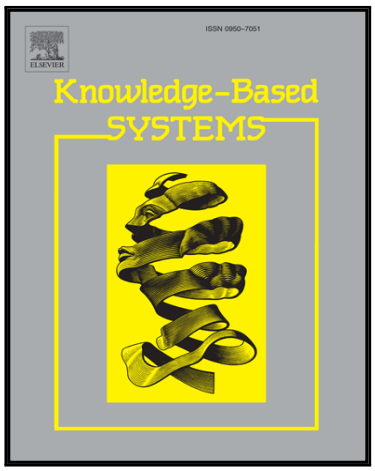

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Enhanced visual data mining process for dynamic decision-making

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Abstract

Data mining has great potential in extracting useful knowledge from large amount of temporal data for dynamic decision-making. Moreover, integrating visualization in data mining, known as visual data mining, allows combining the human ability of exploration with the analytical processing capacity of computers for effective problem solving. To design and develop visual data mining tools, an appropriate process must be followed. In this context, the goal of this paper is to enhance existing visualization processes by adapting it under the temporal dimension of data, the data mining tasks and the cognitive control aspects. The proposed process aims to model the visual data mining methods for supporting the dynamic decision-making. We illustrate the steps of our proposed process by considering the design of the visualization of the temporal association rules technique. This technique was developed to assist physicians to fight against nosocomial infections in the intensive care unit. Actually, an evaluation study *in Situ* was performed to assess the automatic prediction results as well as the visual representations. At the end, the test of the efficiency of our process using utility and usability evaluation shows satisfactory.

Keywords: dynamic decision-making; visualization; data mining; cognitive modelling; association rules

1. Introduction

In today's real-time applications, temporal data is produced at increasing rates. In this context, dynamic decision-making, visualization and data mining are important trends and acquire a more and more significant place in research works [5] [9] [28] [29] [45]. As a matter of fact, visualization and data mining integration in the dynamic Decision Support Systems (DSS) reduces subjectivity and provides a new interesting visual knowledge for decision-makers [49] [50].

Visualization and data mining technologies must closely be associated to each other providing the visual data-mining field [32] [45] [50]. In fact, the contribution of data mining is in the useful patterns identification to provide support for dynamic predictions to be integrated into the decision-making process for decision planning [51]. While the data mining methods offer expertise, temporal visualization assists data miners in understanding the different levels of hidden information in large-scale temporal data [28] [40] [71].

To design and develop visualization techniques, we must follow different steps of the visualization process with regards to Human computer interaction. It is the process of generating views and producing appropriate interaction techniques for a specific data set. Indeed, the research on visualization should not stop at designing and generating representations but should also study how visualization affects decision-maker thinking, comparing and reasoning [44], by referring to a cognitive model, such as those proposed by J. Rasmussen [55]