Chapter XIII

Ripple Down Rules: A Technique for Acquiring Knowledge

Debbie Richards
Macquarie University, Australia

ABSTRACT

Knowledge is becoming increasingly recognized as a valuable resource. Given its importance it is surprising that expert systems technology has not become a more common means of utilizing knowledge. In this chapter we review some of the history of expert systems, the shortcomings of first generation expert systems, current approaches and future decisions. In particular we consider a knowledge acquisition and representation technique known as Ripple Down Rules (RDR) that avoids many of the limitations of earlier systems by providing a simple, user-driven knowledge acquisition approach based on the combined use of rules and cases and which support online validation and easy maintenance. RDR has found particular commercial success as a clinical decision support system and we review what features of RDR make it so suited to this domain.

INTRODUCTION

Knowledge, in particular tacit knowledge, has been recognised as a key factor in gaining a competitive advantage (van Daal, de Haas & Weggeman, 1998). The soft and intangible nature of knowledge has led to increased utilisation of techniques...
such as mentoring and group activities. However, many organisations are looking for technology-based solutions to help them with knowledge management (KM). It is therefore surprising that expert systems, which are concerned with the acquisition and application of knowledge, are less commonly used than techniques such as data warehousing and data mining to assist KM. The very mention of the term expert systems (ES) can bring responses such as: research in that area is dead, they didn’t deliver, and don’t use that word when you speak to industry. Despite negative perceptions held by many, the reality is that while ES had shortcomings, there are successes and ES research is alive. Current research now uses the term knowledge-based systems (KBS), primarily to cover past stigmas, and includes research into knowledge management, modeling and acquisition.

Some of the problems suffered by first-generation ES include: difficult knowledge capture, brittleness, unnatural dialogues and explanations, unmaintainability, and inability to scale-up or reflect on their knowledge. To address these problems second-generation ES research is focused on modeling knowledge above its symbolic representation and at the knowledge level (Newell, 1982). The use of methodologies and extensive a priori analysis and modeling required by these approaches has achieved some industrial success by ensuring that products are systematically developed through to completion. However, due to the situated nature of knowledge (Clancey, 1997) and the unreliability of models (Gaines & Shaw, 1989) such structure has resulted in approaches that have done little to alleviate the original knowledge acquisition (KA) bottleneck or maintenance problems. In most approaches the user has become a third party which has exacerbated what we believe to have been the fundamental reasons for the lack of acceptance of early ES.

This chapter offers an alternative KBS paradigm. The purpose of this chapter is to describe a knowledge representation and acquisition technique, known as ripple-down rules (RDR), that tackles head-on the limitations of first-generation ES while avoiding some of the new problems introduced in second-generation ES. RDR are based on the view that knowledge evolves and is highly dependent on its context. To support this, RDR uses a rule-based exception structure for knowledge representation (KR) and an incremental, rapid and user-driven KA and maintenance technique that combines the use of cases and rules. RDR has found commercial success since the early 90s in the area of pathology report interpretation (Edwards, Compton, Malor, Srinivasan, & Lazarus, 1993; Lazarus, 2000) and more recently in help-desk applications (Kang, Yoshida, Motoda, & Compton, 1997). In this chapter we will consider the features and limitations of first- and second-generation ES and look at how RDR addresses these issues. We will then consider the emerging trends and future directions of KBS research.

EXPERT SYSTEMS—THEIR PAST AND PRESENT

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