Thomas R. Roth-Berghofer
Mehmet H. Göker
H. Altay Güvenir (Eds.)

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Advances in Case-Based Reasoning

8th European Conference, ECCBR 2006
Fethiye, Turkey, September 2006
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Lecture Notes in Artificial Intelligence 4106

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Preface

This volume contains the papers presented at the 8th European Conference on Case-Based Reasoning (ECCBR 2006).

Case-Based Reasoning (CBR) is an artificial intelligence approach where new problems are solved by remembering, adapting and reusing solutions to a previously solved, similar problem. The collection of previously solved problems and their associated solutions is stored in the case base. New or adapted solutions are learned and updated in the case base as needed.

ECCBR and its sister conference ICCBR alternate every year. ECCBR 2006 followed a series of seven successful European Workshops previously held in Kaiserslautern, Germany (1993), Chantilly, France (1994), Lausanne, Switzerland (1996), Dublin, Ireland (1998), and Trento, Italy (2000), and two European Conferences in Aberdeen, UK (2002), and Madrid, Spain (2004). The International Conferences on Case-Based Reasoning (ICCBR) were previously held in Sesimbra, Portugal (1995), Providence, Rhode Island, USA (1997), Seeon, Germany (1999), Vancouver, Canada (2001), Trondheim, Norway (2003), and Chicago, USA (2005). These meetings have a history of attracting first-class European and international researchers and practitioners. Proceedings of ECCBR and ICCBR conferences are traditionally published by Springer in their LNAI series.

The ECCBR 2006 conference was held at the conference center of the Lykia-world Resort hotel in Ideniz/Fethiye, Turkey. The now traditional Industry Day started the program giving insight into fielded CBR applications. The second day was devoted to workshops on specific areas of interest to the CBR community such as Textual CBR: Reasoning with Texts, CBR in Health Sciences, Uncertainty and Fuzziness in Case-Based Reasoning, and CBR and Context-Awareness. The remaining two days featured invited talks, presentations and posters on both theoretical and applied research in CBR.

The accepted papers were chosen based on a thorough and highly selective review process. Each paper was reviewed and discussed by at least three Program Committee members and revised according to their comments.

We believe that the papers of this volume are a representative snapshot of current research and contribute to both theoretical and applied aspects of CBR research. The papers are organized into three sections: invited talks (two papers and two abstracts), research papers (31) and application papers (5).

The chairs would like to thank the invited speakers Edwina Rissland, David McSherry, and Gholamreza Nakhaeizadeh for their contribution to the success of this conference. With their invited talks on CBR in business, Michel Manago and Stefan Wess added substantially to Industry Day. Particular thanks go to the Program Committee and additional reviewers for their efforts and hard work in the reviewing and selection process.

We are also grateful for the work of the Industry Day Chairs, Bill Cheetham and Kareem S. Aggour, the Workshops Coordinator, Mirjam Minor, as well as the Chairs of the four workshops and their various committee members for preparations for Industry Day and the Workshops. We thank all the authors who submitted to the conference to make this program possible and gratefully acknowledge the generous support of the sponsors of ECCBR 2006 and their, partly long-time, sponsorship of ECCBR and ICCBR.

This volume has been produced using the EasyChair system[1]. We would like to express our gratitude to its author Andrei Voronkov. Finally, we thank Springer for its continuing support in publishing this series of conference proceedings.

June 2006

Thomas R. Roth-Berghofer
Mehmet H. Gker
H. Altay Gvenir

[1] http://www.easychair.org

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The Fun Begins with Retrieval: Explanation and CBR

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Abstract. This paper discusses the importance of the post-retrieval steps of CBR, that is, the steps that occur after relevant cases have been retrieved. Explanations and arguments, for instance, require much to be done post-retrieval. I also discuss both the importance of explanation to CBR and the use of CBR to generate explanations.

1 Introduction

Some of the most interesting aspects of CBR occur after relevant cases have been retrieved. Explanations—and here I include argument—are some of the most important, and they play a central role in CBR. They are needed to elucidate the results of the case-based reasoning—why a case was interpreted or classified in a particular way, how a new design or plan works, why a particular diagnosis is most compelling, etc.—and explanations can themselves be created using CBR. For CBR to create arguments, designs, plans, etc., much work must be done, and most of it begins after relevant cases have been retrieved [18], [23]. That is, a good part of the core of case-based reasoning occurs post-retrieval.

Since some systems like Branting's GREBE [5] and Koton's CASEY [19] create their explanations using adaptive mechanisms, it is not clear how to draw a line between so-called interpretive and adaptive CBR systems. However, it is abundantly clear that in both types the lion's share of the work is done post-retrieval. While explanation is not the focus of other adaptive CBR systems like Hammond's CHEF [16] or Cheetham's FORM TOOL [8], they do indeed accomplish their tasks post-retrieval. That is, retrieval is only an initial step in case-based problem-solving, and the fun—and most of the hard work—occurs post-retrieval.

The ability to explain one's reasoning is a hallmark of intelligence, and is—or should be—one of the keystones of CBR systems. This is so whether CBR is being used to interpret or classify a new case, or to adapt an old solution in order to solve a new problem. Too often our CBR systems—particularly those used to classify new cases—de-emphasize or even forget about the post-retrieval "R's" in CBR, like "reuse, revise, retain" [1]. Retrieval is, of course, an absolutely crucial step in CBR, but it is only one of several: it is one of the six R's in Göker & Roth-Berghofer's formulation [14] and one of the eleven in Derek Bridge's [7].

Explanation is really a kind of teaching, and can be viewed as the other side of the coin of learning. Both explanation and learning are inextricably intertwined with

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concepts, conceptual emergence, and concept change. We really thus have a longterm cycle in which cases play an integral role. Although I won't really consider the closely related problems of similarity assessment and credit assignment in this presentation, they are indeed very important to both this overarching cycle and to the inner workings of CBR, including retrieval.

Most of us know how critical the choices of similarity metric and case space structure are in CBR. Both choices are motivated by what we want to bring to the fore in the reasoning. They also dictate what will be possible to accomplish in it or explain about it. That is, there is another inescapable intertwining in CBR between notions of similarity and explanation. One can thus say that the fun also begins before retrieval.

This is especially true in systems that stop at retrieval or a slight bit beyond—what we might call CB-little-r systems—for instance, those that use retrieved examples to classify a new case (e.g., with nearest neighbor methods), or that use the results of the early steps of CBR to initiate other types of processing, like information retrieval. For instance, the SPIRE system stopped short of argument creation, but used retrieval and similarity assessment (e.g., HYPO-style claim lattices) to generate queries for a full-text IR engine [9], [44], [45]. In CB-r systems there is perhaps a more critical dependence on getting the space and metric "right" than in CBR systems that keep on processing or that can explain themselves.

In fact, explanations can help lessen the burdens of CBR systems since they make their reasoning less opaque, a requirement, I believe, for intelligent systems. Explaining the behavior of CBR systems to users is receiving new attention in recent work, with goals such as enabling systems to explain their questions [31] or to explain the space of retrieval possibilities [37]. Leake & McSherry's [24] collection on CBR and explanation demonstrates new activity in a number of directions, but current work just scratches the surface of possibilities. Even with regard to similarity and retrieval, we don't, in my opinion, have enough variety in our ideas. So, in addition to pressing for more consideration of the post-retrieval R's, I would also press for more research on the first R: retrieval.

2 Cases as Both Drivers and Aids

Cases (called exemplars or examples in other contexts) not only are drivers of the inter-looped processes of explanation and concept evolution, but they can also serve as central elements in the representation of concepts and the teaching of the art of explanation. For instance, examples can be used by themselves to produce a totally extensional representation; that is, a concept is simply considered to be the set of its positive exemplars. They can participate in hybrid representations in concert with other mechanisms like rules or prototypes or statistical models. Examples can serve as extensional annotations on rules; these can serve to help resolve ambiguities in rules or terms and to keep them up to date with new interpretations and exceptions. Concrete examples can be used to capture some of the information that statistics summarize but cannot explicitly represent. Cases—like atypical borderline examples, anomalies, penumbral cases—are particularly useful in the tails of distributions where data can be sparse.

Hybrid approaches, both in representation and reasoning, have been used in a variety of systems from the earliest days of CBR to the present: CABARET, GREBE,