

Héctor Muñoz-Avila
Francesco Ricci (Eds.)

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Case-Based Reasoning Research and Development

6th International Conference
on Case-Based Reasoning, ICCBR 2005
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Preface

The International Conference on Case-Based Reasoning (ICCBR) is the pre-eminent international meeting on case-based reasoning (CBR). ICCBR 2005 (<http://www.iccbr.org/iccbr05/>) was the sixth in this series of biennial international conferences highlighting the most significant contributions to the field of CBR. The conference took place during August 23–26, 2005 at the downtown campus of DePaul University, in the heart of Chicago's downtown "Loop." Previous ICCBR conferences were held in Trondheim, Norway (2003), Vancouver, Canada (2001), Seeon, Germany (1999), Providence, Rhode Island, USA (1997), and Sesimbra, Portugal (1995).

Day 1 of ICCBR 2005 was Industry Day, which provided real-world experiences utilizing CBR in fielded applications. Day 2 featured various workshops on CBR in the health sciences, textual case-based reasoning, computer gaming and simulation environments, and similarities – Processes – Workflows. Days 3 and 4 comprised presentations and posters on theoretical and applied CBR research, as well as invited talks from three distinguished scholars: Derek Bridge, University College Cork, Craig Knoblock, University of Southern California, and Colleen Seifert, University of Michigan.

The presentations and posters covered a wide range of CBR topics, including adaptation, applications, case base maintenance, computer games, creative reasoning, knowledge representation, interactive systems, knowledge management, knowledge acquisition, multiagent collaborative systems, similarity, tutoring systems, bioinformatics, and textual CBR.

This volume comprises papers for all of the presentations and posters. These 45 papers were chosen after a highly selective process. Of a total of 74 submissions, the Program Committee selected 19 papers for oral presentation and 26 papers for poster presentation. Each submission was identified as being in one of three categories and judged using the following criteria: 1. Theoretical/methodological research paper (scientific significance; originality; technical quality; and clarity). 2. Applied research paper (significance for scientific research or innovative commercial deployment; originality; technical quality; and clarity). 3. Deployed application paper (demonstrated practical, social, environmental or economic significance; originality; treatment of issues of engineering, management and user acceptance; and clarity).

Many people participated in making ICCBR 2005 a success. Robin Burke, DePaul University, served as Local Chair, with Héctor Muñoz-Avila, Lehigh University, and Francesco Ricci, ITC-irst, as Program Co-chairs. We would especially like to thank Stefanie Brüninghaus, University of Pittsburgh, for serving as Workshop Coordinator, and Mehmet H. Göker, PricewaterhouseCoopers, and Bill Cheetham, GE Research, for chairing Industry Day. We thank the Program Committee and the additional reviewers for their thoughtful and timely

participation in the paper selection process. Finally, we gratefully acknowledge the generous support of the sponsors of ICCBR 2005 and of Springer for its continuing support in publishing the proceedings of ICCBR.

May 2005

Héctor Muñoz-Avila
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Table of Contents

Invited Talks

The Virtue of Reward: Performance, Reinforcement and Discovery in Case-Based Reasoning <i>Derek Bridge</i>	1
Learning to Optimize Plan Execution in Information Agents <i>Craig A. Knoblock</i>	2
Cased-Based Reasoning by Human Experts <i>Colleen M. Seifert</i>	4

Scientific Papers

Learning to Win: Case-Based Plan Selection in a Real-Time Strategy Game <i>David W. Aha, Matthew Molineaux, Marc Ponsen</i>	5
An Ensemble of Case-Based Classifiers for High-Dimensional Biological Domains <i>Niloofar Arshadi, Igor Jurisica</i>	21
Language Games: Solving the Vocabulary Problem in Multi-Case-Base Reasoning <i>Paolo Avesani, Conor Hayes, Marco Cova</i>	35
Evaluation and Monitoring of the Air-Sea Interaction Using a CBR-Agents Approach <i>Javier Bajo, Juan M. Corchado</i>	50
A Comparative Analysis of Query Similarity Metrics for Community-Based Web Search <i>Evelyn Balfe, Barry Smyth</i>	63
A Case-Based Approach for Indoor Location <i>Carlos Bento, Joao Peixoto, Marco Veloso</i>	78
P2P Case Retrieval with an Unspecified Ontology <i>Shlomo Berkovsky, Tsvi Kuftlik, Francesco Ricci</i>	91

Autonomous Internal Control System for Small to Medium Firms <i>M. Lourdes Borrajo, Juan M. Corchado, J. Carlos Yáñez, Florentino Fdez- Riverola, Fernando Díaz</i>	106
The Application of a Case-Based Reasoning System to Attention-Deficit Hyperactivity Disorder <i>Donald Brien, Janice Glasgow, Douglas Munoz</i>	122
Reasoning with Textual Cases <i>Stefanie Brünninghaus, Kevin D. Ashley</i>	137
Using Ensembles of Binary Case-Based Reasoners <i>Bill Cheetham, Joe Shultz</i>	152
Transfer in Visual Case-Based Problem Solving <i>Jim Davies, Ashok K. Goel, Nancy J. Nersessian</i>	163
Generating Estimates of Classification Confidence for a Case-Based Spam Filter <i>Sarah Jane Delany, Pádraig Cunningham, Dónal Doyle, Anton Zamolotskikh</i>	177
Improving Gene Selection in Microarray Data Analysis Using Fuzzy Patterns Inside a CBR System <i>Florentino Fdez-Riverola, Fernando Díaz, M. Lourdes Borrajo, J. Carlos Yáñez, Juan M. Corchado</i>	191
CBR for State Value Function Approximation in Reinforcement Learning <i>Thomas Gabel, Martin Riedmiller</i>	206
Using CBR to Select Solution Strategies in Constraint Programming <i>Cormac Gebruers, Brahim Hnich, Derek Bridge, Eugene Freuder</i>	222
Case-Based Art <i>Andrés Gómez de Silva Garza, Arám Zamora Lores</i>	237
Supporting Conversation Variability in COBBER Using Causal Loops <i>Hector Gómez-Gauchía, Belén Díaz-Agudo, Pedro Pablo Gómez-Martín, Pedro A. González Calero</i>	252
Opportunities for CBR in Learning by Doing <i>Pedro Pablo Gómez-Martín, Marco Antonio Gómez-Martín, Belén Díaz-Agudo, Pedro A. González-Calero</i>	267

Navigating Through Case Base Competence <i>Maarten Grachten, F. Alejandro García, Josep Lluís Arcos</i>	282
A Knowledge-Intensive Method for Conversational CBR <i>Mingyang Gu, Agnar Aamodt</i>	296
Re-using Implicit Knowledge in Short-Term Information Profiles for Context-Sensitive Tasks <i>Conor Hayes, Paolo Avesani, Emiliano Baldo, Pádraig Cunningham</i>	312
Acquiring Similarity Cases for Classification Problems <i>Andrew Kinley</i>	327
A Live-User Evaluation of Incremental Dynamic Critiquing <i>Kevin McCarthy, Lorraine McGinty, Barry Smyth, James Reilly</i>	339
Case Based Representation and Retrieval with Time Dependent Features <i>Stefania Montani, Luigi Portinale</i>	353
The Best Way to Instil Confidence Is by Being Right <i>Conor Nugent, Pádraig Cunningham, Dónal Doyle</i>	368
Cooperative Reuse for Compositional Cases in Multi-agent Systems <i>Enric Plaza</i>	382
Evaluating the Effectiveness of Exploration and Accumulated Experience in Automatic Case Elicitation <i>Jay H. Powell, Brandon M. Hauff, John D. Hastings</i>	397
HYREC: A Hybrid Recommendation System for E-Commerce <i>Bhanu Prasad</i>	408
Extending jCOLIBRI for Textual CBR <i>Juan A. Recio, Belén Díaz-Agudo, Marco Antonio Gómez-Martín, Nirmalie Wiratunga</i>	421
Critiquing with Confidence <i>James Reilly, Barry Smyth, Lorraine McGinty, Kevin McCarthy</i>	436
Mapping Goals and Kinds of Explanations to the Knowledge Containers of Case-Based Reasoning Systems <i>Thomas R. Roth-Berghofer, Jörg Cassens</i>	451

XIV Table of Contents

An Approach for Temporal Case-Based Reasoning: Episode-Based Reasoning <i>Miguel Sánchez-Marré, Ulises Cortés, Montse Martínez, Joaquim Comas, Ignasi Rodríguez-Roda</i>	465
How to Combine CBR and RBR for Diagnosing Multiple Medical Disorder Cases <i>Wenqi Shi, John A. Barnden</i>	477
Case-Based Student Modeling Using Concept Maps <i>Frode Sørmo</i>	492
Learning Similarity Measures: A Formal View Based on a Generalized CBR Model <i>Armin Stahl</i>	507
Knowledge-Rich Similarity-Based Classification <i>Timo Steffens</i>	522
Autonomous Creation of New Situation Cases in Structured Continuous Domains <i>Haris Supic, Slobodan Ribaric</i>	537
Retrieval and Configuration of Life Insurance Policies <i>Alexander Tartakovski, Martin Schaaf, Ralph Bergmann</i>	552
Analogical and Case-Based Reasoning for Predicting Satellite Task Schedulability <i>Pete Tinker, Jason Fox, Collin Green, David Rome, Karen Casey, Chris Furmanski</i>	566
Case Adaptation by Segment Replanning for Case-Based Planning Systems <i>Flavio Tonidandel, Marcio Rillo</i>	579
Selecting the Best Units in a Fleet: Performance Prediction from Equipment Peers <i>Anil Varma, Kareem S. Aggour, Piero P. Bonissone</i>	595
CCBR-Driven Business Process Evolution <i>Barbara Weber, Stefanie Rinderle, Werner Wild, Manfred Reichert</i>	610
CBR for Modeling Complex Systems <i>Rosina Weber, Jason M. Proctor, Ilya Waldstein, Andres Kriete</i>	625

CBE- <i>Conveyor</i> : A Case-Based Reasoning System to Assist Engineers in Designing Conveyor Systems <i>Fei Ling Woon, Brian Knight, Miltos Petridis, Mayur Patel</i>	640
Author Index	653

The Virtue of Reward: Performance, Reinforcement and Discovery in Case-Based Reasoning

Derek Bridge

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Agents commonly reason and act over extended periods of time. In some environments, for an agent to solve even a single problem requires many decisions and actions. Consider a robot or animat situated in a real or virtual world, acting to achieve some distant goal; or an agent that controls a sequential process such as a factory production line; or a conversational diagnostic system or recommender system. Equally, over its life time, a long-lived agent will make many decisions and take many actions, even if each problem-solving episode requires just one decision and one action. In spam detection, for example, each incoming email requires a single classification decision before it moves to its designated folder; but continuous operation requires numerous decisions and actions.

Reasoning and acting over time is challenging. A learner's experiences may prove unrepresentative of subsequent problems; a changing environment can render useless the system's knowledge. A system that tries to solve hard combinatorial problems, for example, may find, through exploration in the space of solutions, that earlier training examples are suboptimal. Concept drift in spam detection is another example: spammers send new kinds of unwanted email or find new ways of disguising spam as ham. Agents must be highly adaptive if, over time, they are to attain and maintain high standards of, for example, accuracy, coverage and efficiency.

To address these challenges in case-based agents, I have been drawing ideas from another field, that of *classifier systems*. Classifier systems, first proposed by John Holland, are rule-based systems. They comprise a performance component, a reinforcement component and a discovery component. The performance component chooses the agent's actions. The other two components enable classifier systems to exhibit two kinds of plasticity, parametric plasticity and structural plasticity. The reinforcement component uses feedback from the environment to update rule quality parameters. The discovery component uses genetic operators and other techniques to propose new rules, which may displace existing rules.

I will describe my attempts to build a case-based counterpart to Stewart Wilson's XCS, which is one of the most popular, modern classifier systems. I will describe each of its three components. In discussing the reinforcement component, I will offer reflections on the relationship between Case-Based Reasoning and reinforcement learning. In discussing the discovery component, I will offer reflections on automatic case discovery and case base maintenance.