABSTRACT

Multi-agent systems (MAS) are a powerful technology for the design and implementation of autonomous intelligent systems that can handle distributed problem solving in a complex environment. This technology has played an important role in the development of data mining systems in the last decade, the purpose of which is to promote the extraction of information and knowledge from a large database and to make these systems more scalable. In this chapter, the authors present a clustering system based on cooperative agents through a centralized and common ERP database to improve decision support in ERP systems. To achieve this, they use multi-agent system paradigm to distribute the complexity of k-means algorithm in several autonomous entities called agents, whose goal is to group records or observations on similar objects classes. This will help business decision makers to make good decisions and provide a very good response time by the use of the multi-agent system. To implement the proposed architecture, it is more convenient to use the JADE platform while providing a complete set of services and have agents comply with the specifications FIPA.

INTRODUCTION

Nowadays, the managers of the companies must make the right decision at the real time based on the information at hand. For this reason, most companies integrate information communication technology in their enterprise resource planning (ERP), to improve their decision-making process. An ERP is designed for very large companies; they are now implanted in SMEs Adam and O'doherty (2000). These packages constituted a set of functional modules covering the domains of finance, human resources, logistics, production, marketing and sales, integrated around a single database Philippe (2006). This software helps to manage the whole process within a company by integrating all those functions Lequeux (1998).

Moreover, ERP offers a decision module, allows more or less sophisticated processing on the ERP database to help executives make the right decisions at the right time. This decision module makes it possible to use intuitively the wealth of ERP data and meet the needs of multiple functions simultaneously: production, logistics, finance, sales, etc. It also allows all employees, regardless of their profession, to make relevant decisions based on performance indicators and to accurately track the objectives set for all departments of the company Mesbahi and Kazar (2015).

In this context and to support the decision making of the ERP, several approaches and techniques have been proposed, but they remain insufficient. For this reason, the Knowledge Discovery from Databases (KDD) and the Data Mining can bury in large databases in order to enhance the information and extraction of new decision-making knowledge and/or forecast (Nimmy et al.,2017). The KDD has become a new edge technology used to achieve the decision-making in the companies. (Karaa, Mannai, Dey, Ashour, & Olariu, 2016) It also facilitates the verification of the consistency of the data to ensure the quality of the decision. (Kausar et al., 2016) Therefore, the aim of data mining is to valorise data information in companies' information systems.

Therefore, we suggest a clustering approach based on cooperative agents to integrate the data-mining module with ERP platform, for improve decision support in ERP systems. We use the paradigm of the multi-agent system and the data mining technique k-means, which is dedicated to the task of clustering, for discover useful knowledge hidden in the ERP database and to improve the quality of response times. Moreover, in our approach, the integration of expert prior Knowledge in a data mining process is crucial for improving datasets preparation. In order to assure this integration, an ontology ERP is built by analyzing existing database ERP with the collaboration of expert users who play a central role. The design of this ontology is directed to facilitating the preparation of datasets.

In this overview, our work will be organized as follows:

A general introduction followed by a presentation of emerging technologies such as ERP systems, knowledge discovery in data and Multi-agents system. We will describe later, the related work, the proposed approach for extracting knowledge from ERP and modelling Multi-Agents of Data Mining based K-means. Then, we describe the JADE platform adapted to implement the proposed approach. Finally, a conclusion and perspectives of study will conclude this work.

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