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Agent-Based Ubiquitous Computing

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To our children,
Patrick, Sofia, Jose, Javier and Maria.

Preface

Ubiquitous computing names the third wave in computing, where the personal computing era appears when technology recedes into the background of our lives. The widespread use of new mobile technology implementing wireless communications such as personal digital assistants (PDAs) and smart phones enables a new type of advanced applications. In the past years, the main focus of research in mobile services has aimed at the anytime-anywhere principle (ubiquitous computing). However, there is more to it. The increasing demand for distributed problem solving led to the development of multi-agent systems. The latter are formed from a collection of independent software entities whose collective skills can be applied in complex and real-time domains. The target of such systems is to demonstrate how goal directed, robust and optimal behavior can arise from interactions between individual autonomous intelligent software agents. These software entities exhibit characteristics like autonomy, responsiveness, pro-activeness and social ability. Their functionality and effectiveness has proven to be highly depended on the design and development and the application domain. In fact, in several cases, the design and development of effective services should take into account the characteristics of the context from which a service is requested. Context is the set of suitable environmental states and settings concerning a user, which are relevant for a situation sensitive application in the process of adapting the services and information offered to the user. Agent technology seems to be the right technology to offer the possibility of exploring the dynamic context of the user in order to provide added-value services or to execute more and complex tasks. In this respect, agent-based ubiquitous computing can benefit from marrying the agent-based technology for the extensive usage of distributed functionality, to be deployed for lightweight devices and enable to combine ubiquity and intelligence in different application areas and challenge with questions the research communities in computer science, artificial intelligence and engineering.

We noticed during the AAMAS workshop we organized about this issue in 2007 that, although a number of other books on ubiquitous computing have been published in the last years, none of these has focused on the agent-based perspective. So we opened a call for chapters to gather input and feedback concerning the above challenges, through the collection of the high-quality contributions that reflect and advance the state-of-the art in agent-based ubiquitous application systems. It brought together researchers, agent-based

software developers, users and practitioners involved in the area of agent-based ubiquitous systems, coming from many disciplines, with the target to discuss the different fundamental principles for construction and design of agents for specific applications, how they co-operate and communicate, what tasks can be set and how different properties like coordination and communication have been implemented, and which are the different problems they had to cope with. Existing perspectives of ubiquitous agents within different application domains have been welcome, as well as the different mechanisms for design and cooperation that can be used within different agent building environments. Specifically, the book focused on the different disciplines contributing to the design, cooperation, coordination and implementation problems of ubiquitous computing applications and how these can be solved through the utilization of agents.

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E. Mangina, J. Carbo and J.M. Molina

Contents

Preface	vii
1. Solving Conflicts in Agent-Based Ubiquitous Computing Systems: A Proposal Based on Argumentation	1
<i>Andrés Muñoz Ortega, Juan A. Botía Blaya, Félix J. García Clemente, Gregorio Martínez Pérez and Antonio F. Gómez Skarmeta</i>	
1.1 Introduction	1
1.2 Classification of authorization policies conflicts	2
1.3 The basics of argumentation	3
1.4 Using argumentation to resolve policy conflicts	7
1.5 Related work	10
1.6 Conclusions and future work	11
1.7 Acknowledgments	11
2. Mixed Reality Agent (MiRA) Chameleons	13
<i>Mauro Dragone, Thomas Holz, G.M.P. O'Hare and Michael J. O'Grady</i>	
2.1 Introduction	13
2.2 Social interface agents	15
2.3 Ubiquitous robots	16
2.3.1 Augmented HRI and immersive interfaces	17
2.4 Ubiquitous agents	18
2.4.1 Discussion	19
2.5 Dynamic embodiment	20
2.5.1 Agent chameleons	21
2.5.2 Discussion	22
2.6 MiRA chameleons	23
2.6.1 Requirements	24
2.6.2 The socially situated agent architecture (SoSAA)	25
2.6.3 Implementation	27
2.6.4 Testbed	30
2.6.5 Discussion	32
2.7 Conclusion	33
3. A Generic Architecture for Human-Aware Ambient Computing	35
<i>Tibor Bosse, Mark Hoogendoorn, Michel C.A. Klein, and Jan Treur</i>	
3.1 Introduction	35
3.2 Modelling approach	36

3.3	Global structure of the agent-based generic model	37
3.4	Generic ambient agent and world model	40
3.5	Case study 1: An ambient driver support system	42
3.6	Case study 2: Ambient aggression handling system	45
3.7	Case study 3: Ambient system for management of medicine usage	48
3.8	Specification and verification of dynamic properties	49
3.9	Discussion	53
3.10	Appendix 1: Driver case	54
3.10.1	Driver assessment agent: Domain-specific temporal rules	54
3.10.2	Cruise control agent: Domain-specific temporal rules	54
3.10.3	Steering monitoring agent: Domain-specific temporal rules	54
3.10.4	Steering sensing agent: Domain-specific temporal rules	55
3.10.5	Gaze-focus sensing agent: Domain-specific temporal rules	55
3.10.6	Alcohol-level monitoring agent: Domain-specific temporal rules	55
3.10.7	Alcohol sensing agent: Domain-specific temporal rules	56
3.10.8	Driver: Domain-specific temporal rules	56
3.10.9	Car and environment: Domain-specific temporal rules	56
3.11	Appendix 2: Aggression handling case	56
3.11.1	Sound analysis agent: Domain-specific temporal rules	56
3.11.2	Microphone agent: Domain-specific temporal rules	57
3.11.3	Persons in crowd: Domain-specific temporal rules	58
3.11.4	Police officer at station: Domain-specific temporal rules	58
3.11.5	Police officer at street: Domain-specific temporal rules	58
3.12	Appendix 3: Medicine usage case	59
3.12.1	Medicine box agent	59
3.12.2	Usage support agent	60
4.	e-Assistance Support by Intelligent Agents over MANETs	63
	<i>Eduardo Rodríguez, Juan C. Burguillo and Daniel A. Rodríguez</i>	
4.1	Introduction	63
4.1.1	Multi agent systems (MAS)	64
4.1.2	Ubiquitous computing	66
4.1.3	Case based reasoning	66
4.1.4	Peer-to-peer	69
4.1.5	Mobile ad-hoc networks	70
4.2	System architecture	71
4.2.1	Reasoning process	72
4.2.2	Communication process	74
4.3	A case of study: An intelligent gym	77
4.4	Conclusions	83
5.	The Active Metadata Framework	85
	<i>Christopher McCubbin, R. Scott Cost, John Cole, Nicholas Kratzmeier, Markus Dale, Daniel Bankman</i>	
5.1	Introduction	85
5.1.1	Background: Concepts	86
5.1.2	Background: The active metadata concept	87
5.2	SimAMF	89

5.2.1	Motivation	89
5.2.2	Related work	89
5.2.3	Implementation	90
5.2.4	Simulation visualization	91
5.2.5	Experiments	92
5.3	SWARM-AMF	93
5.3.1	Background	94
5.3.2	System design	95
5.3.3	An experiment using some swarming metrics	97
5.3.4	Experimental design	98
5.3.5	Results	99
5.3.6	Conclusions	99
5.4	List of acronyms	101
6.	Coalition of Surveillance Agents. Cooperative Fusion Improvement in Surveillance Systems	103
	<i>Federico Castanedo, Miguel A. Patricio, Jesús García and José M. Molina</i>	
6.1	Introduction	103
6.2	Related works	104
6.3	Cooperative surveillance agents architecture	105
6.3.1	Sensor and coalition layer	107
6.3.2	Coalition protocol	108
6.4	Information fusion for tracking during coalition maintenance	109
6.4.1	Time-space alignment	110
6.4.2	Map correction	110
6.5	Experiments	111
6.6	Conclusions and future work	114
7.	Designing a Distributed Context-Aware Multi-Agent System	117
	<i>Virginia Fuentes, Nayat Sánchez-Pi, Javier Carbó and José M. Molina</i>	
7.1	Introduction	117
7.2	Context-aware multi-agent framework for heterogeneous domains	118
7.2.1	Multi-agent architecture	119
7.3	BDI model	120
7.3.1	Beliefs	121
7.3.2	Desires	121
7.3.3	Intentions	122
7.4	Gaia methodology	122
7.4.1	Analysis phase	122
7.5	Analysis and design using Gaia methodology	123
7.5.1	The environmental model	124
7.5.2	The organization structure	124
7.5.3	Role model	124
7.5.4	Interaction model	125
7.5.5	Organizational rules	126
7.5.6	Agent model	126
7.5.7	Service model	126
7.6	Conclusions	126

8. Agent-Based Context-Aware Service in a Smart Space 131

Wan-rong Jih, Jane Yung-jen Hsu

8.1	Introduction	131
8.2	Background technology	132
8.2.1	Context models	132
8.2.2	Context reasoning	133
8.3	Smart space infrastructure	134
8.4	Context-aware service platform	136
8.4.1	Context-aware reasoning	137
8.4.2	Service planning	138
8.4.3	Context knowledge base	139
8.5	Demonstration scenario	141
8.5.1	Context-aware reasoning	142
8.5.2	Service planning	143
8.6	Related work	145
8.7	Conclusion	146

9. Prototype for Optimizing Power Plant Operation 147

Christina Athanasopoulou and Vasilis Chatziathanasiou

9.1	Introduction	147
9.2	Problem domain	148
9.2.1	Electricity generation units	148
9.2.2	Knowledge engineering	149
9.3	Architecture	150
9.3.1	Agent programming paradigm	150
9.3.2	Intelligent Power Plant engineer Assistant MAS (IPPAMAS)	151
9.4	Implementation	157
9.4.1	Data mining	157
9.4.2	Multi-agent system	157
9.4.3	Wireless transmission	158
9.4.4	Profiles	159
9.5	Evaluation	159
9.5.1	MAS performance	159
9.5.2	User evaluation	160
9.6	Concluding remarks and future enhancements	161

10. IUMELA: Intelligent Ubiquitous Modular Education Learning Assistant in Third Level Education 163

Elaine McGovern, Bernard Roche, Rem Collier, Eleni Mangina

10.1	Introduction	163
10.2	Related work	164
10.2.1	Multi-agent systems based learning technologies	164
10.2.2	The mobile device	167
10.2.3	Modular education at UCD	169
10.2.4	Learning styles	170
10.2.5	Teaching strategies	170
10.2.6	Evaluation techniques	170

10.2.7	Presenting modules for selection	171
10.3	IUMELA: the agent architecture	172
10.3.1	The assistant agent	173
10.3.2	The moderator agent	173
10.3.3	Expert agent technologies	174
10.4	IUMELA student user interface	174
10.4.1	Initial registration and login	174
10.4.2	Personalised welcome screen	175
10.4.3	Learning journal facility	177
10.4.4	Student messaging	177
10.4.5	The module and assistant facilities	178
10.5	Evaluation	179
10.5.1	ABITS FIPA messenger in IUMELA	180
10.6	Discussion	181

Bibliography	183
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