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Intelligent Tutoring Systems

10th International Conference, ITS 2010
Pittsburgh, PA, USA, June 14-18, 2010
Proceedings, Part I



Springer

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Library of Congress Control Number: 2010927366

CR Subject Classification (1998): I.2.6, J.4, H.1.2, H.5.1, J.5, K.4.2

LNCS Sublibrary: SL 2 – Programming and Software Engineering

ISSN 0302-9743

ISBN-10 3-642-13387-8 Springer Berlin Heidelberg New York

ISBN-13 978-3-642-13387-9 Springer Berlin Heidelberg New York

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Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper 06/3180

Preface

The 10th International Conference on Intelligent Tutoring Systems, ITS 2010, continued the bi-annual series of top-flight international conferences on the use of advanced educational technologies that are adaptive to users or groups of users. These highly interdisciplinary conferences bring together researchers in the learning sciences, computer science, cognitive or educational psychology, cognitive science, artificial intelligence, machine learning, and linguistics. The theme of the ITS 2010 conference was *Bridges to Learning*, a theme that connects the scientific content of the conference and the geography of Pittsburgh, the host city. The conference addressed the use of advanced technologies as bridges for learners and facilitators of robust learning outcomes.

We received a total of 186 submissions from 26 countries on 5 continents: Australia, Brazil, Canada, China, Estonia, France, Georgia, Germany, Greece, India, Italy, Japan, Korea, Mexico, The Netherlands, New Zealand, Pakistan, Philippines, Saudi Arabia, Singapore, Slovakia, Spain, Thailand, Turkey, the UK and USA. We accepted 61 full papers (38%) and 58 short papers. The diversity of the field is reflected in the range of topics represented by the papers submitted, selected by the authors. The most popular topics among the accepted (full and short) papers were: empirical studies of learning with advanced learning technologies (34 accepted papers), educational data mining (EDM) and machine learning (28), evaluation of systems (23), pedagogical agents (21), natural language interaction (20), affect (19), intelligent games (16), pedagogical strategies (15), models of learners, facilitators, groups and communities (15), and domain-specific: mathematics (15). Of course, many papers covered multiple topics.

We are delighted that five outstanding and world-renowned researchers accepted our invitation to give invited talks during the conference. Abstracts of their presentations are included in this set of proceedings. Chee-Kit Looi from the National Institute of Education (Singapore) shared insights into comprehensive initiatives in Singapore's education system, which involve partnerships between researchers and classroom practice. Stacy Marsella from the Institute of Creative Technologies (University of Southern California) spoke about the role of emotion and emotion modeling in systems with virtual characters. Alexander Renkl from the University of Freiburg (Germany) suggested a way of reconciling theoretical views on learning held by proponents of socio-constructivist approaches with cognitively oriented approaches and discussed implications for the design of ITS. Steven Ritter from Carnegie Learning, Inc. (Pittsburgh, USA) spoke about the third wave of ITS, which takes advantage of the large user base of real-world ITS for purposes of data mining and end-user authoring. Finally, Beverly Woolf, from the University of Massachusetts, Amherst, described the emergence of social and caring computer tutors, which respond to both affect and cognition.

The proceedings contain 17 short papers within the important Young Researchers Track (YRT). This track represents the future of our field. It provides a forum in which PhD students present and discuss their work during its early stages, with mentoring from more senior members of the community. All submissions were carefully reviewed by experts. The proceedings also include 18 abstracts of Interactive Events that during the conference showcased an interesting mixture of mature systems and late-breaking developments in ITS and related tools for authoring, assessment, data analysis, etc. Rounding out the scientific program of the conference were six workshops and three tutorials.

All full papers and short papers included in the proceedings were stringently peer-reviewed. Reflecting the strength of the ITS community, we received a large number of submissions of very high quality. The review process rested significantly on the outstanding team of international experts from 24 countries who made up the Program Committee, the Senior Program Committee and the Advisory Board. Reviewers started the process by bidding on abstracts, ensuring that they were reviewing in areas of their particular interest and expertise. Conflicts of interest were identified so that no paper was assigned to a reviewer who is a close collaborator or colleague of any of the paper's authors. Each paper received at least three reviews. One of the reviewers was a member of the Senior Program Committee, who was also responsible for leading an online discussion of the paper and then writing a meta-review. Criteria for reviews of papers were: relevance, originality, significance, evaluation, related work, organization and readability. The final decisions for acceptance were made by the Program Co-chairs who, working in concert, carefully studied the reviews, discussion and meta-reviews, often initiating additional discussion among reviewers. In some cases, we (the Program Co-chairs) sought additional reviewers. For the most difficult decisions, we also read the papers. In making the hard decisions on accepting full papers, we were largely driven by the reviews and meta-reviews. Where the scores were close, we took into account all review criteria, and in our final decision weighed the relative importance of a paper's strengths and weaknesses. We also considered the different classes of contributions: for example, a full paper describing a new system designed to improve learning should include a sound evaluation or at minimum a convincing pilot study. For short papers, the novelty and potential of the work were key requirements. Due to the large number of high-quality submissions, our choices were difficult. This is a very pleasing situation for the ITS community and augurs well for the future as some of the papers we could not accept have the promise to be excellent future publications.

The quality of the reviews was extremely high, which was critical in enabling us to distinguish the highest quality work for acceptance as full papers. In addition, high-quality reviews are critical for researchers as feedback on their research and their papers, regardless of whether they are accepted for publication or not. For example, many reviews pointed to additional relevant literature, identified particular strengths and gave concrete advice on how to address weaknesses. We believe that authors of many of the rejected papers will be able to use this feedback to produce excellent papers in the future. We worked very hard to select the Program Committee, the Senior Program Committee and the Advisory Board so we could meet these goals. We are pleased to announce the following Outstanding Reviewer Awards: Ivon Arroyo,

Kevin Ashley, Ryan Baker, Joseph Beck, Gautam Biswas, Sydney d'Mello, Peter Brusilovsky, Vania Dimitrova, Neil Heffernan, Akihiro Kashiara, Brent Martin, H. Chad Lane, James Lester, Diane Litman, Rose Luckin, Stellan Ohlsson, Niels Pinkwart, Steven Ritter, Ido Roll, Carolyn Rosé, Peter Sloep, John Stamper and Gerhard Weber.

A scientific conference of the size of ITS 2010 can only succeed due to contributions of many people who generously donate their time. Of great significance are the contributions of the large number of people who helped with the review process: the Advisory Board, the Senior Program Committee, the Program Committee, as well as people who volunteered as reviewers. We are extremely grateful to them for the time and effort they put in. Special thanks are due to the people who volunteered to organize workshops and tutorials, which made up a key part of the scientific program of the conference. We also thank the Chairs for Workshops / Tutorials, Young Researcher Track / Doctoral Consortium, Interactive Events, and Panels, all of whom had a major influence on the scientific program. The Local Arrangements Chairs devoted countless hours of preparation to make the conference actually happen successfully "on the ground." The Volunteers / Outings Chairs recruited and organized dozens of students not only to help run the conference but to lead small-group outings tailored to individual interests in the ITS spirit. The Conference Treasurer organized our budget meticulously, the Sponsorship Chair increased it handsomely, and the Publicity Chair got the word out widely. Lynnetta Miller of Carnegie Mellon deserves special recognition for contributing in multiple guises (conference secretary, artist, webmaster). A special word of thanks is due to Carolyn Manley of Carnegie Mellon's Conference and Event Services, who among other things administered (along with programmer Alex Lang) the online registration system. We would like to thank Kevin Ashley, Vania Dimitrova, Ben du Boulay, Claude Frasson, Art Graesser, Alan Lesgold, James Lester, Roger Nkambou, Beverly Woolf, and other past organizers of ITS and AIED conferences for their kind assistance and sage advice. We are very grateful to Jo Bodnar of Carnegie Mellon and student volunteers Matthew Easterday, Richard Gluga, and Michael Lipschultz for the very significant role they played in assembling the proceedings. And we would like to thank our sponsors, listed later, whose support for the conference we gratefully acknowledge.

Our final thanks must be to the authors whose papers appear in these volumes. They have contributed many exciting new ideas and a comprehensive body of carefully validated work that will serve as an advanced technology bridge to improved learning in real educational settings.

April 2010

Vincent Alevén
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Intelligent Tutoring Technologies for Ill-Defined Problems and Ill-Defined Domains

Collin Lynch, Kevin Ashley, Tanja Mitrovic, Vania Dimitrova, Niels Pinkwart and Vincent Alevén

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