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More than the Modeling of Emotions: A Foreword

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Abstract
In this work I am providing comments on some important factors that must be accounted for when robotics comes near to the human body, as in the case of wearable robots. In addition to well-known socio-demographic factors such as sex/gender, age, ethnicity, skin color and emotional and culturally determined sense of personal space, characteristics of health professionals and caregivers, here I stress the necessity to take into account also fashion and the questions raised by it.

Keywords Robotic assistive technologies· Mediated emotion· Fashion· Sociology of robotics

This volume represents a significant advancement of the knowledge required to build reliable autonomous systems in the various environments sustained by social robotics' products [1–6]. Its focus, that is on the modeling of emotions, stands on the ridge where the social sciences and hard sciences meet and integrate [7]. Emotions in fact are at the core of human relationships and processes such as socialization and education [8]. The study of emotion in itself is a challenge for anthropologists, sociologists, cognitive and social psychologists and neuroscientists, but when the emotions encounter technology and are filtered and mediated by some media, this challenge becomes even more problematic.

It is important to remember that a mediated emotion can be defined as "an emotion felt, narrated or showed, which is produced or consumed, for example in a telephone or mobile phone conversation, in a film or a TV program or in a website, in other words mediated by a computational electronic device. Electronic emotions are emotions lived, re-lived or discovered through machines. Through ICT, emotions are on one hand amplified, shaped, stereotyped, re-invented and on the other sacrificed, because they must submit themselves to the technological limits and languages of a machine" [9]. What happens to emotions in the somersault towards technology is not only a technical problem, but it is a multidimensional problem. As Adam Smith pointed out in his first book The Theory of Moral Sentiments (1759) [10], emotions
are the glue that keeps together the fabric of society. Advancing the understanding of emotion means to address "the reasons of the heart", of which "reason knows nothing", according to Blaise Pascal [11].

The focus of this volume is on the one hand on the social features of emotion in speech, handwriting, facial, vocal and gestural expressions. On the other, it is on people's ability to decode and encode emotional social cues in social interactions, which are a blend of emotion and reason. The findings collected here allow to elaborate multidimensional models of multimodal interactional features. These models will enable the design and development of social robots to be used, for example, in health care services, training/education systems, human–computer interfaces, entertainment, computer games, and communication and information spheres, last but not the least in the human body.

When robot technologies approach the human body, this becomes subject to a robotization process. We must be aware, in this case, of the social stratification and cultural layers that surround the human body. So far studies on robotics stress the importance to considerate a series of socio-demographic factors: sex/gender, age, ethnicity, skin color and emotional and culturally determined sense of personal space, as well as characteristics of health professionals and caregivers.

Women and men often have similar needs, but not the same [12]. As an example, important for the development of social robotics, consider elders needs. Studies indicate that the interaction of sex and gender affects elderly's health [12]. Thus, understanding how sex and gender interact to affect the life conditions of old men and women is crucial to assist engineers in developing à la carte technologies that fit better their specific needs. Dementia strikes equally women and men, but as women live longer in most developed countries, these suffer more dementia [13, 14]. Arthritis and rheumatoid arthritis are more common in women than in age-matched men [15, 16]. Dexterity [17] and hearing impairment [18] impact men more than age-matched women. These differences depend on sex-specific biology, but also on other factors such as the different exposition to the occupational noise experienced more by men than by women [19].

For designing successful robotic assistive technologies, it is important to be aware of sex and gender factors. Only taking in to account these factors it is possible to design assistive technologies with a good marketability, usefulness, and acceptability. This will become even more important as the population continues to age. Data from Europe show that women represent a growing large proportion of older elderly. An important example of the influence of sex-gender factors is the partnering patterns, such as marriage age and age differences in partnerships [12]. In European Union countries and in the U.S., women tend to marry slightly older men [20, 21]. In Sweden and in Norway, age gaps are on average larger among homosexual than heterosexual couples [22–24]. Marriage age gaps that are a gendered phenomenon, when combined with women's greater longevity, means that (1) women are more likely to live alone than men; (2) women are more likely than men to be widowed, and (3) the death of a spouse is a major predictor of loneliness [25].

The combination of sex-gender factor may imply women have greater needs for assistive technologies that provide social connectivity. Overall, designers should be aware that gender differences in marriage age, partnering patterns, experience in household management, and receptivity to technology, are important to consider for effective design. At the same time, they must acknowledge that the majority of the elderly are women, and that women and men often have distinctive needs for physical mobility and cognitive dexterity. When addressing the market for robotic assistive technologies, researchers cannot but take into account women's and men's specific needs as elderly and as elder caregivers.

In developing emotional intelligence in robots, taking into account gendered differences in expression is crucial [26]. Moreover, other factors must be taken into account for robotic assistive technologies: ethnicity, skin color and emotional and culturally determined sense of personal space. Regarding ethnicity, for example, current facial recognition algorithms—used to identify individuals, detect emotional cues, etc.—are often more effective in respect to subjects of one skin color than another [12]. In an international competition facial recognition algorithm developed by researchers in East Asian countries showed to be more accurate for Asian faces than Caucasian faces [27]. At the same time, algorithms developed in Western countries were more accurate for

Caucasian faces than Asian faces. Including the factor of ethnicity in the design of robotic facial recognition systems for global markets might be very important. Finally, in the design if assistive robots also gendered and culturally determined sense of personal space [28] cannot but be considered if engineers aim to build tools capable to interact with users in a socially acceptable way.

Research and design of robot assistive technologies also gain by including the characteristics of health professionals and caregivers. In Europe, women are about twice as many men to provide informal care for ill or elderly adults [29]. In the U.S., about 70% of informal care is provided by women [30, 31]. Over the years, the care givers develop hands-on knowledge that technology designers should access through participatory design [32]. This knowledge is very precious, but designers need to consult also the persons with different relationships to elderly (sons, daughters, spouses, cousins, etc.) [33]. In Finland, researchers have studied both elderly's and caregivers' responses to over 60 assistive technologies in four pilot "smart homes" [34].

According to Schiebinger et al. [12], some assistive robots may work collaboratively with a smart home environment to address psychosocial conditions, such as isolation and depression. Robots may interact directly with users for a variety of purposes such as monitor their mental status, provide cognitive stimulation, offer companionship, and assist them with navigating complex environments [35]. To increase the acceptance of the user, some criteria for assistive technology used in physical interaction have been defined [36]. These criteria are embodiment, personality, empathy, engagement, adaption and transfer.

Women and men differ in their needs for and experience with technology. Women may have less technical experience and more positive attitudes toward technology [37]. They may also be more apprehensive about using assistive robots in domestic environments [38], but also more open than men to welcome them at home. Thus, it is important to include both women and men in the technology design.

Analyzing sex and gender as well as including both women and men users in technology development are positive actions that can lead to better designs and improve marketability of products. Researchers are developing new robot assistive technologies to support independent living for the elderly and to lighten the burdens of caregivers. Involving users and caregivers in the design process enhances out comes. Thus, through participatory research and design with both the elderly and their caregivers, designers are in the position to gain key insights for developing assistive products that are useful to a broad user base.

However, in addition to these socio-demographic variables, I would like to stress here another factor that immediately comes into play when the human body is approached: fashion. Not by chance in 2001 I organized at the Triennale in Milano with a network of universities an important, interdisciplinary workshop on the relationship between the human body and technology attended by scholars coming from a variety of disciplines such as robotics, industrial design, medicine, sociology, communication, history of art, anthropology, psychology, fashion studies [39]. It was a first attempt to put many different disciplines around a table with the purpose to think and discuss how to integrate all these different glimpses into the same object of investigation and research: the human body in its encounter with technology.

One of the outcomes of this workshop was that fashion poses at least three questions.

First, when a technology comes around the human body it MUST come to terms with fashion. Fashion covers and manages the widest area of the human body. At the

same time, it mediates fundamental things of everyday life, such the presentation of the self, the sense of beauty, etc. We learnt about this aspect with the mobile phones. All the other digital technologies such as television were a question of decor, how they could fit inside the decor of our apartment without disturbing it and integrating harmoniously inside. For example, one of the reasons of the delay on the part of Italians in the adoption of personal computers was that these devices at the beginning were so ugly that women could not decide where to place them in the house. Italian women did not perceive as possible to put the computer in the dining room. At the end, the children's bedroom was chosen in many homes to guest the computer, because there was a table (to study) and, at the same time, children's room was a space far from the social routes of the domestic environment. Compared to these technologies, the mobile phone developed a very different story. Very soon, this device from being considered a part of the equipment of a house, became a personal device. From that moment, the mobile phone stayed usually on the human body and from that moment, it became a question of fashion [37]. As consequence, it has had to be harmonized with the outfits of people. It could not remain a classical, ugly black box. It became cute and even more: fashionable. Two different worlds fought to have the predominance on the design of this device: the fashion system and the design field [40]. We have reasons to believe that also robots will need to become fashionable to stay on the human body. On the contrary, in the case they will be some sort of more traditional robots they will become immediately a question of décor. Where to put them inside the house will be the puzzle problem.

The second issue raised by fashion is the inevitable contamination that is produced by its encounter with technologies. In particular, for now on robotics is experimenting on materials and suits, and fashion is experimenting on robotics. The current experimentations need to converge, to fertilize each other. This process can be described as the "robotization" of fashion and the "fashionalizing" of robots. For the fashion system and for social robotics it is a very effervescent moment. Think for example to the integrated clothes systems for space crew [41], increasingly relevant field of research following the increase in the lengthening of space missions' duration. In addition, think for example also to so far unresolved communication issues connected to the health machines [42] and to the fear that their design aroused on patients. The long experimentation on "soft machines" [43] must be read as the attempt to overcome the sense of extraneousness felt by people towards the classic black box. In recent years, new textiles have begun to incorporate various kinds of micro- and nanotechnologies and conductive materials able to react to changes in physical and environmental conditions. In this field of research, the "smart textiles" are engineered and support electronic circuits, micro-controllers, sensors, etc. They are not only functional; they become at the same time fashionable. Given the current prestige of technology in society, the dresses that highlight artificiality and look spectacular are attractive and fascinating. The reason is that they convey the sense of the inorganic and the imagery of the machine: the experimentation in this field goes in the direction to design clothes that can be seen as a kind of machines [44].

The Robot Companions for Citizens Manifesto launched by the Sant'Anna School contains many interesting proposals such the "Robot suit that is a wearable robot that provides support to people when moving and doing everyday life activities". This is a genial idea, and this will be a great part of the future innovation. We must pay attention to the already established field of "fashion tech", which has been around yet for many years. It may be sufficient to think about the research done and which represents the

convergence of fashion design with engineering and participatory design experiences. As Danese [45] points out, this convergence can be exemplified in the projects carried out at the V2 Institute for the Unstable Media in Rotterdam, which recently hosted a lecture on 'Robotic Fashion and Intimated Interfaces', or in the 2012 'Technosensual' exhibition at the Wiener Museum quartier that was focused on technologically enhanced garments. Many of these experiments in the fashion tech try to shape intelligent systems around the human body and share many elements in common with the area of robotics related to the body, where the focus is often to enhance the wearability of the body-related devices. Here we cannot but mention the great, visionary work done by Hussein Challayan, the fashion designer of animatronic fashion.

The third issue posed by fashion is to consider if the body of robots when they enter in a home need to be dressed somehow. There are collections of possible clothes for robots [47]. At the same time there is the attempt to design 'fashionable' robots as in the case of robots designed by Simeon Gergiev for Highsnobiety (Givenchy Robotics) [48].

Although the chapters included in this volume represent surely a valuable progress in the direction of the modeling of emotions—necessary advancement for social robotics studies, it is necessary to acknowledge that we are far from having a multimodal system capable of working with spontaneous emotional material. The automatic synthesis and recognition of human emotions remains an example of computational task that cannot yet be solved by current pattern recognition and machine learning algorithms. To perform this task at a higher level it is necessary a stronger level of integration between hard and soft sciences. It is probably only by putting together these different areas of study that one can approach the complex nature of emotion. We are still far from a theory of emotion that encompasses this complexity, but at least there are several theories and approaches—like those presented in this volume—as well as many research and reflections on the emotional relationship between human beings and machines that can inspire the study of emotion [48–51].

References

1. Sugyiama S, Vincent J (eds) (2013) Special issue Social robots and emotion: transcending the boundary between humans and ICTs. intervalla: platform for intellectual exchange
2. Esposito A, Fortunati L, Lugano G (2014) Modeling emotion, behavior and context in socially believable robots and ICT interfaces. Cogn Comput 6(4):623–627
3. Fortunati L, Esposito A, Ferrin G, Viel M (2014) Approaching social robots through playfulness and doing-it-yourself: children in action. Cogn Comput 6(4):789–801
4. Fortunati L, Esposito A, Lugano G (2015) Beyond Industrial robotics: social robots entering public and domestic spheres. Inf Soc: Int J 31(3):229–236
5. Fortunati L, Esposito A, Sarrica M, Ferrin G (2015) Children's knowledge and imaginary about robots. Int J Soc Robot 7(5):685–695
6. Vincent J, Taipale S, Sapio B, Lugano G, Fortunati L (eds) (2015) Social robots from a human perspective. Springer, Berlin
7. Fortunati L, Esposito A, Vincent J (2009) Introduction. In: Esposito A, Vich R (eds) Crossmodal analysis of speech, gestures, gaze and facial expressions. Springer, Berlin, pp 1–4
8. Vincent J, Fortunati L (eds) (2009) Electronic emotion. The mediation of emotion via information and communication technologies. Oxford, Peter Lang
9. Fortunati L, Vincent J (2009) Introduction. In: Vincent J, Fortunati L (eds) (2009) Electronic emotion. The mediation of emotion via information and communication technologies. Oxford, Peter Lang, pp 13–14

10. Smith A (1759) The theory of moral sentiments. http://www.marxists.org/reference/archive/ smith-adam/works/moral/part07/part7d.htm Accessed 1 Aug 2008
11. O'Connell MR (1997) Blaise pascal: reasons of the heart. Eerdmans, Grand Rapid
12. Schiebinger L, Klinge I, Sánchez de Madariaga I, Schraudner M, Stefanick M (eds) (2011–2013). Gendered innovations in science, health & medicine, engineering and environment. http://ec.europa.eu/research/gendered-innovations/
13. Plassman B, Langa K, Fisher G, Herringa S, Weir D, Ofstedal M, Burke J, Hurd M, Potter G, Wodgers W, Steffens D, Willis R, Wallace R (2007) Prevalence of dementia in the United States: the aging, demographics, and memory study. Neuroepidemiology 29(1–2):125–132
14. Nowrangi M, Rao V, Lyketsos C (2011) Epidemiology, assessment, and treatment of dementia. J Psychiatr Clin N Am 34(2):275–294
15. Alamanos Y, Drosos A (2005) Epidemiology of adult rheumatoid arthritis. Autoimmun Rev 4(3):130–136
16.Linos A, Worthington J, O'Fallon W, Kurland L (1980) The epidemiology of rheumatoid arthritis in Rochester, Minnesota: a study of incidence, prevalence, and mortality. Am J Epidemiol 111(1):87–98
17. Desrosiers J, Hébert R, Bravo G, Dutil É (1995) Upper extremity performance test for the elderly (tempa): normative data and correlates with sensorimotor parameters. Arch Phys Med Rehabil 76(12):1125–1129
18. Cruickshanks K, Zhan W, Zhong W (2010) Epidemiology of age-related hearing impairment. In: Gordon-Salant T, Frisina R, Popper A, Fay R (ed) System the aging auditory, Springer Science and Business Media, New York, pp 259–274
19. Engdahl B, Krog N, Kvestad E, Hoffman H, Tambs K (2012) Occupation and the risk of bothersome tinnitus: results from a prospective cohort study (nord-trøndelag health study, hunt). Br Med J 2(1): e000512
20. Lakdawalla D, Schoeni R (2003) Is nursing home demand affected by the decline in age difference between spouses? Demograph Res 8(10):279–304
21. Van Poppel F, Liefbroer A, Vermunt J, Smeenk W (2001) Love, necessity, and opportunity: changing patterns of marital age hegemony in the netherlands, 1850–1993. Popul Stud: J Demogr 55(1):1–13
22. Andersson G, Noack T, Seierstad A, Weedok-Fekjær H (2006) The demographics of same-sex marriages in Norway and Sweden. Demography 43(1):79–98
23. Kristiansen J (2005) Age differences at marriage: the times, they are a changing? StatisticsNorway, Oslo
24. Noack T, Seierstad A, Weedon-Fekjær H (2005) A demographic analysis of registered partnerships (legal same-sex unions): the case of Norway. Eur J Popul 21(1):89–109
25.Dragset J, Kirkevold M, Espehaug B (2011) Loneliness and social support among nursing home residents without cognitive impairment: a questionnaire survey. Int J Nurs Stud 48(5):611–619
26. Phillips P, Jiang F, Narvekar A, Ayyad J, O'Toole A (2011) An other-race effect for face recognition algorithms. Assoc Comput Mach (ACM) Trans Appl Percept (TAP) 8(2):14–25
27. Brody L, Hall J (2008) Gender and emotion in context. In: Lewis M, Haviland-Jones J, BarrettL (eds) Handbook of emotions, 3rd edn. Guilford Press, New York, pp 395–408

28. Fries S (2005) Cultural, multicultural, cross-cultural, intercultural: a moderator's proposal. International Association of Teachers of English as a Foreign Language (IATEFL)Publications, Paris
29. Daly M, Rake K (2003) Gender and the welfare state: care, work, and welfare in Europe and the USA. Polity Press, Cambridge
30. Lahaie C, Earle A, Heymann J (2012) An uneven burden: social disparities in adult caregiving responsibilities, working conditions, and caregiver outcomes. Res Aging 35(3): 243–274
31. Kramer B, Kipnis S (1995) Elder care and work-role conflict: toward an understanding of gender differences in caregiver burden. Gerontologist 35(3):340–348
32. Landau R, Auslander G, Werner S, Shoval N, Heinik D (2010) Families' and professional caregivers' views of using advanced technology to track people with dementia. Qual Health Res 20(3):409–419
33. Andersson S, Meiland F (2007) Cogknow field test #1 report. European Commission, Brussels
34. Melkas H (2013) Innovative assistive technology in Finnish public elderly-care services: a focuson productivity work. J Prev Assess Rehabil 46(1): 77–91
35. Pollack M (2005) Intelligent technology for an aging population: the use of artificial intelligence (ai) to assist elders with cognitive impairment. AI Mag 26(2):9–24
36. Tapus A, Mataric' MJ, Scassellati B (2007) The grand challenges in socially assistive robotics.IEEE Robot Autom Mag 14(1):35–42
37. Fortunati L, Manganelli AM (1998) La comunicazione tecnologica: Comportamenti, opinionied emozioni degli Europei. In: Fortunati L (ed) Telecomunicando in Europa. Milano: Angeli, pp. 125–194
38. Cortellessa G, Scopelliti M, Tiberio L, Koch Svedberg G, Loutfi A, Pecora F (2008) A cross cultural valutino of domestic assistive robots. Proceedings of AAAI fall symposium on AI in eldercare: new solutions to old problems,
39. Fortunati L, Katz J, Riccini R (eds) (2003) Mediating the human body: technology. Communication and Fashion. Erlbaum, Mahwah
40. Fortunati L (2013) The mobile phone between fashion and design. Mob Media Commun1(1):102–109
41. Dominoni A (2003) Conditions of microgravity and the body's "second skin". In: Fortunati L,Katz JE, Riccini R (eds) Mediating the human body: technology, communication and fashion, Erlbaum, Mahwah, pp 201–208
42. Chiapponi M (2003) Health care technologies. The contribution of industrial design. In Fortunati L, Katz JE, Riccini R(eds) Mediating the human body: technology, communication and fashion, Erlbaum: Mahwah, pp 187–194
43. Danese E (2003) Inside the surface. technology in modern textiles. In: Fortunati L, Katz JE,Riccini R (eds) Mediating the human body: technology, communication and fashion. Erlbaum, Mahwah, pp 147–154
44. Danese E. (2014) Fashion and technology. Paper presentation at the Doctoral Programme inMultimedia Communication. Pordenone, 27 marzo 2014
45. Danese E (2015) Fashion tech and robotics. In: Vincent J, Taipale S, Sapio B, Fortunati L,Lugano G (eds) Social robots from a human perspective. Springer, London, pp 129–138
46. http://robotswearingclothes.tumblr.com;
http://www.cc.rim.or.jp/~comura/doll_web/life_size/lstd/lstd007.html
47. http://hypebeast.com/2014/7/givenchy-robotics-by-simeon-georgiev
48. Fortunati L (1995) Gli italiani al telefono. Angeli Editore, Milano

49.Fortunati L, Manganelli AM (2008) The social representations of telecommunications. Pers Ubiquitous Comput 12(6):421–431
50. Vincent J (2005) Are people affected by their attachment to their mobile phone? In: Nyiri K(ed) Communications in the 21st century. The global and the local in mobile communication: places, images, people, connection, Wien, Passagen Verlag
51. Vincent J (2006) Emotional attachment to mobile phones. Knowl Technol Policy 19:39–44