

# Contents

<b>1</b>	<b>Introduction</b>	1
1.1	Introduction to Embodied Media	2
1.2	Introduction to Mixed Reality	4
1.3	Feeling Communication	7
1.3.1	Emotional Communication and Entertainment Using Multi-sensory Media	9
1.4	Social and Physical Entertainment	12
1.5	Conclusion	16
	References	17
<b>2</b>	<b>Human Pacman: A Mobile Augmented Reality Entertainment System Based on Physical, Social, and Ubiquitous Computing</b>	19
2.1	Introduction	19
2.2	Background	20
2.3	System Design and Game Play	23
2.3.1	Main Concepts: Team Collaboration, Ultimate Game Objectives and the Nature of Pac-world	24
2.3.2	Pacman and Ghost	27
2.3.3	Helper	29
2.3.4	Actual Game Play	31
2.4	User Study	36
2.4.1	Questions and Aims	37
2.4.2	Discussion	37
2.4.3	Analysis of Message Logs	45
2.4.4	Summary Findings	47
2.5	Mobile Service and UbiComp Issues	48
2.5.1	Mobile Computing	49
2.5.2	UbiComp	51
2.5.3	Addressing Sensor-Tracking Issues	53
2.6	Conclusion	54
	References	55

**3 Interactive Theater Experience with 3D Live Captured Actors and Spatial Sound . . . . . 59**

3.1 Introduction . . . . . 59

3.2 Previous Work on Interactive Theater . . . . . 60

3.3 New Media Art and Interactive Theater . . . . . 61

3.4 Background . . . . . 62

    3.4.1 Embodied Mixed Reality Space . . . . . 62

    3.4.2 Live 3D Actors . . . . . 63

    3.4.3 Ambient Intelligence . . . . . 68

3.5 Interactive Theater System . . . . . 69

    3.5.1 3D Live Capture Room . . . . . 69

    3.5.2 Interactive Theater Space . . . . . 71

    3.5.3 System Interaction Design . . . . . 73

    3.5.4 3D Sound in Interactive Theater Space . . . . . 74

3.6 Conclusion . . . . . 81

    References . . . . . 81

**4 Metazoa Ludens: Mixed Reality Interaction and Play Between Humans and Animals . . . . . 83**

4.1 Introduction . . . . . 83

4.2 Objectives . . . . . 84

4.3 Related Works . . . . . 85

    4.3.1 Human–Animal Interaction System . . . . . 85

    4.3.2 Remote Interaction System . . . . . 87

    4.3.3 Mixed Reality System . . . . . 87

4.4 Metazoa Ludens: Fundamental Design . . . . . 88

    4.4.1 Remote Interaction . . . . . 88

    4.4.2 Pet’s Choice . . . . . 88

    4.4.3 Pet Interface . . . . . 88

4.5 System Description . . . . . 89

    4.5.1 System Overview . . . . . 90

    4.5.2 Camera and Tracking Subsystem . . . . . 90

    4.5.3 Hardware Subsystem . . . . . 93

    4.5.4 Moldable Latex Surface . . . . . 93

    4.5.5 Game Subsystem . . . . . 94

    4.5.6 User Game Play Experience . . . . . 96

4.6 Evaluation, Results and Discussion . . . . . 98

    4.6.1 Study 1: Health Benefits to the Hamsters . . . . . 98

    4.6.2 Study 2: Pets’ Choice . . . . . 100

    4.6.3 Study 3: Users’ Enjoyment Based on Flow . . . . . 101

4.7 Framework for Human–Animal Interaction System . . . . . 103

4.8 Veracity of Telepresence . . . . . 108

4.9 Conclusion . . . . . 108

    References . . . . . 109

**5 Poultry Internet . . . . . 111**

5.1 Introduction . . . . . 111

- 5.2 Motivation for Human–Pet Touch Interaction . . . . . 114
  - 5.2.1 Why Do We Keep Animals as Companions? . . . . . 114
  - 5.2.2 The Effect of Touching and Caressing on Poultry and Other Animals . . . . . 115
- 5.3 Review of Related Works . . . . . 115
  - 5.3.1 Previous Tele-haptic Systems . . . . . 115
  - 5.3.2 Previous Human–Pet Interaction Systems . . . . . 116
  - 5.3.3 Why Not Just Interact with Virtual or Robotic Pet? . . . . . 117
- 5.4 Poultry Internet as a Cybernetics System . . . . . 119
- 5.5 Technical Details of the Multi-modal Interaction System . . . . . 119
  - 5.5.1 Overall System . . . . . 119
  - 5.5.2 Remote Physical Touch . . . . . 120
  - 5.5.3 Computer Vision Pet Tracking . . . . . 125
- 5.6 Experiences and User Studies . . . . . 127
- 5.7 Wider Applications . . . . . 131
  - 5.7.1 Multiplexing Existing Communication Channels . . . . . 131
  - 5.7.2 Intimacy Through Ubiquitous Computing . . . . . 132
  - 5.7.3 Spying/Rescuing Pet . . . . . 133
- 5.8 Conclusion and Future Works . . . . . 133
  - References . . . . . 135
- 6 Age Invaders: Entertainment for Elderly and Young . . . . . 137**
  - 6.1 Introduction . . . . . 137
  - 6.2 Related Work . . . . . 139
  - 6.3 Design Methodology . . . . . 140
    - 6.3.1 Problem Identification . . . . . 140
    - 6.3.2 Problem Exploration . . . . . 141
    - 6.3.3 Design Goals . . . . . 142
  - 6.4 Design Requirements . . . . . 143
    - 6.4.1 Resources and Time Constraints . . . . . 143
    - 6.4.2 User Needs . . . . . 144
    - 6.4.3 Context of Use . . . . . 144
  - 6.5 Design Idea Generation . . . . . 144
  - 6.6 Prototype Iterations . . . . . 145
  - 6.7 Current System Description . . . . . 146
    - 6.7.1 System Architecture . . . . . 146
    - 6.7.2 Game Play . . . . . 148
  - 6.8 User Studies Results . . . . . 150
    - 6.8.1 Intergenerational Player Study . . . . . 150
    - 6.8.2 Focus Group Session with Older Players . . . . . 151
    - 6.8.3 Physical Interface Design Issues . . . . . 152
    - 6.8.4 Physicality Issues of the Virtual and Physical Player Roles . . . . . 154
  - 6.9 Software Libraries and Toolkit . . . . . 155
  - 6.10 Product Development . . . . . 158
  - 6.11 Conclusion . . . . . 159
    - References . . . . . 159

- 7 Huggy Pajama: A Remote Interactive Touch and Hugging System . . . 161**
  - 7.1 Introduction . . . . . 161
  - 7.2 Background . . . . . 164
    - 7.2.1 Why Touch Communication? . . . . . 164
    - 7.2.2 Previous Work . . . . . 165
  - 7.3 System Description . . . . . 168
    - 7.3.1 Mediated Touch Module . . . . . 168
    - 7.3.2 Thermal Controlled Fabric Display . . . . . 173
    - 7.3.3 Design of Experiments . . . . . 175
  - 7.4 Results and Discussion . . . . . 180
    - 7.4.1 Input Touch Sensing Module . . . . . 180
    - 7.4.2 Output Touch Actuation Module . . . . . 181
    - 7.4.3 Thermal Control System . . . . . 185
    - 7.4.4 Evaluation of System . . . . . 187
  - 7.5 Conclusion . . . . . 191
  - References . . . . . 192
  
- 8 Culture Computing: Interactive Technology to Explore Culture . . . 195**
  - 8.1 Introduction . . . . . 195
  - 8.2 Prior Research . . . . . 196
  - 8.3 Features of Cultural Computing . . . . . 197
  - 8.4 Media Me . . . . . 198
    - 8.4.1 Introduction . . . . . 198
    - 8.4.2 Motivation . . . . . 201
    - 8.4.3 System Description . . . . . 201
    - 8.4.4 Video Indexing . . . . . 204
  - 8.5 BlogWall . . . . . 206
    - 8.5.1 Introduction . . . . . 206
    - 8.5.2 Motivation . . . . . 206
    - 8.5.3 System Description . . . . . 207
    - 8.5.4 An Example of Poetry Mixing . . . . . 212
  - 8.6 Confucius Computer . . . . . 215
    - 8.6.1 Introduction . . . . . 215
    - 8.6.2 Motivation . . . . . 215
    - 8.6.3 System Description . . . . . 215
  - 8.7 Conclusion . . . . . 218
  - References . . . . . 220
  
- 9 Kawaii/Cute Interactive Media . . . . . 223**
  - 9.1 Introduction . . . . . 223
  - 9.2 The Cute Aesthetic . . . . . 223
    - 9.2.1 Kawaii: Cute Culture History and Development in Japan . . . . . 223
    - 9.2.2 History of Manga . . . . . 225
    - 9.2.3 Kawaii Culture Development in Modern Japan . . . . . 227
    - 9.2.4 Kawaii Globalization . . . . . 228
  - 9.3 Contemporary Perceptions of Kawaii/Cute . . . . . 230
  - 9.4 Cuteness in Interactive Systems . . . . . 230

- 9.4.1 Child-Like Innocence and Play . . . . . 231
- 9.4.2 Moments of Surprise . . . . . 231
- 9.4.3 Relationship with Object’s Personality . . . . . 232
- 9.5 Studying Cuteness . . . . . 232
  - 9.5.1 Defining Cuteness . . . . . 233
  - 9.5.2 Color Selection . . . . . 233
  - 9.5.3 Texture . . . . . 235
  - 9.5.4 Motion . . . . . 236
  - 9.5.5 Sound . . . . . 237
  - 9.5.6 Size and Proportion . . . . . 238
  - 9.5.7 Shapes and Form . . . . . 240
  - 9.5.8 Smell and Taste . . . . . 243
- 9.6 Related Works. Cute Interactive Systems . . . . . 243
- 9.7 Cute Engineering . . . . . 244
  - 9.7.1 Cute Filter . . . . . 244
  - 9.7.2 Research-Oriented Design . . . . . 246
- 9.8 Qoot Systems. Petimo and Virtual World for Social Networking . 246
- 9.9 Sensing, Actuation and Feedback . . . . . 249
  - 9.9.1 Sensing . . . . . 250
  - 9.9.2 Actuation and Feedback . . . . . 251
- 9.10 Conclusion . . . . . 253
- References . . . . . 253

**10 Designing for Entertaining Everyday Experiences . . . . . 255**

Masa Inakage, Takahiro Arakawa, Kenji Iguchi, Yuichiro Katsumoto,  
Makoto Katsura, Takeshi Osawa, Satoru Tokuhisa, and Atsuro Ueki

- 10.1 Introduction . . . . . 255
- 10.2 Everyday Media . . . . . 256
  - 10.2.1 Amagatana . . . . . 257
  - 10.2.2 Tabby . . . . . 258
- 10.3 Embodied Media . . . . . 259
  - 10.3.1 Morel . . . . . 260
  - 10.3.2 MYSQ . . . . . 261
  - 10.3.3 livePic . . . . . 262
- 10.4 Sensuous Media . . . . . 264
  - 10.4.1 Nozoki-Hana . . . . . 264
  - 10.4.2 Mamagoto . . . . . 266
- 10.5 Collective Media . . . . . 267
  - 10.5.1 Mopie . . . . . 267
- 10.6 Conclusion . . . . . 268
- References . . . . . 269

**11 Tabletop Games: Platforms, Experimental Games and Design Recommendations . . . . . 271**

Michael Haller, Clifton Forlines, Christina Koeffel, Jakob Leitner,  
and Chia Shen

- 11.1 Introduction . . . . . 271

- 11.2 Tabletop Hardware & the Types of Interaction They Support . . . 272
  - 11.2.1 SmartBoard . . . . . 273
  - 11.2.2 DiamondTouch . . . . . 273
  - 11.2.3 SmartSkin . . . . . 274
  - 11.2.4 Microsoft Surface . . . . . 275
  - 11.2.5 Frustrated Total Internal Reflection (FTIR) . . . . . 276
  - 11.2.6 Entertaible . . . . . 276
  - 11.2.7 Stylus . . . . . 277
- 11.3 Experimental Tabletop Games . . . . . 278
  - 11.3.1 Educational . . . . . 278
  - 11.3.2 Therapeutic . . . . . 280
  - 11.3.3 Entertainment . . . . . 283
- 11.4 Case Studies . . . . . 284
  - 11.4.1 Jam-O-World: CircleMaze . . . . . 284
  - 11.4.2 CircleMaze . . . . . 285
  - 11.4.3 User Testing and Observations . . . . . 286
  - 11.4.4 Porting to a Direct-Touch Tabletop . . . . . 286
  - 11.4.5 Comino and NeonRacer . . . . . 286
  - 11.4.6 User Testing and Observations . . . . . 287
  - 11.4.7 Interaction Design for a Walk-up-and-Use Tabletop  
Game . . . . . 288
- 11.5 Heuristics for Tabletop Games . . . . . 289
  - 11.5.1 Evaluation Process . . . . . 290
- 11.6 Ten Heuristics for Tabletop Games . . . . . 293
  - 11.6.1 Cognitive Workload . . . . . 293
  - 11.6.2 Challenge . . . . . 293
  - 11.6.3 Reach . . . . . 293
  - 11.6.4 Examinability . . . . . 294
  - 11.6.5 Adaptability . . . . . 294
  - 11.6.6 Interaction . . . . . 294
  - 11.6.7 Level of Automation . . . . . 294
  - 11.6.8 Collaboration and Communication . . . . . 295
  - 11.6.9 Feedback . . . . . 295
  - 11.6.10 Comfort of the Physical Setup . . . . . 296
- 11.7 Conclusions . . . . . 296
  - References . . . . . 296
- Index . . . . . 299**



<http://www.springer.com/978-1-84996-136-3>

Art and Technology of Entertainment Computing and  
Communication

Cheok, A.D.

2010, XX, 299 p., Hardcover

ISBN: 978-1-84996-136-3