8.0 SEX, GENDER, AND ROBOTS

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ABSTRACT

Technological robots are mechanical appliances, and appliances do not have sex, nor a gender as they are not living beings and do not engage in reproduction (in possession of sexed bodies), nor do they have a gender (a cultural expression of a role). However, technological artefacts can be marketed to appeal to certain genders (for example through stereotypical colour coding) (Fine 2005), or mimic the human form, and therefore, explicitly or implicitly express the appearance of a gendered body (Robertson 2010). In the REELER project, sex, gender and robots will feature as central issues, and we will explore the way in which sex and gender is articulated through our interactions with stakeholders – roboticists, companies and affected stakeholders. Gender is the study of males and females and the dynamics between them in a particular setting (Fine 2005, Figures 2012).

8.1 Opening

Sex, gender and robots will be one of our most important working concepts in REELER. There are multiple issues to attend to when considering sex and gender and the ways in which robots are developed. Though many of the robots we will study in REELER will have a non-humanoid form (such as the RETRAINER robot), sex and gender is not only about whether a robotic artefact appears male or female. Robots may not be developed with a gendered form but may acquire one over time, or be ascribed one by their users. In the REELER project we are interested in the gendering of robots, but also in the systemic and structural systems in which robots are produced by university and industry. Moreover, issues of sex and gender relate to issues of class, race, and sexuality, as males and females are viewed in different ways. We believe that sex and gender requires us to think critically about the contexts in which robots are produced, and challenging normative assumptions about skills, values and obligations, economic insecurity, sexual objectification and inequality. We draw also on feminist studies of technologies that highlight the way in which gender impacts on processes. For example, in engineering, physical parts are ascribed male and female characteristics. A socket that has an entry is a female part (representing the vagina) while male parts of physical appliances have extended parts analogous to a penis. See image below

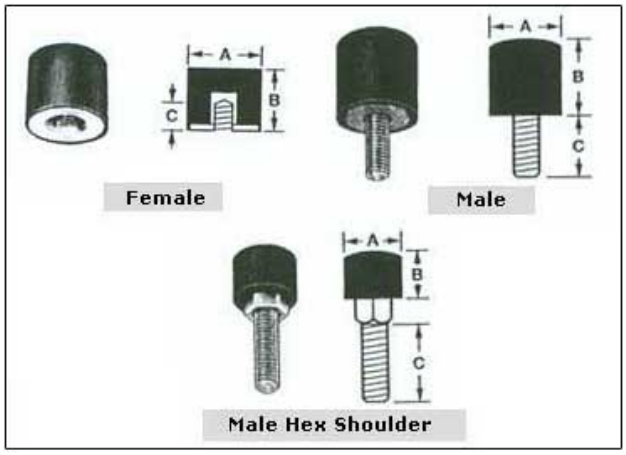

Figure 1

A description of male and female parts in Threaded Urethane Bumpers with Metal Core1.

It is not just the way in which mechanical parts are described, but also in what kind of artefact is produced. In recent years the development of service robots in Japan are designed to look like young Japanese women (Robertson 2010), while in the US, highly sexualised representations of women are produced in sex robots (Richardson 2016). In light of this, it is important to consider how robotics environments, that are male dominated, are able to promote certain kinds of representations of robots, and consider the ethical fall out from these kinds of developments. These developments in robotics might continue to reinforce stereotypical ideas of males and females as possessing certain kinds of qualities, or of reinforcing structural working differences between males and females.

8.2 Methodology

The methodology in this section is developed through the expertise gained as a researcher in the field of social anthropology of robotics over more than a decade. Robots and gender has become increasingly important over the last decade as there is more funding for robotics research of humanoid robots, a strand of robotics where the appearance of the machine if part of the research space (i.e, attention is paid to the way in which the robot looks in order to invite certain kinds of responses from people).

A search on SCOPUS reveals a growth in the terms robot AND gender used as keywords in papers. Keywords are important as they indicate what the main topic of the article will be about and are designed to guide a reader and demonstrates the paper is significantly concerned with this topic.

Figure 2

A search for the term gender AND robot on Scopus from 2002 to 2017.

My methodology draws on a range of social studies of science and technology which look at the particular role that gender has played in the construction and maintenance of knowledge systems (Fine 2005, Keller 1995, Hasse 2002, Martin 1991, Wajcman 2010, Haraway 1991).

1 Mechanical Spares Rubber Products Website. Accessed 20th May 2017 <http://mechspares.com/products/pu-products/bumpers/>

8.3 Why give a machine a gender?

Robotics is a heterogeneous practice, issues exploring sex and gender might be less explicit in the design, development and use of some robots than in others. As in our project, we have not excluded the robot imagery expressed through fiction and mass media portrayals of robots, robots in these depictions often take a gender form. From Maria in *Metropolis* (1927), to Ava in *Ex Machina* (2014) the way in which women have been represented as robots is largely driven by male writers and directors of robotic feature films.

Take the RETRAINER project as an example, the issue of sex or gender does not appear relevant as the robot is non-humanoid. However RETRAINER robot has a physical structure – we could ask our participants if their robots are informed by their own bodies? Or was the robot's physical shape modelled on the body of living human being? Or earlier forms of it?

The famous Cog robot at the Massachusetts Institute of Technology (MIT) was modelled on the body of a female lab scientist, though many in the project see Cog as "male". In my own work I have looked at the ways in which robotic scientists refer to themselves when they create robots. If the roboticists is creating a robot hand, they will use their own hand as a starting point. This implicit bias that is featured in the products of science and technology is described in detail by feminist studies of science and technology (Fine 2005, Haraway 1991).

There are some difference in the ways in which robots are produced between Europe, the US and Japan. In Japan, the development of humanoid (often female looking) robots outpaces the development of robots developed in Europe for example. In Europe, there is no, young female robot in production that is tied to research groups. Perhaps this as Robertson (2010) explained is due to the way in which Japanese culture view female bodies and the relative lack of progress for Japanese women in achieving gender equality. In Europe, the development of child-like robots (often ascribed a male gender) such as Nao or Romeo, developed by companies such as Aldebaran show a different direction to gender the appearance of robots. The robots Icub, Kaspar, Nao and Romeo all appear like male children. In the case of Nao, a robot used to help children with autism, the creators argue that a male-looking child robot can appeal better to children with autism, who statistically more likely to be male (Baron-Cohen, Golan et al. 2009, Trevarthen, Aitken et al. 1998). Age and gender are co-variables in European projects, in ways in which service role and female gender in Japan are.

8.4 Robotics and Gender

Working towards gender equality is a core part of the European research and innovation policy. Robotics is an interdisciplinary field that draws upon research in computing science, engineering (mechanical and electrical), neuroscience and psychology. With the exception of psychology and neuroscience (at undergraduate level studies at least), these fields have a higher proportion of male academics at undergraduate, graduate, postgraduate and senior levels of the academy. For example, one study exploring female representation in fields of Science, Technology, Engineering and Mathematics (STEM) at the level of the twenty eight member states of the EU, women scientists and

engineers made up 2.8% of the total labour force, compared to men at 4.1% (SHE figures 2015 p. 12). In 2012, women at doctoral level made up 28% of graduates in engineering, manufacturing and construction. Only 21% of women graduated from courses in computer (ibid). Moreover, at the level of salary, the gender pay gap still persists and women's hourly average gross earnings (in EU-28) were 17.9% lower in 2010 than those of men in scientific research and development. Women are more likely to work part-time (13.5% of women compared to 8.5% of men). There have been some changes, the proportion of women heads in higher education institutions (EU-28) rose to 20% in four years, from 15.5 %.

Moreover, it is not only at the university level in STEM subjects (key subjects for robotics) that women are underrepresented or have different working contracts than their male counterparts. Over the last few years, a number of high profile sexual harassment lawsuits have been filed against technology corporations including Uber, Reddit, Facebook and Apple. A recent Elephant in the Valley[3] study found that 60% of women had said they have been sexually harassed at work in tech companies. Other findings included:

- Witnessing sexist behaviour at company sites/at conferences (90%)
- Being the target of unwanted sexual advances from a superior (60%)

Though many of these high profile cases are in the US but less so in Europe. Could this be due to less sexual harassment? Or more fears about reporting it? Or a different attitude towards gender equality that is encouraged by the commission but is not encouraged in private corporations in the US? The REELER project will facilitate discussion among our participants in this area and reports our findings in future deliverables, working papers and journal articles.

Several strategies have developed to find out why there is fewer females in STEM subjects, and some of the findings reveal that the early socialisation of males and females could play a part in what career directions they take in adolescent and later life (Fine 2005). Lemons (2007) has created the concept of a 'cognitive scheme' to explore this issue, showing how views of what it means to be male and female are translated into the kinds of associations they then make about their own future direction. Another study reported that stereotypical imagery of the 'nerd' or 'geek' was off-putting to girls, who saw a future career in STEM as less social (as in able to socialise) than other subjects (Kelty 2005, Varma 2007, Richardson 2015).

8.5 Sex and Gender

Gender is attributed to the idea of a role, a gender role is the performance of a gender. Sex and gender are in relationship, but biological sex (innate) differs from socially constructed gender roles. For example, psychologist Simon Baron-Cohen believes that STEM subjects reflect the natural preferences of the essential nature of being male (Baron-Cohen, Bolton et al. 1998, Baron-Cohen, Ashwin et al.

2 European Union, 2015. She figures 2015. European Commission. Research and Innovation. Accessed 25 February 2017.

<https://ec.europa.eu/research/swafs/pdf/pub_gender_equality/she_figures_2015-final.pdf>

3 BBC NEWS, 21 February 2017 'Does Silicon Valley have a sexism problem? Accessed 21st June 2017 < http://www.bbc.co.uk/news/world-us-canada-39025288>

2009). For Baron-Cohen and those who subscribe to this theory, encouraging more gender equality in STEM subjects is problematic as females are not statistically hard-wired like men to do these subjects. These ideas have been challenged by numerous feminist studies of science and technology that take into account the whole system structure of the production of ideas, and the way in which power is exercised more widely between males and females (Fine 2005, Martin 1991).

In recent years, the topic of sex and gender has become more complicated as gender *identity* is seen as a more powerful basis of meaning than *biological sex*. Those people who experience a mismatch between gender identity and opposite biological sex has prompted increased discussions around transgender persons.

Sexed bodies are living bodies, comprising reproduction capacities, primary and secondary sex characteristics (ova, testes etc..). For example, most human males have 46 chromosomes with an X and a Y chromosome (46XY) and most human females have a 46 chromosomes with two X chromosomes (46XX) (Sytsma 2006p.1). But there are variations to this. A human with 46XY karyotype 'could have a testis that produces testosterone but a gene for AMH that is inactive' leading to a combination of both male internal genitalia, but also female internal genitalia' (Ibid p. 5). The presence of male or female genitalia is known as intersexed. Intersex is a biological condition, but males and females are socialised into gender roles from the moment of birth. Fine (2005) proposes that science that binds biological sex with gender expression are culturally constructed, and built around ideas of patriarchy (male privilege).

Human bodies are sexed bodies. Sexed bodies acquire gendered forms, that is different types of cultural norms and meanings are attributed to females and males, we might term these attributes loosely as feminine and masculine. Moreover, female and males are biologically able to produce human children in different ways, and therefore, human females are engaged with the dual tasks of often working and reproducing the human species.

In what ways can robots be considered 'gendered' or 'sexed'?

As robot bodies are not sexed, what is reflected in robot bodies are simulated gender forms – robots may be realistic such as the robots in the labs of Japanese roboticist Hiroshi Ishiguro:

ERICA

Erica is an android developed as a research platform for the autonomous conversational robot. We are developing total technology to enable Erica to have natural interaction with persons by integrating various technologies such as voice recognition, human tracking, and natural motion

generation. It has nineteen degrees of freedom for face, neck, shoulder, and waist, and can express various facial expressions and some gestural motions. Its appearance is designed for beautiful and neutral female face, by which people can familiarly interact with it. It speaks in synthesized voice.

Source: http://www.geminoid.jp/en/robots.html

Designing robots to resemble humans is situated as part of ongoing endeavour to reproduce the human form in humanmade artefacts – these includes paintings, statues, dolls, puppets, figurines or masks (Richardson 2015, Robertson 2010). While in these non technological forms, they did not have capacities to respond back, to look back at the human as though it were also capable of recognizing human beings.

In human lived experience, most human bodies come in a recognizable male or female form (regardless of what gender identity the person may feel in size), males for example are typically larger than females and carry more muscle mass making them on average stronger. In wider society, there are roles that females and males perform and there is a gendered organization in the way that certain industries are organized. Some professions, for example nursing are predominantly female, while construction work is predominantly men. In the service sector, females often play the roles as receptionists, or hostesses. In one Japanese study, the researchers found that people expected robots to have the gender most common in the assigned role (Nomura, Kinoshita 2015). Therefore, in making robots that are in humanlike appearance it also means giving them a recognizable form.

The huge interest in sex robots is one example of the way in which 'sexualised' representations of women from pornography are influencing the design of these dolls. These dolls are beyond the human, as like the children's toy the Barbi doll, their proportions are not real, unrealistically small waists, large breasts etc…(Richardson 2017).

On the other hand, robots can have no consciously designed gender at all, but the start to take on a form that people will attribute male or female 'qualities' and social expectations. Put another way, robots reflect back to us normative values about sex and gender and what these issues mean for wider society.

The difficulties, however, is that unconscious sexism that persists in society is reproduced and maintained by the production of gendered robots. Corporate giants Microsoft and Apple both have female AI voices on their phone devices. Male users have been known to ask Siri or Cortana about their sexual preferences. Though these users of the device know full well that Siri or Cortana are not women and have no physical existence. Military robots by contrast have masculinized forms, alongside many industrial robots. These robots reflect the gender constructions in wider society.

Finally, problems are complicated in technology as there are differences between the uptake of female researchers in the Science Technology Engineering and Mathematics (STEM) subjects. Active campaigns to recruit female students into these fields has become a priority in some European countries and for research councils wanting to support gender equality.

8.6 Conclusion

For the REELER consortium members, sex and gender of robots and systemic issues gender equality and inequality will be central to our research. Through our interviews with roboticists and business people, and affected stakeholders, we want to learn from our interlocutors in what ways sex and gender is important. Through using sociodrama and the mini publics, we hope these can invite more discussion sex and gender. We will ask if robots should have a gender, and what should be the criteria to decide a gender? Are there problems with fictional or hypersexualised representations of robots? Does it affect men and women equally for example if sex robots are developed? Why do our participants feel that there is less reporting of sexism in European companies and universities compared to the high profile cases in the US. We will explore the way in which gendered terms are part of scientific practices and what this means in the context of knowledge production.

REFERENCES

BARON-COHEN, S., ASHWIN, E., ASHWIN, C., TAVASSOLI, T. and CHAKRABARTI, B., 2009. Talent in Autism: Hyper-Systemizing, Hyper-Attention to Detail and Sensory Hypersensitivity. Philosophical Transactions: Biological Sciences, 364(1522), pp. 1377-1383.

BARON-COHEN, S., BOLTON, P., WHEELWRIGHT, S., SCAHILL, V., SHORT, L., MEAD, G. and SMITH, A., 1998. Autism occurs more often in families of physicists, engineers, and mathematicians. Autism, 2(3), pp. 296-301.

BARON-COHEN, S., GOLAN, O. and ASHWIN, E., 2009. Can Emotion Recognition Be Taught to Children with Autism Spectrum Conditions? Philosophical Transactions: Biological Sciences, 364(1535), pp. 3567-3574.

FIGURES, S., 2012. Gender in research and innovation. Statistics and Indicators. European Commission (2013).Luxembourg: Publications of the European Union.doi, 10, pp. 38520.

FINE, C., 2005. Delusions of gender: The real science behind sex differences. Icon Books Ltd.

HARAWAY, D.J., 1991. Simians, cyborgs and women: the reinvention of nature. London: Free Association Books.

HASSE, C., 2002. Gender diversity in play with physics: The problem of premises for participation in activities. Mind, culture, and activity, 9(4), pp. 250-269.

KELLER, E.F., 1995. Gender and science: Origin, history, and politics. Osiris, 10, pp. 26-38.

KELTY, C., 2005. Geeks, social imaginaries, and recursive publics. Cultural Anthropology, 20(2), pp. 185-214.

LEMONS, M.A. and PARZINGER, M., 2007. Gender schemas: A cognitive explanation of discrimination of women in technology. Journal of Business and Psychology, 22(1), pp. 91-98.

MARTIN, E., 1991. The egg and the sperm: How science has constructed a romance based on stereotypical male-female roles. Signs: Journal of Women in Culture and Society, 16(3), pp. 485-501.

NOMURA, T. and KINOSHITA, Y., 2015. Gender stereotypes in cultures: experimental investigation of a possibility of reproduction by robots in Japan, Culture and Computing (Culture Computing), 2015 International Conference on 2015, IEEE, pp. 195-196.

RICHARDSON, K., 2017. Rethinking the I-You relation through dialogical philosophy in the Ethics of AI and robotics, .

RICHARDSON, K., 2016. Sex Robot Matters: Slavery, the Prostituted, and the Rights of Machines. IEEE Technology and Society Magazine, 35(2), pp. 46-53.

RICHARDSON, K., 2015. An Anthropology of Robots and AI: Annihilation Anxiety and Machines. Routledge.

ROBERTSON, J., 2010. Gendering humanoid robots: robo-sexism in Japan. Body & Society, 16(2), pp. 1-36.

SYTSMA, S.E., 2006. Ethics and intersex. Springer Science & Business Media.

TREVARTHEN, C., AITKEN, K., PAPOUDI, D. and ROBARTS, J., 1998. Children with autism: Diagnosis and intervention to meet their needs. Aufl.London (Kingsley), .

VARMA, R., 2007. Women in computing: The role of geek culture. Science as culture, 16(4), pp. 359-376.

WAJCMAN, J., 2010. Feminist theories of technology. Cambridge journal of economics, 34(1), pp. 143-152.