POLITECNICO DI TORINO Repository ISTITUZIONALE

The robotic service objects. Design approach for the multidimensional evaluation of robotic aesthetics

Original

The robotic service objects. Design approach for the multidimensional evaluation of robotic aesthetics / Germak, Claudio; Abbate, Lorenza. - ELETTRONICO. - 37:(2024), pp. 544-552. (Intervento presentato al convegno OPEN: Objects, Processes, Experiences and Narratives tenutosi a Parma (IT) nel 5-6 maggio 2022) [10.1007/978-3-031-49811-4_52].

Availability: This version is available at: 11583/2985544 since: 2024-01-30T15:45:19Z

Publisher: Springer

Published DOI:10.1007/978-3-031-49811-4_52

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

Springer Series in Design and Innovation 37

Francesca Zanella · Giampiero Bosoni · Elisabetta Di Stefano · Gioia Laura Iannilli · Giovanni Matteucci · Rita Messori · Raffaella Trocchianesi *Editors*

Multidisciplinary Aspects of Design

Objects, Processes, Experiences and Narratives





Springer Series in Design and Innovation

Editor-in-Chief

Francesca Tosi, University of Florence, Florence, Italy

Series Editors

Claudio Germak, Politecnico di Torino, Turin, Italy Francesco Zurlo, Politecnico di Milano, Milan, Italy Zhi Jinyi, Southwest Jiaotong University, Chengdu, China Marilaine Pozzatti Amadori, Universidade Federal de Santa Maria, Santa Maria, Rio Grande do Sul, Brazil Maurizio Caon, University of Applied Sciences and Arts, Fribourg, Switzerland **Springer Series in Design and Innovation** (SSDI) publishes books on innovation and the latest developments in the fields of Product Design, Interior Design and Communication Design, with particular emphasis on technological and formal innovation, and on the application of digital technologies and new materials. The series explores all aspects of design, e.g. Human-Centered Design/User Experience, Service Design, and Design Thinking, which provide transversal and innovative approaches oriented on the involvement of people throughout the design development process. In addition, it covers emerging areas of research that may represent essential opportunities for economic and social development.

In fields ranging from the humanities to engineering and architecture, design is increasingly being recognized as a key means of bringing ideas to the market by transforming them into user-friendly and appealing products or services. Moreover, it provides a variety of methodologies, tools and techniques that can be used at different stages of the innovation process to enhance the value of new products and services.

The series' scope includes monographs, professional books, advanced textbooks, selected contributions from specialized conferences and workshops, and outstanding Ph.D. theses.

The volumes of the series are single-blind peer-reviewed.

Keywords: Product and System Innovation; Product design; Interior design; Communication Design; Human-Centered Design/User Experience; Service Design; Design Thinking; Digital Innovation; Innovation of Materials.

How to submit proposals

Proposals must include: title, keywords, presentation (max 10,000 characters), table of contents, chapter abstracts, editors'/authors' CV.

In case of proceedings, chairmen/editors are requested to submit the link to conference website (incl. relevant information such as committee members, topics, key dates, keynote speakers, information about the reviewing process, etc.), and approx. number of papers.

Proposals must be sent to: series editor Prof. Francesca Tosi (francesca.tosi@unifi.it) and/or publishing editor Mr. Pierpaolo Riva (pierpaolo.riva@springer.com).

Francesca Zanella · Giampiero Bosoni · Elisabetta Di Stefano · Gioia Laura Iannilli · Giovanni Matteucci · Rita Messori · Raffaella Trocchianesi Editors

Multidisciplinary Aspects of Design

Objects, Processes, Experiences and Narratives



Editors Francesca Zanella Department of Engineering "Enzo Ferrari" University of Modena and Reggio Emilia Modena, Italy

Elisabetta Di Stefano Department of Humanities University of Palermo Palermo, Italy

Giovanni Matteucci D Department of Philosophy and Communication Studies University of Bologna Bologna, Italy

Raffaella Trocchianesi Department of Design Politecnico di Milano Milan, Italy Giampiero Bosoni Department of Design Politecnico di Milano Milan, Italy

Gioia Laura Iannilli Department of Philosophy and Communication Studies University of Bologna Bologna, Italy

Rita Messori Department of Humanities, Social Sciences and Cultural Industries University of Parma Parma, Italy



 ISSN 2661-8184
 ISSN 2661-8192 (electronic)

 Springer Series in Design and Innovation
 ISBN 978-3-031-49810-7
 ISBN 978-3-031-49811-4 (eBook)

 https://doi.org/10.1007/978-3-031-49811-4
 ISBN 978-3-031-49811-4
 ISBN 978-3-031-49811-4 (eBook)

This work was supported by Centro Studi e Archivio della Comunicazione, Università di Palermo and Politecnico di Milano.

© The Editor(s) (if applicable) and The Author(s) 2024. This book is an open access publication.

Open Access This book is licensed under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this book are included in the book's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the book's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Paper in this product is recyclable.

Introduction

This book is the result of a long research process. The work started in 2020 with an exhibition held in Parma (*Design! Oggetti processi esperienze*, CSAC Università degli Studi di Parma), and a book of the same title, edited by F. Zanella (with essays by G. Bosoni, E. Di Stefano, G.L. Iannilli, G. Matteucci and R. Trocchianesi) and published in 2023 (Electa Milano) centered on the role of archives as memory repositories and agents for contemporary design. This first period of reflection was followed by an international conference: *Design! O.P.E.N.* (https://www.designopen.it) held in Parma on May 5–6, 2022. The present volume contains most of the papers presented at the conference.

Starting from the first volume (*Design! Oggetti processi esperienze*), the research was always characterized by a multidisciplinary approach, which became even more multidisciplinary at the international conference held in 2022.

In fact, the conference was organized by a network of scholars from the world of design, philosophy and history of art, whose aim was to intertwine several types of knowledge. Consequently, multidisciplinarity is also the main feature of this second volume whose objective is to reflect, in an integrated manner, on the different dimensions of design, using competencies from the field of design and from that of humanities.

The aim of this project is to create a repertoire of opportunities of exchange and of relation among the culture of designers and the applied marketability of humanists in the project and in the innovation processes, in particular those design processes characterized by an important social and cultural impact.

In this context of exploration and experimentation in the territory of bordering subjects, stands the interpretative model in Fig. 1. It represents the potentialities in the interdisciplinary relations which verify the logics and dynamics in the "behavior" of a designer dealing with some project variables. On the vertical axis, humanities and techniques can be found, and on horizontal one, research and project.

Where these variables intersect, there can be four types of intervention:

- The intersection of techniques and research generates technological experimentation considering techniques and technology fields in continuous and fast evolution.
- Where research and humanities intersect, we are in the field of a historical/social/philosophical approach in which the analytical and critical dimensions of the research itself are developed.
- Between humanities and project, we are in the area on which our project focuses: here the meta-project approach becomes the synthetic expression of the relation among the two poles.
- Finally, between project and technique, we are in the area where the executive component of the project itself emerges.

There have already been significant studies which have stressed the importance of humanities for design and have shown that design can be a stimulus for humanities; this

Introduction



Fig. 1. Potential synergies between design and humanities [1]

is why the conference Design! O.P.E.N. intended to be an opportunity for research and debate with the objective of continuing this fundamental line of work.

Some crucial issues which interdisciplinary research must tackle are:

- The research of "new problems for design", that is, the collective need, as a scientific community, to find new directions toward which work must be periodically re-oriented, and this can be done only through a process of joint reflection.
- Research investigating the "meanings" that the product can have for design.
- Research that investigating the "value" that the design product shows.

As far as meanings are concerned, design and humanities integrated research can challenge, in a theoretically sounder way, "sustainability" by enhancing those concepts that are on the boundary between ethics and esthetics. Today, design cannot afford to dismiss ethical reflection, and, in this direction, humanistic culture can help to reinterpret the reflection on the mere functionality, in the more philosophically complex terms of the concept of "suitability for the purpose".

With regards to the analysis of the value generated by the action of design, it may be interesting to speak of "technology of value", which only humanistic investigation can help to process and fill with tools useful to produce not only ex-post critical knowledge, but first and foremost, oriented toward experimentation and to showing new corridors for contemporary design [1].

The volume follows the paths of reflection which structured the conference Design! O.P.E.N., focusing on current themes and issues that are still at the center of the multidisciplinary debate on design, investigated through four keywords: objects, processes, experiences and narratives, which correspond to the book chapters.

The first chapter focuses on object-oriented design, enhancing its functional narrative and experiential values. In fact, objects, beyond their value in use, bear symbolic, anthropological, political and social meanings and worldviews. This section also develops a theoretical reflection on the esthetic categories used to interpret the design object

vi

in relation to the classic dichotomy useful-beautiful, to the category of game, to artistic values and the relation between ethics and esthetics.

The second chapter is on the designer's self-reflective moment which is focused on the analysis and on the definition of processes in various contexts, spanning innovation, social engagement, reflection on emergencies or forecasting. This section investigates how designers develop and test their models, both at production, implementation and research levels. The areas of investigation are those addressing innovation, social engagement and pursuing a reflection on emergencies or forecasting. The section is intended as an arena for discussion on topics revolving around both the different moments in the history of design and the contemporary condition. The contributions collected in the Processes Section reflect the current condition of the disciplinary debate, which is strongly characterized by a profound transformation of design processes due to the comparison with scientific research methods, with a prevailing interest for methodologies and contemporary priorities as the environmental one, or to the dematerialization of processes.

The third chapter focuses on as a theoretical and practical strategy aimed at facilitating and fostering experiential interactions among people, between people and objects or environments. This section aims at investigating the foundations and the implications of a specifically experiential turn in design from various perspectives and in various disciplines. Due to the multifaceted nature of this turn, both theoretical and practice-based research are testified by contributors.

Finally, the last chapter is on narrative. The narrative vocation of design represents a crucial key of interpretation in contemporary cultural expressions such as making history, representing through different media, archiving and exhibiting. This section explores narratives in three different "dimensions": narrative as a scenario (envisioning new contexts, behaviors, uses, spaces); narrative as a tool (creating new ways to trigger innovation); and narrative as a process (framing new methodologies to face complex issues).

Each chapter reflects the results of the conference held in Parma and is constituted by the analysis of concrete case studies and theoretical and methodological proposals aimed at highlighting the "multiverse" character of design. It is organized in the thematic subsection defined for the conference program, just to emphasize the prevailing interpretative trajectories.

A special thanks to the institutions that have funded the conference and the present publication (The Department of Humanities, Social Sciences and Cultural Industries and CSAC, University of Parma; the Department of Philosophy and Communication Studies, University of Bologna; the Department of Humanities, University of Palermo; the Department of Design, Politecnico di Milano; and the Department of Engineering Enzo Ferrari, University of Modena and Reggio Emilia) and all those who, in different ways, have contributed to reach this result (particularly Alice Biancardi and Marta Elisa Cecchi, and also: Okuniev Avhustyn; Katia Botta; Gabriela Del Rosario Abate; Giorgia Ferri; Salvatore Martino; Serena Massimo; Diego Valle; and Laura Xhaja).

viii Introduction

Without their help, it wouldn't have been possible to make this event and this volume happen. We hope that this book will become a useful tool of reflection on the theoretical and methodological aspects between humanities and design.

The scientific committee and book editors:

Giampiero Bosoni, Elisabetta Di Stefano, Gioia Laura Iannilli, Giovanni Matteucci, Rita Messori, Raffaella Trocchianesi and Francesca Zanella.

Reference

1. Celaschi, F.; Penati, A.; Trocchianesi, R. Design e Humanities al Politecnico di Milano, pp. 16–30. In M. Celi; E. Formia (eds) Humanities Design Lab. Le culture del progetto e le scienze umane e sociali. Maggioli editore, Sant'Arcangelo di Romagna (2016).

Contents

OBJECTS

Silvia Berselli

Beyond the Beauty-Utility Diatribe: Towards New Aesthetic Categories	3
Elisabetta Di Stefano	5
"The Useful-Beautiful Couplet": On the Aesthetic Appraisal of Designed	
Objects	11
Imaginative Object and Mimetic Object Andrea Mecacci	21
OBJECTS. Objects Between Anthropology and Material Culture	
Seaweed Fabrics for Fashion Design. A Field Research Experience Paolo Franzo	31
Material Objects as Dispositive of Memory	41
Objects Between Material Culture and Visual Culture Loredana La Fortuna	56
Puppets' Tales. New Design Perspectives for a Multimedia Archive	
of a Humanity's Intangible Heritage Vincenzo Maselli	65
Anonima Castelli. Objects, Design and Cultural Heritage Dario Scodeller	75
OBJECTS. Political and Social Value of Objects	
Through the Mirror. Concept Maps to not Lose (One's Way Between)	
Objects	87

x Contents

For F☆ck's Sake. The Political Narrative of Sex Toys in the Communication of MySecretCase	103
Telephones in Italy, the Italtel Study-Case Rosa Chiesa	116
Design and Self-reproduction: A Theoretical-Political Perspective	127
OBJECTS. Philosophy and Representation	
Everyday Design: The Aesthetic Dimension of Alternative Use Monika Favara-Kurkowski	139
Digital Objects' Aesthetic Features. Virtuality and Fluid Materiality in the Aesthetic Education	147
The Value System of Objects Through the Interpretation of Photographic Language	156
Objects, Things, Hyperobjects. A Philosophical Gaze on Contemporary Design <i>Chiara Scarpitti</i>	165
OBJECTS. Symbolic Value and Use Value	
The Evolution of Yacht: From Status-Symbol to Values' Source Giuditta Margherita Maria Ansaloni, Arianna Bionda, and Andrea Ratti	177
Liberating the Imprisoned Soul of Dorian Gray: Cultural Affordance as Design Tool to Rediscover Cultural Values Andreas Sicklinger and Alireza Ajdari	187
The Extraordinary Everyday. The Post-Crafts in the Historical City	197
PROCESSES	
Archives and Processes <i>Francesca Zanella</i>	211

	Contents	xi
25 Ways to Hammer a Nail. "Postcrocian" Aesthetics and Everyday Poetics in Enzo Mari <i>Rita Messori</i>	y Life's	225
PROCESSES. Contemporary Strategies and Perspectives		
Design Through Body Memory for the Regeneration of Urban Are. Anna Anzani, Giulio Capitani, and Eugenio Guglielmi	as	235
Environmental Re-design of the Top San No Touch 2.0 Portable To The Contribution of the Bio-inspired Approach	oilet:	244
How to Use Strategic Design Process to Address Complex Challer A Practical Case of Application to Discuss Strategic Design Proce Fundamental Traits	nges: ess'	254
Design for Emergencies: The Contribution of Design Culture in Emergencies		263
PROCESSES. Histories of Processes and Processes for History		
Exhibiting Design as a Process Fiorella Bulegato and Marco Scotti		275
Toward Paris! 45 Years of Domus for a Design à la Français Elena Dellapiana		285
Archival Projects. Tools and Methods for Promoting the Corporate Starting from Historical Brand Elena Dellapiana, Ali Filippini, Chiara L. Remondino, and Paolo Tamborrini	Culture	295
<i>Working in Regress</i> and Beyond, with Rural Material Culture [1] . <i>Elisabetta Rattalino</i>		304
PROCESSES. Design Methodological Processes		
Air as a Design Tool: Raw Material, Infra-material Space, and Transformative Matter <i>Francesca Ambrogio</i>		315

xii Contents

Evasion Design for the Novacene Era Design and Production of Cultural Imaginaries	325
The Physical Model as an Evolution of the Design Process: From the "Capostipite" to the Finished Product	334
The Felicitating Factor. Cinzia Ruggeri's Clothing Project Elena Fava	344
Environmental Affordances: Some Meetings Between Artificial Aesthetics and Interior Design Theory <i>Fabrizio Gay and Irene Cazzaro</i>	354
PROCESSES. Dematerialized Processes	
The Critical Forms of Design Futures Scenarios: Introducing Unconventional Ways of Scenarios Making	367
How Do Design Narratives Play a Role in Cognitive and Social Processes? An Explorative-Systematizing Expert Interview Yasuyuki Hayama and Francesco Zurlo	377
Human-AI System Co-creativity to Build Interactive Digital Narratives Anca Serbanescu	388
Envisioning Technological Artefacts Through Anticipatory Scenarios and Diegetic Prototypes <i>Mila Stepanovic and Venere Ferraro</i>	399
EXPERIENCES	
Feeling Through Technology	411
EXPERIENCES. Education and Culture	

Storytelling as a Tool to Design Museum Experiences: The Case	
of the Secret Marquise	423
Licia Calvi, Bertine Bargeman, Moniek Hover, Juriaan van Waalwijk,	
Wim Strijbosch, and Ondrej Mitas	

	Contents	xiii
Open Communication Design A Teaching Experience Based on Anti-disciplinarity, Thinkering and Speculation <i>Francesco E. Guida</i>		434
Fashion Education: Cultivating Fashion Designers-Plants Clizia Moradei		443
Accessible Experiences. Designing Synaesthetic Access to Culture Dina Riccò		452
Misleading Design Implications of Adopting Embodied Interface in Everyday Objects		462

EXPERIENCES. Transitions

Communication Design for Welfare, the Challenge of Preserving	
Collaborative Activities for a Virtual Environment	475
Valeria Bucchetti, Michela Rossi, Umberto Tolino,	
Benedetta Verrotti di Pianella, and Pamela Visconti	
Aesthetics of Design for Social Innovation. Pathways for a Dialogue	
with Everyday Aesthetics	485
Annalinda De Rosa and Laura Galluzzo	
Designing Employee Experience to Experiment with Novel Working	
Modes. Action Research Project to Support Organizations in Engaging	
Employees in a Post-pandemic Scenario Michele Melazzini and Gianluca Carella	493
Design for Behavior Change in Design Education. A Case Study	503
Margherita Pillan	
EXPERIENCES. Can Experiences Be Measured?	
Italian Cultural Institutions Across and Beyond Covid-19: Designing	
Digital Cultural Experiences in Extra-Ordinary Times	513

Beyond Visualisation Data as Raw Material for Uncoded Experiences	. 526
Lucilla Calogero	

Ilaria Bollati, Valeria Morea, Federica Antonucci, and Marta Spanevello

xiv Contents

Designer and AR Technology: The Relationships Between the User and Virtual Antonio de Feo and Luca Casarotto	534
The Robotic Service Objects. Design Approach for the Multidimensional Evaluation of Robotic Aesthetics	544
EXPERIENCES. Tourism and Mobile Experiences	
Designing a New User Experience for the Travel Sector: A Research Project Reimagining the Role of Travel Stakeholders in the Digital Post-pandemic Age	555
Operazione Arcevia. Existential Community. The Reality of the Experience and the Utopia of the Vision	569
Collaborative Dialogues Between Souvenirs and Territories: From Evocative Objects to Experience-Objects	584
NARRATIVES	
For a Novel and Transversal Narration of Extemporaneous Places of Artistic and Design Thinking: The City's Network of Crossroads Between Art and Design: The Milanese Case in the 20th Century <i>Giampiero Bosoni</i>	595
Design Narrative	603
NARRATIVES. Communications, Strategies, Tools	
Space as a Narrative Interface. Phygital Interactive Storytelling in the Field of Cultural Heritage	613
Worldbuilding Practice as a Collaborative and Inclusive Design Process. The Case of ACTS-A Chance Through Sport	623

Contents	XV
The Role of Infographics in the Representation of Design Research Vincenzo Cristallo and Miriam Mariani	632
The Open Logo and the Closed History Notes of a Social History of Visual Identities	640
An Advanced Design Tool for Archiving, Mapping, and Narrating a Complex System: The ADU Packaging Innovation Observatory <i>Clara Giardina</i>	649
NARRATIVES. Cultural Heritage, Museums, Territories	
From Narrative to Phygital. An Experimental Semantic Survey Marco Borsotti	661
Enhancing Local Cultural Heritage by Designing Narrative and Interactive Exhibitions. MEET at the "Museo del Territorio di Riccione" Alessandra Bosco, Silvia Gasparotto, and Margo Lengua	671
Making Value: Storydoing Actions for Cultural and Creative Industries Simona Colitti, Ami Liçaj, Lorela Mehmeti, and Elena Vai	682
Ustica, a Whole World in an Island Fragment Cinzia Ferrara and Marcello Costa	694
NARRATIVES.Interaction, Digital, Sustainability	
Craftmanship and Digitalization in the Italian Knitwear Industry. A Paradigm Shift for the Narrative of Made in Italy Martina Motta, Giovanni Maria Conti, Giulia Lo Scocco, and Rachele Didero	705
Design in the Metamorphosis of Matter	714
Counter-Narratives Against Gender-Based Violence. A Twofold Perspective on Choices in Interactive Dramas Sofia Peracchi and Ilaria Mariani	724
Sustainable Mobility as a Sport Domenico Schillaci, Salvatore Di Dio, and Mauro Filippi	735

xvi Contents

NARRATIVES. Critical Approach, Languages, Explorations

Provocation Through Narratives: New Speculative Design Tools for Human-Non-Human Collaborations <i>Francesca Casnati, Alessandro Ianniello, and Alessia Romani</i>	747
Designer as Drama Manager: Understanding the Roles of Narrative Within Design Processes for Change	756
Interaction and Verisimilitude. How Narration Can Foster the Design Process	765
Conversation Design for Raising Awareness on the Responsible Use of the Internet: Co-design of a Chatbot Game with Secondary School Students	773
From a Word-Formation to a Concept-Formation: Mnemosphere as a Connective Tool in Interdisciplinary Design <i>Clorinda Sissi Galasso and Marta Elisa Cecchi</i>	783
Author Index	795



The Robotic Service Objects. Design Approach for the Multidimensional Evaluation of Robotic Aesthetics

Claudio Germak [™] and Lorenza Abbate[™] [™]

Politecnico di Torino, Turin, Italy {claudio.germak,lorenza.abbate}@polito.it

Abstract. With the growing popularity of service/social robots in different contexts and for many users, it becomes one of the future challenges for research to achieve a higher level of acceptability through the characterisation of the interaction with the machine, both from an expressive and functional point of view. A characterisation will depend on the type of user, work context and tasks to be performed by the machine. In this scenario, telepresence robots require an in-depth characterisation study, as they are machines intended to represent the extension, and therefore the personality, of remote subjects, mediating their communication. Through an analysis of case studies, this paper aims to provide an overview of approaches to telepresence robotics's physical and/or cognitive characterisation. The use and application contexts dynamics will be explored to build support for experimentation.

Keywords: Human-robot interaction · Aesthetics · User Experience · Telepresence design approach · Personalization · Embodiment design

1 Introduction

Service/social robots, often clustered in the same category, are gaining popularity, particularly in health care, home care and education. Although the differences appear nuanced, the former (service robots) are purely functional machines, while the latter (social robots) develop stronger interpersonal skills. From the most specific services offered in terms of order execution to more complex cognitive processing, the service/social robot possesses its physical form (a body) and a communication system based on sensory properties expressed at different levels: capable of speaking, touching, gesturing, pointing, even expressing emotional reactions. Bartneck & Forlizzi [1] define a social service robot as "an autonomous or semi-autonomous robot that interacts and communicates with humans by following the behavioural norms expected of the people with whom the robot is intended to interact." Therefore, these robots take on different identities depending on their functional role and the context for which they are designed. In other words, they possess an overall form (the Anglo-Saxon form) that is not only determined by the sophisticated technologies used here but is the result of well-defined design choices [2]. The service/social robot, as an intelligent machine to entertain, assist, and educate, or as a telepresence robot to communicate with people at a distance, is perhaps the object with the most complex system of interaction with humans. It is a system that can offer

© The Author(s) 2024

F. Zanella et al. (Eds.): Design! OPEN 2022, SSDI 37, pp. 544–552, 2024. https://doi.org/10.1007/978-3-031-49811-4_52 different performances, the impact of which has to be measured through the degree of acceptability of the robot by the people who interact with it, obviously divided into categories: children, adults, the elderly, the frail, etc. The aesthetics of the machine, which in this category of the robot is determined by a complex of relationships not only of a somatic character but also of a sensory and interactive nature, has its fundamental importance [3]. In robotics, the concept of functionality proper to industrial objects extends to the semantic nature of formal and interaction relations, with the primacy of embodiment, i.e., the principle of the embodied mind, where human reactions arise from a complex interweaving of mind, brain and body [4].

In this multidimensional direction that places at the basis of the morphological reading of the robot the integration of interaction and expressiveness of the body, there are several studies of an anthropological and psychological nature that inform us about the requirements for the acceptance and adequacy of certain forms without, however, systematizing all the elements that contribute to a descriptive synthesis of the methodologies for their measurement.

The research, therefore, aims to present a series of approaches aimed at characterizing telepresence robots through the analysis of case studies in the literature to identify the directions that telepresence should take in the future. These robots enable remote communication between people so they can fully experience individual, group, and remote spaces through the functions and features they possess motion, screens, sensors, and voice commands [5]. This task raises questions about the characterization of the machine depending on who experiences and shares it.

2 Enhanced Human-Robot Interaction and Human-Robot-Human

In the case of telepresence, human-robot-human social interaction is a dynamic and complex phenomenon influenced by specific factors such as socio-cultural context and past experiences. Therefore, most scholars think that in order to create a positive interaction between the robotic machine and the user, especially in the case of telepresence, it is necessary to introduce the concept of "humanized natural" through the reproduction of only some traits and behaviours that belong to humans [6]. This, on the other hand, is not the case at the two opposite extremes of robotics: at the bottom, household appliance robots, generally characterized by a curated but aseptic design expressiveness, typical of tools subjected to a good design process; at the top, humanoid laboratory robots such as iCub, designed by IIT Istituto Italiano di Tecnologia, a reference model for recent application experiments such as RoBee, the first Italian cognitive robot intended for Industry 5. 0 (Oversonic Robotics), equipped with anthropometric dimensions and somatic features almost identical to the human standard, to better contribute to the performance of tasks that are not repetitive but require great precision (pick and place) and cognitive performance (facial recognition).

In the less performant, social and service robots, including telepresence robots, we find examples of humanizing aesthetics that look to the human model according to three scalar design attitudes: copying, quoting and allusion.

In the direction of humanoid copying are perhaps the digital technologies that today allow for novel explorations: among them is Furhat Robot (Fig. 1), a rear-projected

546 C. Germak and L. Abbate

robotic head that can be modelled after a range of human likenesses through the choice of skin colour, expression of the eyes, mouth, and nose [7]. Experiments that could, in part, be introduced into telepresence machines as well, where the goal of greater acceptance of the robot as a mediating element in human-to-human relationships at a distance is driving research to explore different levels of characterization, most of which use quotation and allusion, particularly in body definition.



Fig. 1. The Furhat Robot (2022) designed by the start-up Furhat Robotics.

The robot Pepper, equipped with a humanoid body and a screen for communication, cites some elements of its human appearance and behaviour (movement and voice) in a comic key. Others, however, depart from the quotation through a formal simplification of the body, which we call allusive. As a result, human features are present only partially, as in Ava Robot (mainly for the hospital context) and Temi (for housing and entertainment) to minimal ones like Double, where the machine is reduced to a few components: a screen representing the head, an adjustable rod for the body, and wheels as feet.

3 Approaches to Telepresence Machine Characterization

The formal reduction that is characteristic of this new generation of telepresence robots, however, brings with it a need of an opposite sign to their minimalist conception: characterization. We are witnessing a phenomenon that had already presented itself with serial design objects and that had led the industry to manufacture differentially from the standard, as a response to the demand for products that are more familiarizing with each specific user but also adapting to different contexts: in other words, custom design [8]. The characterization of social robots, from the hardware point of view, has led researchers to explore different possibilities to transform the morphology of the machine's appearance. This is a complex concept, away from references to taste, thus also to style, which looks at design as a multidimensional expressive language beyond the actual form, a

concept that also applies to robotic design: "a path to the non-thing, where form is immaterial" [9].

The modes of characterization are of course many: from the robotic kit that allows the controlled transformation of the machine directly by the user to spontaneous characterization by adding physical elements to the embodiment of the machine, such as tattooing a body or customizing one's smartphone to enhance interaction and empathy with the machine [10]. The research, from the perspective of characterization affordance, is also tasked with exploring ways to make the robot's appearance more consistent with the context of the activity. The motive stems from the observation that, particularly in telepresence, identical machines now operate in fields as diverse as hospitals, care, commercial, and education. Therefore, characterization becomes a central value in telepresence as it can enhance the identity of the remote person to achieve appropriate work cooperation, caring assistance or hands-on learning. This complexity is associated with the two simultaneous roles that the telepresence robot assumes in the task. For the remote operator it is a human proxy, while for the co-located interlocutor it is also a physical machine, which is at the same time and increasingly indestinguishably, embodiment and body.

4 Methodology

This section will discuss different approaches to research on the characterization of human-machine-human interaction (telepresence) through an analysis of case studies that represent milestones in this direction. Several experiments characterizing the telepresence machine have appeared in the literature in recent years, distinguishable into four main approaches. The first is the *spontaneous* one, in which the robot, through spontaneous initiatives, acquires anthropomorphic characteristics. The second is the *playful one*, where the user chooses his or others' configuration through construction kits. The third is an *anthropometric* approach in which the robot reproduces known human dimensions; finally, *mediated reality*, where the user's identity is expressed through different modalities. Indeed, by acting on the material and digital interface of the robot, it is possible to give the machine gender identity and character, where the body (head, torso, and limbs) and sensory communication (looks, gestures, and voice) become the protagonists of the interaction.

4.1 Spontaneous Design Approach: I'm Wearing What I Want

Several studies on the introduction of telepresence robotics in social contexts show spontaneous characterisation initiatives of the robot through the introduction of the dress. The machine wears T-shirts, togas, hats, ties, necklaces, and wigs to acquire more distinctive traits of the subject at a distance. In the study by Fitter et al. (11), the impact of personalisation on clothing was measured. The results showed an appreciation on the part of remote users and the perception on both sides of a humanising effect of the machine. This, however, did not exclude the appearance of feelings of discomfort, especially for in-presence users, associated with the Uncanny Valley [12].

Indeed, when representation becomes stereotypical, it can evoke feelings opposite to the quest for characterisation: standardisation vs customisation.

548 C. Germak and L. Abbate

Among the work on the personalisation of the telepresence machine, the one presented-to by Tsui et al. [13], through the VGo robot, experiments with some modes of communication closer to users with co- cognitive and motor disabilities, in addition to the ease of driving. In summary, these are two proof of concept machines, Margo, and Hugo, characterised by distinctive and easy-to-read symbols such as a Hawaiian shirt for the former and a tie for the latter.

This approach can also be found in the educational sector. This is the case with the study by Han & Conti [14], who, to investigate the factors determining the acceptance of the telepresence machine, made the robot wear a T-shirt to impersonate the student at a distance. Indeed, it has been shown that people are more likely to interact with robots whose personality conforms to their role [15].

4.2 Playful Design Approach: Building Myself

The characterisation in telepresence assumes an increasingly important role, as it is a factor in the interpretation of the individual's personality. As a result, initiatives for do-it-yourself construction are emerging, as in the case of Smartipresence (Fig. 2), made by The Crafty Robot, a low-cost telepresence robot associated with a smartphone. The small cardboard robot is designed to support one's smartphone, which enables remote communication via audio, video and movement. Smartipresence was created as an expansion of the Smartibot kit, where the user can build his or her robot with printed circuit boards, motors and a battery, choosing the physical cardboard embodiment from several available characters.



Fig. 2. Av1 Robot by No Isolation designed for education technology for inclusion.

My Classroom Robot [16] was realised in this direction as an interactive game led by players (the students) operating a telepresence robot in a virtual classroom. The aim was to explore the use of telepresence robots for K-12 education. The virtual environment allows for fast and flexible experimentation with different telepresence solutions, familiarising the students with the interaction between the machine and the remote subject. With this experience, the students became familiar with the topic of personalisation through different tools. These include the light signals emitted by the robot for non-verbal communication, which makes the interaction more functional and expressive.

4.3 Anthropometric Design Approach: I Am as You See Me

The need to represent a subject at a distance through a robot has led designers to consider certain anthropometric elements for the natural presence of the robot. These include flexibility in height, a feature that some commercial robots offer (e.g. Double Robot, Beam +, Ava robot), to activate a conversation on par with the human individual [17].

However, expressing one's personality at a distance has also been interpreted by reproducing images that are as realistic and faithful to the human body as possible. This is the case with the Large Screen Mobile Telepresence Robot and Mixed Reality Window prototypes [18]. This is a family of products where large screens are integrated into robotic systems capable of moving in remote environments. Working at full scale, it is possible to imagine new strategies for Mixed Reality and ubiquitous computing for the not-too-distant future. By allowing remote users to participate and superimpose their images and content directly onto the two-way window, accessibility to these spaces is greatly expanded in ways that are not strictly related to physical proximity.

The use of an anthropometric approach has also been used in the Profesor Avatar holographic projection system [19], a telepresence model developed at the Tecnológico de Monterrey that combines the use of real-time holographic projection and telepresence robots. The subject's image at a distance is projected in real-time and at full scale through a screen that allows the lesson to be followed where there are problematic geographical situations, environmental insecurity, and high travel costs. Furthermore, telepresence specialists, tutors and students interact in real-time, exchanging knowledge and experience in different contexts. Hardly probable but possible, holography presents itself as the future goal of remote telepresence: a robotic representation of the individual in 3-D, full-scale, and capable of moving through space as most social/service robots allow today.

4.4 Mediated Design Approach: See-Through

The mediated reality in telepresence represents one of the most relevant approaches in this field; think of telemanipulation applications where a machine reproduces them in a remote environment through replicating human movements. This approach has also been applied to telepresence social robots such as the AV1 Robot, capable of imitating presence through the robot's body acting as a representation. The applications of this robot are intended for the school context where the robot represents the child or adolescent in the classroom. Children can control the robot's head, the direction of the camera in the classroom and the microphone and decide whether it is open for communication or

550 C. Germak and L. Abbate

mute and 'raise their hand' by switching on the light at the top of the robot's head. This type of robot design implies that the child cannot move within the remote space and is therefore always dependent on the other students [20]. This customisation is provided by the interface created by the remote user's movements.

From the perspective of a mediated approach, the study conducted by Luria et al. [21] shows an advancement in the concept of re-embodiment of the machine, communicating through the design of eyes and audio. The work aims to map the design space of social presence flexibility to help designers and researchers understand how to design conversational agents and social robots for personalised interactions.

5 Conclusions

The development of social robots will continue to grow at a strong rate, even during the Covid-19 pandemic. Against this backdrop of future uncertainty, telepresence robots will gain strategic relevance to communicate with humans at a distance.

For these reasons, the degree to which the machine's appearance matches the context and the actions to be performed will be crucial to the acceptance and introduction of robots with a role and appearance consistent with the assigned context and task. In addition, the shape, size, and technologies used will require human-centred design considerations to enable the design to meet the needs of the various stakeholders. On the one hand, the remote user manifests his/her presence through the robot; on the other hand, the in-presence actors interact directly with the robot. The analysis of the case studies revealed the need to establish specific criteria for characterizing the machine according to the context and the tasks to be performed. The physical characterization of the machine (body) is an aspect that is still under-explored, except for small spontaneous and playful design interventions. However, it is hoped that solutions allow the conformation to be modified through actions left to the discretion of the users and the subject at a distance. Just think of the school context and child users, where the physicality of the machine is crucial for good interaction. At the same time, we are witnessing in the marketplace the proposal of machines that are increasingly an expression of formal synthesis and mediated reality, certainly more aimed at an adult audience. Reflections such as these require further (and rapid) experimentation from the perspective of design thinking to increase a conscious diffusion of telepresence tools that are also consistent with users' needs and different contexts of use.

References

- Bartneck, C., Forlizzi, J.A.: Design-centred framework for social human-robot interaction. In: 13th IEEE International Workshop on Robot and Human Interactive Communication (IEEE Catalog No.04TH8759), RO-MAN 2004, pp. 591–594 (2004). https://doi.org/10.1109/ ROMAN.2004.1374827
- Gemeinboeck, P.: The Aesthetics of Encounter: a relational-performative design approach to human-robot interaction. Front. Robot. AI 7 (2021). https://doi.org/10.3389/frobt.2020. 577900
- 3. Colle, A., Gaudl, S.E.: Non-zoomorphic robots: the role of aesthetics in social robotic design (2020)

- 4. Shapiro, L.: The mind incarnate, Bradford Books, Denver (2004)
- Rae, I., Venolia, G., Tang, J.C., Molnar, D.: A framework for understanding and designing telepresence. In: Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing, pp. 1552–1566 (2015)
- Hegel, F.: Effects of a robot's aesthetic design on the attribution of social capabilities. In: Proceedings - IEEE International Workshop on Robot and Human Interactive Communication, pp. 469–475 (2012). https://doi.org/10.1109/ROMAN.2012.6343796
- Al Moubayed, S., Beskow, J., Skantze, G., Granström, B.: Furhat: a back-projected humanlike robot head for multiparty human-machine interaction. In: Esposito, A., Esposito, A.M., Vinciarelli, A., Hoffmann, R., Müller, V.C. (eds.) Cognitive Behavioural Systems. LNCS, vol. 7403, pp. 114–130. Springer, Berlin (2012). https://doi.org/10.1007/978-3-642-34584-5_9
- 9. Mecacci, A.: Estetica e design. Il Mulino, Bologna, Italia p. 209 (2012)
- 10. Marathe, S., Shyam Sundar, S.: What Drives Customization? Control Or Identity? (2011)
- Fitter, N.T., Strait, M., Bisbee, E., Mataric, M.J., Takayama, L.: You're wigging me out! Is personalization of telepresence robots strictly positive? In: Proceedings of the 2021 ACM/IEEE International Conference on Human-Robot Interaction, pp. 168–176 (2021). https://doi.org/ 10.1145/3434073.3444675
- 12. Mori, M., MacDorman, K.F., Kageki, N.: The uncanny valley [from the field]. IEEE Robot. Autom. Mag. **19**(2), 98–100 (2012)
- Tsui, K.M., Yanco, H.A.: Design challenges and guidelines for social interaction using mobile telepresence robots. Rev. Hum. Fact. Ergon. 9(1), 227–301 (2013). https://doi.org/10.1177/ 1557234X13502462
- 14. Han, J., Conti, D.: The use of UTAUT and post acceptance models to investigate the attitude towards a telepresence robot in an educational setting. Robotics **9**(2), 34 (2020)
- Tay, B., Jung, Y., Park, T.: When stereotypes meet robots: the double-edge sword of robot gender and personality in human-robot interaction. Comput. Hum. Behav. 38, 75–84 (2014)
- Cha, E., Greczek, J., Song, A., Matari´cmatari´c, M.J.: My classroom robot: exploring telepresence for K-12 education in a virtual environment (2017). https://doi.org/10.0/Linux-x86_ 64
- Rae, I., Takayama, L., Mutlu, B.: The influence of height in robot-mediated communication (2013). https://doi.org/10.1109/HRI.2013.6483495
- Gonsher, I., Han, Y., Desingh, K., Gokaslan, A.: Prototyping mixed reality large screen mobile telepresence robots (2022)
- Mendívil, E.G., Belmonte, L.L., de Lara Díaz, L.E., Milián, H.Q.: Profesor AVATAR: telepresence model. In: IACEE World Conference on Continuing Engineering Education, Monterrey, IACEE, pp. 1–9 (2018)
- Weibel, M., et al.: Back to school with telepresence robot technology: a qualitative pilot study about how telepresence robots help school-aged children and adolescents with cancer to remain socially and academically connected with their school classes during treatment. Nursing Open 7(4), 988–997 (2020). https://doi.org/10.1002/nop2.471
- Luria, M., Hoggenmüller, M., Lee, W.-Y., Hespanhol, L., Jung, M., Forlizzi, J.: Research through design approaches in human-robot interaction. In: Companion of the 2021 ACM/IEEE International Conference on Human-Robot Interaction, pp. 685–687 (2021). https://doi.org/ 10.1145/3434074.3444868

552 C. Germak and L. Abbate

Open Access This chapter is licensed under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.



Author Index

A

Abbate, Lorenza 544 Ajdari, Alireza 187 Ambrogio, Francesca 315 Ansaloni, Giuditta Margherita Maria 177 Antonucci, Federica 513 Anzani, Anna 235 Arquilla, Venanzio 555

B

Balsamo, Mariangela Francesca 244 Bargeman, Bertine 423 Berselli, Silvia 87 Bertolo, Maresa 756 Biasetton, Noemi 103 Biasetton, Silvia 103 Bionda, Arianna 177 Bollati, Ilaria 513 Bollini, Letizia 613 Borsotti, Marco 661 Bosco, Alessandra 671 Bosoni, Giampiero 595 Bucchetti, Valeria 475 Bulegato, Fiorella 275

С

Calogero, Lucilla 526 Calvi, Licia 423 Capitani, Giulio 235 Carella, Gianluca 254, 493 Caruso, Federica 555 Casarotto, Luca 534 Casnati, Francesca 747 Cazzaro, Irene 354 Cecchi, Marta Elisa 783 Chiesa, Rosa 116 Ciancia, Mariana 623, 756 Ciaramitaro, Mario 325 Colitti, Simona 682 Conti, Giovanni Maria 705 Costa, Marcello 694 Costa, Pietro 325 Cristallo, Vincenzo 632

D

De Angelis, Chiara 263 De Chirico, Michele 714 de Feo, Antonio 534 De Rosa, Annalinda 485 Dellapiana, Elena 285, 295 Di Dio, Salvatore 735, 773 Di Salvo, Andrea 765 Di Stefano, Alessandro 334 Di Stefano, Elisabetta 3 Didero, Rachele 705

F

Fava, Elena 344 Favara-Kurkowski, Monika 139 Ferrara, Cinzia 694 Ferraro, Venere 399 Filippi, Mauro 735, 773 Filippini, Ali 295 Forsey, Jane 11 Fransoni, Alessio 127 Franzo, Paolo 31

G

Galasso, Clorinda Sissi 783 Galluzzo, Laura 485 Galluzzo, Michele 640 Gasparotto, Silvia 671 Gay, Fabrizio 354 Genco, Davide 555 Germak, Claudio 544 Giardina, Clara 649 Guglielmi, Eugenio 235 Guida, Francesco E. 434 Guzzo, Sabrina 773

H

Haidamous, Toufic 41 Harb, Ammer 367

© The Editor(s) (if applicable) and The Author(s) 2024 F. Zanella et al. (Eds.): Design! OPEN 2022, SSDI 37, pp. 795–796, 2024. https://doi.org/10.1007/978-3-031-49811-4

Author Index

Hayama, Yasuyuki 377 Hover, Moniek 423

I

Ianniello, Alessandro 747

L

La Fortuna, Loredana 56 Lengua, Margo 671 Liçaj, Ami 682 Lo Scocco, Giulia 705

М

Malorni, Stefano 773 Manera, Lorenzo 147 Mariani, Ilaria 462, 724 Mariani, Miriam 632 Maselli, Vincenzo 65 Mazzanti, Anna 569 Mecacci, Andrea 21 Mehmeti, Lorela 682 Melazzini, Michele 254, 493 Messori, Rita 225 Mitas, Ondrej 423 Moradei, Clizia 443 Morea, Valeria 513 Motta, Martina 705

P

Paciotti, Davide 334 Parente, Marina 584 Parise, Chiara 555 Peracchi, Sofia 724 Pillan, Margherita 503 Piredda, Francesca 623, 756 Proverbio, Paola 156

R

Rattalino, Elisabetta 304 Ratti, Andrea 177 Remondino, Chiara L. 295 Riccò, Dina 452 Romani, Alessia 747 Rossi, Michela 475

S

Scarpitti, Chiara 165 Schillaci, Domenico 735, 773 Scodeller, Dario 75 Scotti, Marco 275 Scuderi, Angelo 773 Serbanescu, Anca 388 Sicklinger, Andreas 187 Spanevello, Marta 513 Spence, Jocelyn 411 Stepanovic, Mila 399 Strijbosch, Wim 423

Т

Tamborrini, Paolo 295 Tolino, Umberto 462, 475 Trapani, Viviana 197 Trocchianesi, Raffaella 603

V

Vai, Elena 682 van Waalwijk, Juriaan 423 Verrotti di Pianella, Benedetta 475 Visconti, Pamela 475

Z

Zanella, Francesca 211 Zurlo, Francesco 254, 377

796