ELSEVIER International Journal of Approximate Reasoning 25 (2000) 15–42

INTERNATIONAL JOURNAL OF APPROXIMATE REASONING

www.elsevier.com/locate/ijar

Approximate reasoning and conflict resolution

Ronald R. Yager *

Machine Intelligence Institute, Iona College, 715 North Avenue, New Rochelle, NY 10801, USA

Received 1 February 1999; accepted 1 February 2000

Abstract

Our focus in this work is to provide mechanisms to enable the fuzzy set based approximate reasoning (AR) system to deal with conflicts in knowledge. The basic concepts of the theory of AR are introduced. The issue of conflict is raised and some of its bizarre effects are described. We then turn to some modifications of the basic AR mechanisms to ameliorate these effects. Two approaches strong and weak entailment are investigated. Next we consider some approaches to avoid conflict. Here again two approaches are considered. The first is a weighting of knowledge with respect to our belief in the certainty of its content. The second is a prioritization of the knowledge. © 2000 Elsevier Science Inc. All rights reserved.

1. Introduction

Approximate reasoning (AR) is a very powerful mechanism for the representation and manipulation of knowledge [1–5]. It provides in one framework an extension of the classical binary logic as well as an extension of the variable-functional modeling used in many disciplines such as engineering and physics. In [6], we discuss how this system can provide a basis for the development of intelligent/information systems by allowing for the implementation of Zadeh's agenda of computing with words [7]. The fuzzy systems modeling technique which is the foundation of the very successful technology used in the

* Tel.: +1-212-249-2047; fax: +1-21-249-1689.
E-mail address: ryager@iona.edu (R.R. Yager).

0888-613X/00/$ - see front matter © 2000 Elsevier Science Inc. All rights reserved.
PII: S0888-613X(00)00045-1

construction of fuzzy logic controllers is based on the methodology of approximate.

At the heart of approximate reasoning is the idea of representing knowledge by assigning values to variables. This assignment is generally carried out by associating fuzzy sets with variables. This assignment of sets, as the value of variables, provides a natural framework for including uncertainty in our knowledge, in addition, the use of fuzzy subsets enables the representation of knowledge expressed in linguistic form. The association of sets with variables can be seen as imposing constraints on the possible value of variables, the use of fuzzy sets induces soft or graded constraints [8]. The manipulation of knowledge in AR involves combining of different pieces of knowledge. Since our knowledge is expressed in terms of sets the combining process is generally based on a conjunction like operation.

Conflict can be seen as a state in which two or more pieces of knowledge associate values with a variable that are incompatible. The appearance of conflict is a result of the state of our knowledge and not induced by the reasoning system we use, nevertheless the reasoning system must be suitably prepared to deal with this conflict. Formally the occurrence of conflict can be seen to be related to the appearance of the null set as the result of some combining operation, a situation which usually induces difficulties. In the reasoning mechanism used in classical logic the appearance of conflict results in a situation in which everything is assumed to be true. This situation is closely related to the desire to imbue the reasoning system with the very desirable property of monotonicity. The basic approximate reasoning system also has this characteristic, conflict implies everything is true. In many ways this situation is anti-intuitive. It is our purpose in this work to try to provide the approximate reasoning systems with alternative mechanisms to more appropriately handle situations in which conflict in our knowledge occurs. We first suggest two alternative mechanisms for modifying inference in AR. These mechanisms, called strong and weak entailment, modify the entailment principle, the basic inference tool in AR. Our second direction is to try to avoid or lessen the effect of conflict by relaxing the constraints imposed by our knowledge. Here we first suggest a weighting associated with each piece of knowledge and use this weight to appropriately relax the constraints imposed by the pieces of knowledge. The second approach is to prioritize our knowledge. This allows lower priority knowledge to defer to higher priority knowledge to avoid conflict.

2. Basic concepts of AR

The primary elements of an AR representation are a collection of variables, V_j for $j = 1$ to n, called atomic variables. Associated with each variable V_j is a

دریافت فوری ← متن کامل مقاله

ISIArticles
مرجع مقالات تخصصی ایران

✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
✓ امکان دانلود نسخه ترجمه شده مقالات
✓ پذیرش سفارش ترجمه تخصصی
✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
✓ دانلود فوری مقاله پس از پرداخت آنلاین
✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات