Ethical Concerns when Robots Assist Eldery People

Aspectos éticos en robots asistivos para personas mayores

Arantxa Renteria-Bilbao
TECNALIA
Parque Tecnológico de Bizkaia
arantxa.renteria@tecnalia.com

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Abstract: There are ethical concerns about the introduction of assistive robots (and their advanced and intrusive technology) in the life of elderly people, potentially suffering from some form of dementia. It may imply that some ethical aspects (e.g. loss of autonomy, independence, intimacy) are questioned, together with psychological problems (feelings of isolation, emotional attachment to an artificial being). An important input in this new field of assistive robots is the opinions, needs and requirements of the intended users: elderly people themselves, their informal careers (relatives) and the professional careers. A relevant number of research projects have been carried out, but there still is a lack of enough number of evaluations. There is an important pending work: more specific definition of standards, binding legislation, more research projects are needed regarding the ethical implications of the use of these robots by people suffering from cognitive or physical disabilities.

Keywords: Assistive robots, elderly, ethics, artificial companions, dementia, intrusive technology

Resumen: La introducción de robots asistivos (y sus tecnologías intrusivas) en la vida de personas mayores pone de relieve aspectos éticos, sobre todo si esas personas sufren de algún tipo de demencia asociada a la edad. Se cuestiona la pérdida de autonomía, independencia, intimidad, junto con problemas psicológicos (sentimiento de aislamiento, nexo emocional a un ser artificial). Un dato importante en este nuevo campo de los robots asistivos son las opiniones, necesidades y requisitos de las personas usuarias: la población de edad avanzada, sus cuidadores informales (familiares) y los cuidadores profesionales. Se han desarrollado varios proyectos de investigación, pero no hay todavía un número significativo de evaluaciones. Quedan pendientes diversas tareas: más definiciones específicas de estándares, legislación vinculante y nuevos proyectos de investigación sobre las implicaciones éticas del uso de estos robots por personas mayores con discapacidades cognitivas o físicas.

Palabras clave: robots asistivos, vejez, compañia artificiales, demencia, tecnología-intrusiva

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1. Introduction

The use of advanced robotic developments is seen as a solution to promote and support the independent life of the elderly. The ageing process is often associated with an increasing need for physical, as well as cognitive assistance: elderly people become less physically fit and frailer with time, sometimes suffering from cognitive impairments. Elderly people wish to live independently in their home for as long as they possibly can (Stula, 2012). But the fact is the decreasing capacity for the provision of caregivers (the number of able-bodied aged 50 and more that could help people who are losing their autonomy). The world is rapidly ageing: the number of people aged 60 and over as a proportion of the global population will be 22% by 2050. By then, there will be more elderly people than children (aged 0-14 years) for the first time in human history. In addition, the gap between the population dependent and non-dependent is widening, requiring external assistance (Colin and Coutton, 2000). Providing all the care required at this stage being an informal caregiver, probably a family member with a professional activity and personal family life, is difficult. Nursing and care homes are not always viable solutions. Technological support should be developed to assist the senior population and those who provide care.

Up to date, there have been several projects demonstrating robotic systems which are able to act autonomously in home-like environments, verbally and physically interact-

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ing with end-users. These robots allegedly are in a position to provide support for standard everyday activities (e.g. cognitive training, cooking, bathing etc.), for mobility through ambulation assistance and for rehabilitation. Some examples of assistive robots are the Japanese seal-shaped PARO (Wada et al., 2003), Huggable and Leonardo from the MIT (Stiehl et al., 2006), the toy-robot dog AIBO by Sony (Fujita 2001),[1] iCat by Philips, FACE (University of Pisa), and NAO (Aldebaran Robotics), Pearl (Pollack et al., 2002), Car-o-bot (Graf et al., 2004), Robocare (Bahadori et al., 2003).

But the reality is that very few robotic solutions have been really accepted by the consumers (general public, not only the elderly), and can be considered as a commercial success (e.g., Roomba). The cost of a robot might be decisive for its success but is not the only factor to influence prospective consumers. Although there are robots which can offer a wide set of functionalities, this is not enough to get robotic systems accepted by non-specialist users, who, maybe, search for additional features on this kind of systems. Many robots have been developed without careful consideration of the social, aesthetic, emotional and cultural aspects[2] that are important for elderly people. For a full social interaction with users, robots need to be further enriched with a series of special features such as embodiment, emotion, dialogue, personality, human-oriented perception, user modeling, socially situated learning and intentionality (Fong et al., 2003).

The future of robotics is advancing towards the incorporation of increasing intelligence. Being a term that is not commonly defined (or recognized) when applied to humans, it is even more difficult to know how to develop the intelligence in the brain of a robot. In order for a robot to achieve a psychological behaviour similar to humans, a series of in-depth studies need to be performed on how the human brain functions, and many efforts in future robotic developments move in this direction. Researchers try to identify the mental processes through studying cognitive psychology, a branch of psychology which is concerned with such mental processes. This science closely investigates the ways a person perceives, remembers, obtains knowledge and generally experiences the world (whether this is the physical or social world). The modern cognitive psychology has been influenced and made extensions to other disciplines such as information processing, artificial intelligence and linguistics. Generally speaking, the cognitive science studies the mental processes which allow our daily development in the recognition of familiar objects and persons, experiencing the physical surroundings, abilities for reading, writing, planning, thinking, decision taking, and memorization. Computing sciences have made great efforts in trying to emulate those mental processes in an artificial way: development of artificial neural networks, biological inspired cognitive algorithms (e.g. the so-called genetic algorithms), decision support systems, binary logic and fuzzy logic, expert systems, learning algorithms, and more. Several efforts are under development to try to implement some sort of intelligence, advance behavior and artificial ethics into assistive robots.

2. Ethical aspects

Active ageing is interwoven with two fundamental concepts in ethics: autonomy and independence. Autonomy is defined, in its accepted Kantian explanation, as the human capacity to rule over one's own actions (self-determination) (Kant, 1993). The notion of autonomy takes a different meaning in the case of people with cognitive impairments, which is understood as *allowing the maximum freedom whilst trying to prevent harm to the self or others*

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(Jones, 2001). Independence is seen as the faculty of a person to carry out the tasks related to the daily living (ability to live in community, receiving little or no help) (Roberts, 1999). The opposite, dependence, implies the need of help for these daily activities (Lopez et al., 2012).

The introduction of assistive robots in people's life implies different consequences compared to any other technology being accepted by the user. A robot's functionality is not very well known at the beginning of the interaction with users (or, on the contrary, people have unreal expectations about them). They may behave and move in such a way that makes the interaction with the user a completely new experience depending on the situation, environment, user characteristics and more. This alone constitutes an ethical issue for consideration and analysis. In the case of assistive robots used for the support of elderly people, a wide spectrum of ethical aspects needs to be considered and analyzed due to the specific physical and cognitive capacities of this segment of the population.

The ethical concerns stemming from the dynamic relationship between the robot and the human become affected by traditionally accepted human ethics, but also by the way the robot might (re)act following certain, well-established ethical principles, integrated in its artificial way of behaviour.

3. Artificial ethics

Moral rights and duties of assistive robots may arise if the robot is perceived not as a simple functional machine, but as being provided with human-like features and behavioural patterns, in such a way that it can develop social interactions with humans. When speaking about human-robot relationships, an important concept is *trust*, as it is present in such kind of interactions (a person trusting someone or something means the possibility of not getting what he/she was expecting from the other, and therefore is betrayed). The precise behaviour (more or less complex) of autonomous robots is not completely known when the system is in the design phase. Their actions are generated when the robots are working, under circumstances that could be, or not, predicted at design time. As a consequence, their behaviour might be unexpected and out of control, thus affecting to the trust the owner had on it.

Some efforts addressing this problem are focusing on putting some kind of restraint to the behaviour of autonomous robots (and software in general), which implies the application of the principles or moral philosophy (Hoven and Van der Lokhorst, 2002). The research is in the field of the logic (Danielson, 1998) with the modeling (programming) of rules to reinforce a specific behaviour or detect a deviant one. Therefore, the challenge is to develop an artificial moral reasoning, which probably should be along the lines of human moral reasoning. For these purposes some moral philosophical considerations may be taken into account and programmed in a computer language (Wiegel and Van der Berg, 2009), such as the meta-ethics (what moral knowledge is?), applied ethics (focused on a specific domain), normative ethics (what is to be considered as a right or wrong conduct?). The latter can be divided itself into three types: teleological ethics (evaluation of an act depending on its consequences), virtue ethics (character traits of an individual) and deontological ethics (focused on the own right of the action). In addition, teleological ethics implies the estimation of the result of an action, requiring a high level of cognitive ability, which, from the point of view of programming,

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demands a lot of computing capacity. It could be compared to the chess game played by a powerful computer, but the difference is that the only goal of such computer is to gain the match, while an assistive robot may have multiple objectives, not so well described.

Other relevant aspect of artificial ethics is that the morality of an outcome of an action depends often on the situation. In the case of humans this is acquired by experience or learning, but for an artificial agent such as an assistive robot it is not so straightforward, so every time its sensors receive signals and acts in consequence, a weight regarding a "moral" qualification should be assigned to the action. Again, the cognitive load and computing requirements are high. Even simple considerations and rules lead to complex cognitive models and cycles, and deep decision trees. Unfortunately, the real world, where humans and robots meet, is full of permissions, obligations, duties, optional actions, reinforced decisions, external conditions, side-effects and consequences.

In occasions, an intelligent machine could make faster and better decisions than a human, as it can process great volumes of data very quickly, but only when the information about the problem is accurate and enough. Some intelligent (to some extent) systems already exist and are being used in various fields such as e-business, inventory systems, planning and scheduling applications, energy distribution, automatic airplane landing, and so on. Humans, on the other side, have the ability to take good decisions with incomplete and vague information (we apply intuition and/or instinct) (Ullman 2002; Gigerenzer 2000, 2007). When applying this reasoning to the environment of the elderly, it is important to have the sufficient information and to know how to interpret it in order to be able to detect an abnormal situation or a distress signal in the daily living of the old person. This detection goes from an instant event such as a fall (there are already detection devices for this event), to a more complex diagnosis of a cognitive deterioration, by means of the analysis of the habits of a person over a long time period (big volume of data which needs to be filtered, interrelated, analyzed by experts, etc.). For now, this capacity has not been fully developed in robots or monitoring systems in general, neither there is enough background analysis to begin with.

The conclusion is that current assistive robots are far from being considered intelligent beings or have any moral conduct programmed. They are not able to take decisions on complex problems. But, in the future, the developments related to artificial intelligence (learning, reasoning, etc.) will bring us these open questions (Wallach, 2011):

- How does the robot know that a situation implies ethical decisions?
- How does it discern essential from non-essential information?
- How does the robot estimate that it has enough information, and that it has completed all the necessary steps in its decision tree in order to take an action?
- What are the requirements for a robot to decide a valid judgment about a complex situation?
- Will humans feel comfortable with machines sensitive to their emotional states?

Future developments require more powerful learning algorithms, artificial neural networks, fuzzy logic, pattern matching, statistical computing, genetic algorithms (which mimics the process of natural evolution, producing new programs), which can improve this kind of cognitive knowledge and reasoning capabilities. But their robustness and correct outputs rely on the quality of the learning data (a time consuming phase). This is the bottom-up approach, where the ethical principles are being built up by the inputs while the system is functioning. The top-down approach, on

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the contrary, starts by the definition of basic ethics rules. But the reality is often so complex that this definition hardly covers all the potential situations, and it requires a lot of context-sensitivity. Some authors defend a combined solution, together with after-evaluation tools. There seems to be some developments using genetic programming (Gay, 2010) which lets experimenting with different philosophies of morality and combinations of them, so the robot evolves in responding moral issues (among them, a safe behaviour). It has already been demonstrated that there are programming solutions that allow the robots to learn about the consequences of their behavior, and how they affect to the surrounding humans (applying learned knowledge and using determinants for what is a good outcome and what is a bad one).A comprehensive discussion about this matter can be found in (Wallach and Allen, 2008), covering aspects like machine morality, machine ethics, computational ethics, artificial morality, friendly artificial intelligence and robo-ethics. Also interesting sources are the related works and roadmaps that are under development of the IEEE Group in Roboethics (www.roboethics.org), platforms (https://www.eu-robotics.net/). The project ETHICSBOTS (Emerging techno-ethics of human interaction with communication, bionics and robotic systems) also address these issues.

These technological innovations can increase the resolution capacity of the robots in its behavioral similarities with a person, but, does it make it more human? Some human features are the consciousness, intentionality, free-will, instinct and so forth, but we are far from understanding them if we pretend to integrate such properties in a robot. Some authors (Duffy, 2006) argue that the aim, on the contrary, should be to create a socially engaging robot, and, for that purpose, it is enough if the user has the *perception* that the robot *appears* to have these features. After all, the intelligence attributed to a person relies on the perception of it by another person, by means of a social interaction and observation. Accordingly, if the technology advances to the extent that a social robot may observably possess intelligence and emotions, it is easier for us to classify it as intelligent and it is closer to be human.

In any case, additional questions arise:

- An artificial agent must be free in order to be responsible for what he does? (Castell, 1962) What does freedom mean for the robot once engaged to represent an author (programmer)?
- Who is the responsible for wrong decisions or actions derived from a technological malfunction or failure?
- From old Roman times, a master is held responsible for all actions of his slave or servant. Since a servant acts for his master," the master must pay for the act if it is wrongful and has the advantage of it if it is right" (Wolgast, 1992).
- Is the robot's programmer responsible only for the programmed foundations? And is the robot responsible for the further execution of these basic programming?
- And different opinions about the future:
- A robot will never have free will since it will always be a product of our technological creation (Galvan, 2003).
- Computer power will make it possible, in less than a few decades, to create software that will be smarter than humans (Kurzweil, 2005).

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4. Recommendations

Regarding the ethical aspects, the respect for the minimum principles stated above must be assured, meaning that the following issues should be accomplished:

1. The intimacy of the space of the person (physical and cognitive) is respected.
2. There is a trade-off between more autonomous robots (with improved initiative and support) and respect for the autonomy and freedom of the user.
3. The provided assistance should be adapted to the impairments of the elderly.
4. Confidentiality of the collected information must be assured.
5. Use of standardized trials, respecting the ethical code.
6. The right of access to this kind of supporting aids is guaranteed.

References

Bahadori, S., Cesta, A., Grisetti, G., Iocchi, L., Leone, R., Nardi, D., Oddi, A., Pecora, F., Rasconi, R. (2003). *"*RoboCare: an Integrated Robotic System for the Domestic Care of the Elderly". *Proceedings of workshop on Ambient Intelligence AI,* Pisa,Italy.

Castell, A. (1962). "The Self in Philosophy*". World Futures: The Journal of Global Education*. Volume 1, Issue 2.

Colin, C., Coutton, V. (2000). "Proportion of dependant aged people (Le nombre de poersonnes agées dependants)". *DREES-Direction de la recherché des Etudes de l´evaluation et des statistiques*, 94, pp. 2-8.

Danielson, P. (1998). *Modeling rationality, morality and evolution*. Oxford University Press, New York.

Duffy, B.R (2006). "Fundamental Issues in Social Robotics." *International Review of Information Ethics*. Vol. 6 (12/2006) ISSN 1614-1687.

Fong, T., Nourbakhsh, O., Dautenhahn, K. (2003). "A survey of socially interactive robots". *Robot Autonom Syst*, 42(3-4).

Fujita, M. (2001). "AIBO: Toward the Era of Digital Creatures". *The International Journal of Robotics Research*; 20(10): pp. 781-794; doi:10.1177/02783640122068092.

Galvan, J. M. (2003). "On technoethics". *IEEE-RAS Magazine*, 10 (2003/4), pp. 58-63.

Gay, R. F. (2010). "A developer's perspective". *Ethical and Legal Aspects of Unmanned Systems-Interviews. Ethica Themen.* Institut für Religion und Frieden, Wien.

Gigerenzer, G. (2007). *Gut feelings. The intelligence of the unconscious*. Penguin Group.

Gigerenzer, G. (2000). *Simple heuristics that make us smart*. Oxford University Press.

Graf, B., Hans, M., Schraft, R.D. (2004). "Care-O-bot II—Development of a Next Generation Robotic Home Assistant". *Autonomous Robots*, 16(2):193-205; doi:10.1023/ B:AURO.0000016865.35796.e9.

Hoven, MJ., Van den Lokhorst, G.J. (2002). "Deontic logic and computer supported computer ethics in cyberphilosophy". *Metaphilosophy*, 33: 376-386. doi:10.1111/1467-9973.00233.

Jones, R. G. (2001). "Ethical and Legal Issues in the Care of People with Dementia". *Rev Clin Gerontol*, 11: pp 245-268.

Kant, I. (1993). *Groundwork of the metaphysics of morals*. 3rd ed. Hackett.

Kurzweil, R. (2005). *The Singularity Is Near: When Humans Transcend Biology*. Penguin Group, New York, NY.

Lopez, D., Mantovani, E., De Hert, P. (2012). "Autonomy in ICT for older persons at the crossroads between legal and care practices" in Gutwirth, S. (ed.) *European Data Protection: Coming of Age?*, Springer.

Pollack, M.E., Engberg, S., Matthews, J.T., Thrun, S., Brown, L., Colbry, D., Oroszm C., Peintner, B., Ramakrishnan, Poulson, D., Ashby, M., Richardson, S. (1996). *Userfit: A practical handbook on user-centered design for Assistive Technology*, ECSC-EC-EAEC, Brussels-Luxembourg.

Roberts, B. L. (1999). "30 activities of the daily living: Factors related to independence", in Hinshaw, A. S., Feetham, S. L., Shaver, J. L. F. (eds.) *Handbook of clinical nursing research*. SagePublications. DOI:10.4135/9781412991452.

Stiehl, W.D., Lieberman, J., Breazeal, C., Basel, L., Cooper, R., Knight, H., Lalla, L., Maymin, A., Purchase, S. (2006). "The huggable: a therapeutic robotic companion for relational, affective touch". *Proceedings of the 3rd IEEE Consumer Communications and Networking Conference*; DOI:10.1109/CCNC.2006.1593253.

Stula, S. (2012). "Living in old age in Europe: current developments and challenges". Observatory for socio political developments in Europe. http://www.sociopolitical-observatory.eu/uploads/tx_aebgppublications/AP_7_EN.pdf. Accessed 23 September 2012.

Ullman, D. G. (2002). "Toward the Ideal Mechanical Engineering Design Support System". *Research in Engineering Design*, pp. 13.

Wada, K., Shibata, T., Saito, T., Tanie, K. (2003). "Effects of robot assisted activity to elderly people who stay at a health service facility for the aged". *Proceedings of IROS 2003: The IEEE/RSJ International Conference on Intelligent Robots and Systems*; 2003; DOI:10.1109/IROS.2003.1249302.

Wallach, W., Allen, C. (2008). *Moral machines: teaching robots right from wrong*. Oxford University Press.

Wallach, W. (2011). *Robots minds and human ethics*. Presentation at the INNOROBOT Summit, Lyon, France.

Wiegel, V., Van den Berg. J. (2009). "Combining Moral Theory, Modal Logic and Mass to Create Well-Behaving Artificial Agents". *International Journal of Social Robotics* 1: pp. 233–242, DOI 10.1007/s12369-009-0023-5.

Wolgast, E. (1992). *Ethics of an artificial person. Lost responsibility in professions and organizations*. Ed. Stanford University Press, California.

Notas

1. Philips Research Technonolies – Social robot for research of human-robot interactions. Available from: http://www.research.philips.com/technologies/robotics.html

2. When comparing, for example, reactions of end-users in Japan and Europe.

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