

Contents

Part I Care Models and Algorithms

**The Mo.Di.Pro Experimental Project at the Galliera Hospital:
I.C.T., Robots and Care of the Environment for the Rehabilitation
of Patients Before Discharge** 3
Niccolò Casiddu and Claudia Porfirione

1 Introduction 3
 1.1 Objectives 4
2 Materials and Methods 4
 2.1 Accommodation Design 6
 2.2 Monitoring of Parameters 10
 2.3 Ethics: Informed Consent 12
3 Results and Discussion 13
 3.1 Experimentation with Telepresence Robots 13
4 Conclusion 16
References 16

**Theoretical Model for Remote Heartbeat Detection Using
Radiofrequency Waves** 19
V. Di Mattia, G. Manfredi, M. Baldini, V. Petrini, L. Scalise,
P. Russo, A. De Leo and G. Cerri

1 Introduction 20
2 The Electromagnetic Multilayer Model 21
 2.1 Multilayer Model Implementation 22
3 Validation of the Model 27
4 Conclusions 28
References 29

A Wearable System for Stress Detection Through Physiological Data Analysis	31
Giorgia Acerbi, Erika Rovini, Stefano Betti, Antonio Tirri, Judit Flóra Rónai, Antonella Sirianni, Jacopo Agrimi, Lorenzo Eusebi and Filippo Cavallo	
1 Introduction	32
1.1 Physiological Signals and Stress Concept	32
1.2 The Aim of the Study	34
2 Materials and Methods	35
2.1 Instrumentation	35
2.2 Participants	36
2.3 Experimental Protocol	36
2.4 Data Analysis	39
3 Results and Discussion	41
3.1 Physiological Parameters Assessment	42
3.2 Psychometric Instruments Evaluation	44
3.3 Correlation Between Physiological Parameters and Psychometric Instruments	44
3.4 Data Classification	45
4 Conclusion	47
References	48
Complete Specifications of ICT Services in an AAL Environment	51
Laura Burzagli, Paolo Baronti, Marco Billi, Pier Luigi Emiliani and Fabio Gori	
1 Introduction	51
2 Position of the Problem	52
3 Design Approach	54
3.1 Cookbook	54
3.2 Diary	54
3.3 Pantry	55
3.4 Appliances	55
4 A Case Study—The Example of a Shopping List Service	55
5 Technical Implementation	57
6 Future Work	59
7 Conclusions	60
References	60
Design of a Community-Supported CapAble Microwave System for People with Intellectual and Physical Disabilities	61
Matteo Zallio, Paula Kelly, Modestas Jakuska, Hicham Rifai and Damon Berry	
1 Introduction	62

2	Cooking Appliances State of Art: Development and Use of a Microwave	63
2.1	Microwave Usability Analysis	64
3	Research Methodology for a Community-Designed Device	65
3.1	Quality Function Deployment Method for a User Centred Design Approach	66
3.2	Designing with the “Persona” Model	69
3.3	Preferences from the Users	71
4	The CapAble Microwave	72
4.1	System Architecture of the CapAble Microwave	73
5	Conclusion	75
	References	77
	Work of the Home and Social Relationships as a Guide to Domestic Care for the Elderly	79
	Giulia Frezza, Helen Keefe and Marta Bertolaso	
1	A Home that Changes Along with a Changing Body	80
2	The Problem of Social Isolation in Elderly Populations	81
3	Technology and Human Technologies for Elderly Care	82
3.1	TRIL Building Bridges (BB) System	83
3.2	An Option Often Overlooked and Underrated: Inter-generational Living	84
4	Conclusions—Rediscovering the Home	85
	References	86
	The Design Contribution for Ambient Assisted Living	87
	G. Losco, A. Lupacchini, L. Bradini and D. Paciotti	
1	From Design for All to Design for AAL	87
2	Generating Principles	88
3	The Specific Contributions: Product Design Skills	88
3.1	User Centred Design (UCD) and Interaction Design (ID).	88
3.2	Technological Implementation Design: Smart Design	90
3.3	Morphology and Design: The Role of Shape	91
4	Specific Contributions: The ALL Intervention Levels	92
4.1	Objects and Smart Aids	92
4.2	Residential Spaces and Intelligent Environments	97
4.3	Movement and Mobility	101
	Adaptive Interface for Smart Home: A New Design Approach	107
	Francesca Gullà, Silvia Ceccacci, Roberto Menghi, Lorenzo Cavalieri and Michele Germani	
1	Introduction	107
2	Research Background	108

3	The Design Approach	110
4	The Proposed Adaptive System	111
4.1	Database	111
4.2	Application Core.	112
4.3	User Interface	113
5	Conclusion	114
	References	115

Part II Enabling Technologies and Assistive Solutions

Unobtrusive Technology for In-Home Monitoring: Preliminary Results on Fall Detection	119
---	------------

Giovanni Diraco, Alessandro Leone and Pietro Siciliano

1	Introduction	120
2	Materials and Methods	121
2.1	System Overview	121
2.2	Algorithmic Framework for Fall Detection	121
2.3	Experimental Setup.	123
3	Results and Discussion.	124
4	Conclusion	125
	References	126

A Neural Network Approach to Human Posture Classification and Fall Detection Using RGB-D Camera.	127
---	------------

Alessandro Manzi, Filippo Cavallo and Paolo Dario

1	Introduction	127
2	Related Work	129
3	System Overview	130
3.1	Dataset	130
3.2	NN Architecture	131
3.3	Training, Validation and Testing Sets.	132
4	Real-Time Tests	132
4.1	Experimental Setup.	133
5	Results	134
6	Fall Detector Application	135
7	Conclusion and Future Work	136
	References	137

A Tilt Compensated Haptic Cane for Obstacle Detection	141
--	------------

Bruno Andò, Salvatore Baglio, Vincenzo Marletta and Angelo Valastro

1	Introduction	142
2	The Haptic Cane Architecture	144
3	The Detection/Stimulation Paradigm	145
4	Results and Conclusions.	148
	References	149

Improved Solution to Monitor People with Dementia and Support Care Providers	153
Laura Raffaeli, Carlos Chiatti, Ennio Gambi, Laura Montanini, Paolo Olivetti, Luca Paciello, Giorgio Rascioni and Susanna Spinsante	
1 Introduction	154
2 Related Works	155
3 System Architecture and Functionalities	157
3.1 Data Acquisition	158
3.2 Data Processing	158
3.3 Notification Management	160
3.4 System Configuration	161
3.5 Remote Storage	163
4 Preliminary Tests and Discussion	166
5 Conclusion	168
References	168
Open Source Technologies as a Support for Community Care	171
Giada Cilloni, Monica Mordonini and Michele Tomaiuolo	
1 Introduction	171
2 The Need for Holistic Care Management	173
3 Overview of Software for the Community-Care	175
4 Identification of Common Use Cases	179
5 A Case Study on an Open-Source Platform	182
6 Functional Evaluation of the Tested Open Source Platform	186
7 Conclusion	187
References	188
Implementation of a Solution for the Remote Monitoring of Subjects Affected of Metabolic Diseases: The Metabolink Project	191
Daniele Sancarlo, Grazia D'Onofrio, Arcangela Matera, Anna Maria Mariani, Domenico Ladisa, Enrico Annese, Francesco Giuliani, Francesco Ricciardi, Antonio Mangiacotti and Antonio Greco	
1 Introduction	192
2 Materials and Methods	193
2.1 Overall View	194
3 Results and Discussion	195
4 Conclusion	195
References	196

MuSA: A Smart Wearable Sensor for Active Assisted Living 197
V. Bianchi, A. Losardo, F. Grossi, C. Guerra, N. Mora,
G. Matrella, I. De Munari and P. Ciampolini

1 Introduction 197
2 The HELICOPTER Project 198
3 The MuSA Wearable Sensor 201
 3.1 Physical Activity Estimation 202
 3.2 User Identification and Localization 203
4 Preliminary Results 204
5 Conclusions 206
References 206

**How to Help Elderly in Indoor Evacuation Wayfinding: Design
and Test of a Not-Invasive Solution for Reducing Fire Egress
Time in Building Heritage Scenarios** 209
Gabriele Bernardini, Enrico Quagliarini, Marco D’Orazio
and Silvia Santarelli

1 Introduction 210
2 Materials and Methods 211
 2.1 Rules for Wayfinding System Definition on Behavioral Bases 212
 2.2 Evacuation Drills 212
3 Results 214
 3.1 Wayfinding System Definition on Behavioral
 Bases 214
 3.2 Evacuation Drills Results 215
4 Conclusion 219
References 220

**The A.I.zeta Framework: An Ontological Approach
for AAL Systems Control** 223
Guido Matrella, Monica Mordonini, Roberto Zanichelli and Riccardo Zini

1 Introduction 224
2 An Ontological Inference Approach to Control an AAL System 226
3 The A.I.zeta Framework 230
4 Interface Between AAL System DB and A.I.zeta 231
5 Reconfigurable Mapping Through the Interface 232
6 Interface Between A.I.zeta and OWL-Based Ontology 232
7 Ontology Inference Based Design Approach 233
8 The Time Model 234
9 Results 236
10 Conclusions 236
References 237

Human Indoor Localization for AAL Applications:

An RSSI Based Approach	239
L. Ciabatonni, F. Ferracuti, A. Freddi, G. Ippoliti, S. Longhi, A. Monteriù and L. Pepa	
1 Introduction	240
2 Experimental Setup	242
3 Experimental Tests	244
4 Indoor Localization Algorithms	244
4.1 Min-Max	245
4.2 Trilateration	245
4.3 Maximum Likelihood	245
5 Experimental Results	246
6 Conclusions	248
References	248

User Indoor Localisation System Enhances Activity Recognition:

A Proof of Concept	251
Laura Fiorini, Manuele Bonaccorsi, Stefano Betti, Paolo Dario and Filippo Cavallo	
1 Introduction	251
1.1 Related Works	252
1.2 Objective	254
2 Materials and Methods	255
2.1 Phase I: Experimental Protocol Definition	255
2.2 Phase II: Experimental Setting and Data Acquisition	258
2.3 Phase III: Feature Extraction	258
2.4 Phase IV: Feature Classification	259
2.5 Phase V: Evaluation	260
3 Results and Discussion	261
4 Conclusions	265
References	266

An Innovative Speech-Based Interface to Control AAL and IoT

Solutions to Help People with Speech and Motor Disability	269
Massimiliano Malavasi, Enrico Turri, Maria Rosaria Motolese, Ricard Marxer, Jochen Farwer, Heidi Christensen, Lorenzo Desideri, Fabio Tamburini and Phil Green	
1 Introduction	270
1.1 The CloudCAST Project and Environmental Control	270
2 Materials and Methods	271
2.1 A Single Multi-standard Access Point	271
2.2 Implementing the Prototype	273
2.3 Integrating IoT Devices and Low Cost ICT Solution	273

3	Results and Discussion	274
3.1	A Completely Hands-Free Home Control Interface	274
3.2	The CloudCAST Based Solution	274
4	Conclusion	277
	References	278
	Fall Risk Evaluation by Electromyography Solutions	279
	Gabriele Rescio, Alessandro Leone, Andrea Caroppo and Pietro Siciliano	
1	Introduction	280
2	Materials and Methods	280
2.1	Hardware Architecture	280
2.2	Software Architecture	282
3	Results	283
4	Conclusion	284
	References	285
	Semantic Knowledge Management and Integration Services for AAL	287
	Gianfranco E. Modoni, Mario Veniero and Marco Sacco	
1	Introduction	288
2	The Vision	289
3	The Integration Services	290
3.1	Supporting the Signaling Capabilities Through the Information Dispatching Service	292
3.2	The Data Persistence Through the Semantic Repository	296
4	The Conducted Experiments	296
5	Conclusion	298
	References	298
	Part III Experiments, Evaluation and Lessons Learnt	
	ASTRO: Autism Support Therapy by Robot Interaction	303
	Massimo Pistoia, Marco Pistoia and Paolo Casacci	
1	Introduction	303
2	Materials and Methods	304
3	Technology	305
4	Results	308
	References	309

MARIO Project: A Multicenter Survey About Companion Robot Acceptability in Caregivers of Patients with Dementia	311
Daniele Sancarlo, Grazia D'Onofrio, James Oscar, Francesco Ricciardi, Dymrna Casey, Keith Murphy, Francesco Giuliani and Antonio Greco	
1 Introduction	312
2 Materials and Methods	314
3 Results	315
3.1 Acceptability and Functionality of Caring Service Robot	316
3.2 Support Devices and Impact of Caring Service Robot	316
3.3 Effects of Sex and Age of the Caregivers	319
3.4 Effects of Educational Level and Caregiving Types of the Caregivers	323
4 Discussion	323
5 Conclusion	326
Appendix 1: Mario Questionnaire on the Use of Companion Robotics	327
References	335
Enhancing the Interactive Services of a Telepresence Robot for AAL: Developments and a Psycho-physiological Assessment.	337
Gabriella Cortellessa, Francesca Fracasso, Alessandra Sorrentino, Andrea Orlandini, Giulio Bernardi, Luca Coraci, Riccardo De Benedictis and Amedeo Cesta	
1 Motivation and Context	338
1.1 The GIRAFFPLUS Telecare System	339
1.2 User Needs from Fielded Deployment	339
2 Technological Improvements of the Robotic Platform	341
2.1 @Home Services	341
2.2 Multimodal Communication Module	342
3 User Evaluation and HRI Experiments	345
3.1 Method	346
3.2 Results	349
4 Discussions	354
References	356
Evaluating SpeakyAcutattile: A System Based on Spoken Language for Ambient Assisted Living	359
F. Fracasso, G. Cortellessa, A. Cesta, F. Giacomelli and N. Manes	
1 Introduction	360
2 The SpeakyAcutattile Platform	362
3 Method	364
3.1 Participants	364
3.2 Materials and Metrics	365
3.3 Experimental Procedure	367

3.4 Statistical Analysis	369
4 Results and Discussion	369
4.1 Overall Satisfaction	370
4.2 Single Module Satisfaction	373
5 Conclusions	374
References	375
Quantify Yourself: Are Older Adults Ready?	377
Paolo Massa, Adele Mazzali, Jessica Zampini and Massimo Zancanaro	
1 Introduction	378
2 Related Work	379
3 Interview Study of Health Tracking in Older Adults	380
4 Results	382
4.1 Two Types of Indicators: Health and Wellness	382
4.2 Measurement and Tracking: Two Different Sub-phases	383
4.3 Tools for Measuring and Tracking: Artefacts and Mind	384
4.4 Sharing: Of Artefacts, Not of Tracked Data	386
4.5 Perception of Active Involvement During Measurement and Tracking	386
4.6 Barriers to Tracking	387
5 Conclusion	388
References	389
Telemedicine for Dementia-Affected Patients: The AAL-ACCESS Project Experience	391
Gianfranco Raimondi, Paolo Casacci, Giuseppe Sancesario, Beatrice Scordamaglia, Gaia Melchiorri and Massimo Pistoia	
1 Introduction	391
2 Materials and Methods	393
3 Clinical Aspects	396
4 Results	400
5 Discussion	402
Further Reading	403

Ambient Assisted Living

Italian Forum 2016

Cavallo, F.; Marletta, V.; Monteriù, A.; Siciliano, P. (Eds.)

2017, XVIII, 404 p. 141 illus., Hardcover

ISBN: 978-3-319-54282-9