The Barriers of Social Robotics take-up by Society

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Abstract. Social robotics have a huge potential for near future applications in different domains like older adult care, assistive robotics, health care, education and many more. Nevertheless the progress of establishing robotic technology in private homes is rather slow. One reason is the maturity of the technology but also legal aspects need to be considered with the development of artificial intelligence capacities. In the next years, justified by the slow maturation and the still considerable high cost of robotic solutions, different business models will play a critical role when bringing robotic solutions into private homes. The benefits of robotic platform operation in social environments are only now becoming visible, but still need to demonstrate real added value regarding the services they can provide, to justify all associated costs. In any case social robotics are currently at a transfering stage, from prototypes to mass diffusion. The workshop discusses the barriers of social robotics uptake from different perspectives, considering legal, business and research aspects.

1 Workshop Overview

The research community has been gradually pushing technologies in order to address the problems of an ageing society. In the specific case of robotics, albeit numerous projects and initiatives have been put forward, few to none have succeeded in having an actual autonomous, multi-purpose, social robot (beyond the classic Skype on Wheels). From a technologys perspective, realistically the fact remains, multi-purpose robotic technologies are not yet mature enough to free roam on peoples homes, but the research community is working determinately for it. Moreover, there is the need to overcome the barriers of the suspicious human nature when it comes to robots with the slightest degree of autonomy in their decisions. The main goal of this workshop on the challenges of social robotics take-up by society is to gather these different stakeholders on Social Robotics for Active and Healthy Ageing, and promote a discussion ranging from the most recent advances in research on machine learning algorithms and human-robot

interfaces up to ethical guidelines, legislation, deployment and technology assessment. The session is expected to allow researchers with different backgrounds to share ideas closing the cycle between research, industry and end-users. The aim is to identify challenges and possible solutions that emerge when developers bring their robots to real environments.

2 Submission Categories

The main topics to be addressed can be broadly divided into:

- The design of machine learning algorithms to make autonomous decisions considering their degree of autonomy and impact on acceptability.
- Assessment metrics on technology evaluation and acceptance.
- Design of systems that comply with ethical and legal requirements, including ISO standardization and certification.
- Business Case Studies for Social Robots.

3 Program Overview

The workshop will follow-up with a Discussion Forum, which is expected to allow identifying potential future directions on research & technological development, specialized human resource training and funding models of the associated activities. It also addresses a societal impact from economical and legal perspectives. The discussion aims to point out potential actions that intent to accelerate the take-up and promote Social Robots as a solution to societal problems in the areas of Ambient Assisted Living and Active and Healthy Ageing.

With the increasingly need for technologies to support an ageing society and promote sustainability, robots will soon appear in the frontline as key enabling technologies to compensate for the degradation of elderly capabilities, to act as peers in their social circles, or to help formal and informal carers to better take care of their next of keen. There is a wide range of open challenges that robots can fulfil, yet these carry an equal number of questions, which we aim to discuss in a broadening forum, getting together a number of different specialists in different areas, such as robotics, psychology or law.

The discussion forum did address the following topics which have been discussed with the invited experts:

- Big Data and the future challenges in machine learning from an ethical and legal perspective.
- The Millennial and Geographical Caveat: Are the solutions of the present culturally transferable to
- the users of the future?
- Robots as new legal entities: A legal and industrial perspective
- Public and Private Funding: Opportunities and Impact Assessment

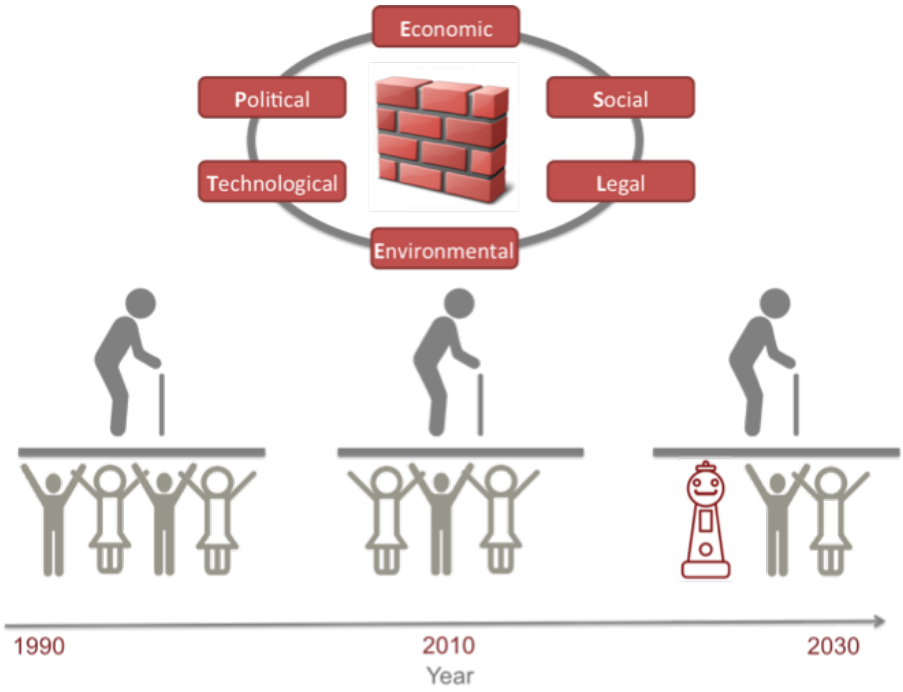

Fig. 1. Barriers for the integration of social robots in the older people care

Table 1. Final Workshop Program - September 1^{st} 2017

09:00 - 09:30	Jorge Solis (Karlstad University) "Challenges on Humanoid-Musician Interaction: From Biologically-Inspired Design to Impressions from Musicians"
09:30 - 10:00	Markus Vincze (Technical University of Vienna): "What a Year of Trials with a Mobile Robot in User Homes Reveals about the Actual User Needs"
10:00 - 10:30	Jorge Solis (Karlstad University): "Japan-Sweden Academia-Industry International Collaboration: Challenges in developing a robotic assistive eating device for frail elderlys independent life"
10:30 - 10:50	**Coffee break**
09:00 - 09:30	Andy Bleaden (Stockport Council - United Kingdom) "Stockport Council A municipality testing robots and technology with Seniors"
09:30 - 10:00	Francesco Ferro (PAL Robotics SA.): "Social Robot Certification, what is certifiable, what is not and what can be done in the future"
10:00 - 10:30	Sandra Passinhas (University of Coimbra - Law School): "Robots as New Legal Entities"
12:15 - 14:30	**Lunch**
14:30 - 16:00	**Discussion Forum**

3.1 Invited Speakers

Jorge Solis - Karlstads University, Sweden

Short Bio: Jorge Solis is an Associate Professor of the Department of Engineering and Physics, Karlstad University, adjunct researcher of the Research Institute for Science and Engineering, Waseda University as well as visiting research at the Humanoid Robotics Institute, Waseda University. He received his B.S. degree in Electronics Systems from the Monterrey Institute of Technology (Mexico) in 1998 and the Ph.D. degree from the Scuola Superiore SantAnna (Italy) in 2004. He has been visiting researcher to the Groupe Automatique Symbolique du Laboratoire dAnalyse et dArchitecture des Systemes (LAAS/CNRS) in Toulouse, France; the Bio-Robotics Division of the Mechanical Engineering Laboratory, Tsukuba, Japan. From 1998 to 2000 was a support engineer of the

RS/6000 Hardware Department at IBM of Mexico.

Marcus Bajones - Technische University Wien, Austria

Short Bio: Markus Bajones is a PhD candidate at Technische Universitt Wien. He works in the field of behaviour coordination of social robots which assist humans in their daily lives. The goal of his thesis is to show that a rather simple behaviour coordinator is able to show enough adaptation to the user to gain higher acceptance than a static, predefined behaviour without the need of complex full cognitive architectures. His research is based on HRI studies with participants in kindergartens (SQUIRREL) and elderly in their own apartments (HOBBIT). Markus completed his Master degree (Msc.) in Electrical Engineering from Technische Universitt Wien (2013).

Andy Bleaden - Stockport Council, United Kingdom

Short Bio: Andy Bleaden is and international projects manager at ECHAlliance (European Connected Health Alliance) & Funding Manager at Stockport Council. For the Stockport Council he is leading on securing all external funding whether that be from EU, National, Regional and Lottery Funding Sources for a wide variety of projects from Regeneration, Economic Development, Adult Social Care, and Low Carbon. He is expert in funding related to Telehealth and Telemedicine as well getting links with private sector/industry specialists through Manchester MHealth Ecosystem and ECH Alliance. He is very active in forming alliances with pan EU Age/Seniors related groups and recent EIP on Age Friendly Cities.

Francesco Ferro - CEO PAL Robotics SA., Barcelona - Spain

Short Bio: Francesco Ferro is CEO of PAL Robotics and he obtained an MsC in Telecommunications Engineering in 2002 from the Politecnico di Torino, Turin, in Italy. He began a PhD in Computer Vision, but left in 2004 to found PAL Robotics. Concentrating initially on the development of stereo vision algorithms and autonomous robot navigation, in 2008 Francesco became the manager of PAL Robotics software department. Francesco completed an MBA at the UB University in Barcelona, and was appointed CEO of the company in 2011. Passionate about the development of collaborative humanoid robots, Francesco oversaw production of the first fully autonomous biped robot in Europe. Now one of the leading robotics companies in the world, PAL Robotics is involved in a wide range of European research projects and collaborations that aim to improve our everyday lives. Over the last 17 years, the award-winning company has successfully built robots for services and research, contributed to open-source projects and participated in several major robotics competitions.

4 Organizing Committee

Ron Chrisley is director of the Centre for Cognitive Science (COGS) at the University of Sussex, where he is also on the faculty of the Sackler Centre for Consciousness Science, and is a Reader in Philosophy in the School of Engineering and Informatics. He has a Bachelors of Science from Stanford University and a DPhil in Philosophy from the University of Oxford. Before arriving at Sussex he was an AI research assistant at Stanford, NASA, RIACS, and Xerox PARC, and investigated neural networks for speech recognition as a Fulbright Scholar at the Helsinki University of Technology and at ATR Laboratories in Japan. From 2001-2003 he was Leverhulme Research Fellow in Artificial Intelligence at the School of Computer Science at the University of Birmingham, and for over ten years was an occasional Visiting Lecturer and Researcher at the Department of Computer Science at the University of Skvde in Sweden. He is one of the co-directors of the EU Cognition cognitive systems network, and is an Associate Editor of Cognitive Systems Research and Frontiers in Psychology (Consciousness Research). Concerning social robotics specifically, his recent activities include giving an invited lecture to the Workshop on Moral Competence in Autonomous Robots (Tufts, 2014) and a keynote presentation at the 2nd UAE Symposium on Social Robotics (Abu Dhabi, 2016). In January of 2017 he developed and led three hands-on sessions with social robots for children in Sussex schools. This Social Robots in Schools initiative has now been extended, with six 3-hour sessions now commissioned for 2017-2018. Ron is also co-organizer, with Steve Torrance, of the Workshop on Social Robots and Human Experience to be held at the University of Sussex in April of 2017.

Sandra Passinhas holds a PhD from European University Institute, Florence, since 2010 with a Thesis on the "Dimensions of property under European Law: fundamental rights, consumer protection and intellectual property - bridging concepts?" under the guidance of Prof. Christian Joerges (IUE/University de Bremen. She is currently an assistant professor at Law School of the University of Coimbra. She regularly works with the Consumer Law Centre and Biomedical Law Centre from the University of Coimbra. In 2005, she worked for the Court of Justice of the European Communities. Her research interests are European Private Law and Property Law. She is author of the Portuguese volume of the International Encyclopedia of Laws, Property and Trust Law [1].

Luis Santos holds a PhD from the University of Coimbra (UC), Portugal. He is currently an Invited Researcher at University of Coimbra and is acting as a Project and Technical Manager for the H2020 GrowMeUp Project (GA 643647 [3]. He held a postdoctoral position at the Institute of Systems and Robotics of the University of Coimbra from October 2014 to March 2015. He acted as a seconded researcher from the UC to a company, Citard Services Ltd., within the scope of the Marie Curie IAPP Project Social Robot (GA 285870[4], till the 30th of September, 2014. He holds a Pre-Bologna M.Sc. degree in Electrical

[3] www.growmeup.eu
[4] http://mrl.isr.uc.pt/projects/socialrobot

and Computer Engineering, specialization in Robotics and Automation by the Faculty of Science and Technology from the University of Coimbra. He worked as researcher in the area of human-robot interaction and action recognition using Laban Movement Analysis, within the BACS European Project from November 2007 to February 2010. His current research topics mainly focus on machine learning methods for autonomous cognitive systems and human motion analysis towards end-user applications.

Sten Hanke has a Master in electrical engineering and a PhD in medical science. He is a researcher for the Austrian Institue of Technology (AIT) biomedical engineering in smart biomedical systems. He joined AIT in the year 2005. He is working on European and national projects in the field of ambient assisted living, social robotics, interaction with ICT systems, smart systems as well as psycho-physiological assessments since more than 10 years. At the moment is he technical manager of the FP7 Miraculous-Life project[5] dealing with development of a virtual support partner as well as workpackage leader of the H2020 GrowMeUp project[6] developing an ICT service robot for ambient assisted living environments. He is a working member of the international ISO/IEEE 11073, European ISO/TC 215 and CEN/TC 251 health care and medical device communication working group as well as the national ON-AG238.4 group. Currently he is in the Ambient Assisted Living Open Association (AALOA) Governing Board.

Conclusion

The workshop highlighted the need of further research in scientific topics like real time perception and action synthesis for robotic plaftorms in real environments. Although current technology already allows deploying robots with limited functionalities, the need to enhance critical technologies is needed if we aim to see real autonomous robots assisting human in social environments. Additionally, it is clear that the final users of these technologies need to involved since the begining of the development. This has two clear advantages in the specific case of the ageing challenge: 1) It is an inclusive process that integrates elderly as key players in social and technological development with positive benefits to their lifes; 2) we ensure that the final products really meets their needs and specificities, which cannot be totally foreseen during the design phase. A very positive example on how the inclusion of societal problems should be included in regional politics with visible social and economical benefit was given by the Stockport Council. It clearly shows how policies to hihglight the local industry as key players in the solution to societal problems can promote sustainable, active and healthy ageing. But before robots reach society, several legal aspects need to be addressed. Framing robots into a legal liable figure is a relevant issue discussed internationally by policy makers, and this workshop helped to understand the ongoing discussion. This issue advances hand in hand with certification, which

[5] www.miraculous-life.eu
[6] www.growmeup.eu

industry is still lacking for real autonomous robots capable of making their own decisions, but so far, they cannot be liable for their actions.

Acknowledgment

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References

1. Passinhas, S.: Property and Trust Law in Portugal. Kluwer Law International (2012), https://books.google.at/books?id=9ajTMgEACAAJ