

Lecture Notes in Artificial Intelligence

1733

Subseries of Lecture Notes in Computer Science

Edited by J. G. Carbonell and J. Siekmann

Lecture Notes in Computer Science

Edited by G. Goos, J. Hartmanis and J. van Leeuwen

Springer

Berlin

Heidelberg

New York

Barcelona

Hong Kong

London

Milan

Paris

Singapore

Tokyo

Hideyuki Nakashima Chengqi Zhang (Eds.)

Approaches to Intelligent Agents

Second Pacific Rim International Workshop
on Multi-Agents, PRIMA'99
Kyoto, Japan, December 2-3, 1999
Proceedings



Springer

Series Editors

Jaime G. Carbonell, Carnegie Mellon University, Pittsburgh, PA, USA
Jörg Siekmann, University of Saarland, Saarbrücken, Germany

Volume Editors

Hideyuki Nakashima
Electrotechnical Laboratories
Umezono 1-1-4, Tsukuba, Ibaraki 305-0045, Japan
E-mail: nakashim@etl.go.jp

Chengqi Zhang
Deakin University Geelong, School of Computing and Mathematics
Victoria 3217, Australia
E-mail: chengqi@deakin.edu.au

Cataloging-in-Publication data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Approaches to intelligent agents : proceedings / Second Pacific Rim International Workshop on Multi-Agents, PRIMA '99, Kyoto, Japan, December 2 - 3, 1999. Hideyuki Nakashima ; Chengqi Zhang (ed.). - Berlin ; Heidelberg ; New York ; Barcelona ; Hong Kong ; London ; Milan ; Paris ; Singapore ; Tokyo : Springer, 1999
(Lecture notes in computer science ; Vol. 1733 : Lecture notes in artificial intelligence)
ISBN 3-540-66823-3

CR Subject Classification (1998): I.2, C.2, D.2.3

ISBN 3-540-66823-3 Springer-Verlag Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law.

© Springer-Verlag Berlin Heidelberg 1999
Printed in Germany

Typesetting: Camera-ready by author
SPIN: 10704096 06/3142 - 5 4 3 2 1 0 Printed on acid-free paper

Preface

Intelligent agents will be the necessity of the coming century. Software agents will pilot us through the vast sea of information, by communicating with other agents. A group of cooperating agents may accomplish a task which cannot be done by any subset of them.

This volume consists of selected papers from PRIMA'99, the second Pacific Rim International Workshop on Multi-Agents, held in Kyoto, Japan, on December 2-3, 1999.

PRIMA constitutes a series of workshops on autonomous agents and multi-agent systems, integrating the activities in Asia and the Pacific rim countries, such as MACC (Multiagent Systems and Cooperative Computation) in Japan, and the Australian Workshop on Distributed Artificial Intelligence. The first workshop, PRIMA'98, was held in conjunction with PRICAI'98, in Singapore.

The aim of this workshop is to encourage activities in this field, and to bring together researchers from Asia and Pacific rim working on agents and multiagent issues. Unlike usual conferences, this workshop mainly discusses and explores scientific and practical problems as raised by the participants. Participation is thus limited to professionals who have made a significant contribution to the topics of the workshop.

Topics of interest include, but are not limited to:

- multi-agent systems and their applications
- agent architecture and its applications
- languages for describing (multi-)agent systems
- standard (multi-)agent problems
- challenging research issues in (multi-)agent systems
- communication and dialogues
- multi-agent learning
- other issues on (multi-)agent systems

We received 43 submissions to this workshop from more than 10 countries. Each paper was reviewed by at least two program committee (PC) members who are internationally renowned researchers. After careful consideration, 17 papers were selected for these proceedings. We would like to thank all the authors who submitted their papers to this workshop. We would also like to thank all the PC members for their quality work. Special thanks goes to the keynote speaker, Professor Michael Georgeff from the Australian Artificial Intelligence Institute, for his support.

For more information about PRIMA, please check the following web pages:

PRIMA Web page <http://www.lab7.kuis.kyoto-u.ac.jp/prima/>
PRIMA'99 Web page <http://www.lab7.kuis.kyoto-u.ac.jp/prima99/>

This workshop is held in cooperation with:

- IEICE (The Institute of Electronics, Information and Communication Engineers), Japan
- ETL (COE Global Information Processing Project), MITI, Japan
- MACC (Multi-Agent and Cooperative Computation), Japanese Society for Software Science and Technology

October 1999

Hideyuki Nakashima
Chengqi Zhang

PRIMA'99 Committee Members

General Chair

Fumio Hattori
Electronic Commerce Development Center
NTT Software Corporation
223-1 Yamashita-cho, Naka-ku,
Yokohama 231-8554 JAPAN
fhattori@po.ntts.co.jp

Program Co-Chairs

Hideyuki Nakashima
Information Science Division
ETL
Umezono 1-1-4
Tsukuba, Ibaraki 305-0045 Japan
and
School of Information Science
JAIST
1-1, Asahidai, Tatsunokuchi, Ishikawa 923-1292 Japan
nakashim@etl.go.jp

Chengqi Zhang
School of Computing and Mathematics
Deakin University
Geelong, Victoria 3217, Australia
chengqi@deakin.edu.au

Program Committee

Makoto Amamiya	Japan	amamiya@is.kyushu-u.ac.jp
Brahim Chaib-draa	Canada	chaib@iad.ift.ulaval.ca
Tharam Dillon	China	csdillon@comp.polyu.edu.hk
Mark d’Inverno	UK	M.dInverno@westminster.ac.uk
Ed Durfee	USA	durfee@umich.edu
Norbert Glaser	Germany	nglaser@epo.nl
Jieh Hsiang	Taiwan	hsiang@csie.ntu.edu.tw
Jane Hsu	Taiwan	yjhsu@csie.ntu.edu.tw
Michael Huhns	USA	huhns@ece.sc.edu
Toru Ishida	Japan	ishida@kuis.kyoto-u.ac.jp
Minkoo Kim	Korea	minkoo@madang.ajou.ac.kr
David Kinny	Australia	dnk@cs.mu.oz.au
Yasuhiko Kitamura	Japan	kitamura@info.eng.osaka-cu.ac.jp
Kazuhiro Kuwabara	Japan	kuwabara@cslab.kecl.ntt.co.jp
Jaeho Lee	Korea	jaeho@ee.uos.ac.kr
Victor Lesser	USA	lesser@cs.umass.edu
Ho-fung Leung	China	lhf@cse.cuhk.edu.hk
Jyi-shane Liu	Taiwan	jsliu@cs.nccu.edu.tw
Jian Lu	China	lu@nju.edu.cn
Michael Luck	UK	mikeluck@dcs.warwick.ac.uk
Xudong Luo	China	xluo@cse.cuhk.edu.hk
David Morley	Australia	morley@aaai.oz.au
Tim Norman	UK	t.j.norman@elec.qmw.ac.uk
Douglas Norrie	Canada	norrie@enme.ucalgary.ca
Ei-Ichi Osawa	Japan	osawa@csl.sony.co.jp
Ichiro Osawa	Japan	osawa@etl.go.jp
Sascha Ossowski	Spain	s.ossowski@escet.urjc.es
Jeff Rosenschein	Israel	jeff@cs.huji.ac.il
Ramakoti Sadananda	Thailand	sada@cs.ait.ac.th
Zhongzhi Shi	China	Shizz@envst-1.ict.ac.cn
Toshiharu Sugawara	Japan	sugawara@t.onlab.ntt.co.jp
Gerhard Weiss	Germany	weissg@informatik.tu-muenchen.de
Lam Kwok Yan	Singapore	lamky@comp.nus.edu.sg
Makoto Yokoo	Japan	yokoo@cslab.kecl.ntt.co.jp
Soe-Tsyrr Yuan	Taiwan	yuans@tpts1.seed.net.tw
Minjie Zhang	Australia	minjie@cs.newcastle.edu.au

Local Arrangements

Kazuhiro Kuwabara (Chair)
 Social Communication Laboratory
 NTT Communication Science Laboratories
 2-4 Hikaridai, Seika-cho, Soraku-gun, Kyoto 619-0237 Japan
 kuwabara@cslab.kecl.ntt.co.jp

Koji Fukada	Kyoto University	k-fukada@kuis.kyoto-u.ac.jp
Toru Ishida	Kyoto University	ishida@i.kyoto-u.ac.jp
Yasuhiko Kitamura	Osaka City University	kitamura@info.eng.osaka-cu.ac.jp
Satoshi Oyama	Kyoto University	oyama@kuis.kyoto-u.ac.jp
Makoto Takema	Kyoto University	takema@kuis.kyoto-u.ac.jp
Masayo Tanaka	ETL	masayo@etl.go.jp
Sen Yoshida	NTT	yoshida@cslab.kecl.ntt.co.jp

Table of Contents

Cooperation

Flexible Multi-agent Collaboration Using Pattern Directed Message Collaboration of Field Reactor Model	1
<i>Tadashige Iwao, Makoto Okada, Yuji Takada and Makoto Amamiya</i>	
Reliable Agent Communication – A Pragmatic Perspective	16
<i>David Kinny</i>	
Formal Semantics of Acknowledgements, Agreements and Disagreements ...	32
<i>Norihiro Ogata</i>	
Making Rational Decisions in N-by-N Negotiation Games with a Trusted Third Party	47
<i>Shih-Hung Wu and Von-Wun Soo</i>	
The Security Mechanism in Multiagent System AOSDE	62
<i>Zhongzhi Shi, Ju Wang and Hu Cao</i>	

Mobility

Remote Messaging Mechanism Supporting Agent Mobility Based on CORBA	72
<i>Byung-Rae Lee, Kyung-Ah Chang and Tai-Yun Kim</i>	
Persisting Autonomous Workflow for Mobile Agents Using a Mobile Thread Programming Model	84
<i>Minjie Zhang and Wei Li</i>	
Mobile Robot Navigation by Distributed Vision Agents	96
<i>Takushi Sogo, Hiroshi Ishiguro and Toru Ishida</i>	

Learning

Rationality of Reward Sharing in Multi-agent Reinforcement Learning	111
<i>Kazuteru Miyazaki and Shigenobu Kobayashi</i>	
How to Design Good Rules for Multiple Learning Agents in Scheduling Problems?	126
<i>Keiki Takadama, Masakazu Watabe, Katsunori Shimohara and Shinichi Nakasuka</i>	
Hierarchical Multi-agent Organization for Text Database Discovery	141
<i>Yong S. Choi, Jaeho Lee and Suk I. Yoo</i>	

Interfacing

Predicting User Actions Using Interface Agents with
Individual User Models 154
Jung-Jin Lee and Robert McCartney

Gleams of People: Monitoring the Presence of People with
Multi-agent Architecture 170
Takeshi Ohguro, Sen Yoshida and Kazuhiro Kuwabara

System Design

Distributed Fault Location in Networks Using Learning Mobile Agents 182
Tony White and Bernard Pagurek

Designing Multi-Agent Reactive Systems: A Specification Method Based
on Reactive Decisional Agents 197
Bouchaib Bounabat, Rahal Romadi and Salah Labhalla

A Class of Isomorphic Transformations for Integrating EMYCIN-Style
and PROSPECTOR-Style Systems into a Rule-Based
Multi-Agent System 211
Xudong Luo, Chengqi Zhang and Ho-fung Leung

An Agent Architecture for Strategy-Centric Adaptive QoS Control
in Flexible Videoconference System 226
*Takuo Suganuma, SungDoke Lee, Takuji Karahashi, Tetsuo Kinoshita
and Norio Shiratori*

Author Index 241