

Is Your Roomba Male or Female? The Role of Gender Stereotypes and Cultural Norms in Robot Design

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Introduction

In cultures all over the world, gender plays a central role in each individual's identity as well as in the way people interpret others' actions, thoughts, and emotions. Today, as robots begin to creep further and further out from futuristic films and science fiction novels and into the here and now of day-to-day life, they too need to be understood and interpreted as a part of society. Because gender is such a key part of human identity, it is also often used as a starting point for a robot's persona, particularly if the robot has any human-like physical attributes such as a face or body. The majority of these robots, whether created as toys, tools, or commodities, possess gender-specific features that identify them as either male or female. In many cases, even the most ambiguously gendered robots are referred to consistently as either "he" or "she"—rarely is the pronoun "it" used. Whether these gender identities are explicit or subtle, and whether they are expressed through form or function, they contribute towards establishing the robot's role in society.

A robot's designer can precisely dictate what its physical and behavioral features will be. As a result, the gendered attributes that are projected onto robots reflect many of the assumptions and stereotypes about gender that are present in the minds of both the designer and the robot's potential users. In general, humanoid robots—those whose physical form resembles that of a human—tend to have more distinctly gendered traits than non-humanoid robots. However, it is female-gendered humanoid robots that are particularly affected by this trend; they are often designed to possess hyper-feminine physical characteristics and to carry out functions that are traditionally performed by women. This practice encourages a particular depiction of what it means to be a woman in society, one that is based on a stereotypical image of femininity. The emphasis on femininity in certain robot designs and on masculinity in others reflects the socio-cultural values that are ascribed to each gender, and reinforces the gender norms that are entrenched in the societies in which these robots are created.

Beauty and the Feminine Ideal

Physical appearance is one of the principal ways in which an individual's gender is read and interpreted by other people in society. Most people initially distinguish between men and women according to a set of socially accepted rules about body shape, grooming, and dress. Examples of the stereotypically ideal feminine form can often be found on the covers of popular magazines such as *Cosmopolitan*. The woman shown in Figure 1a, for example, has long hair, smooth, fair skin, wide hips, and large breasts; she wears makeup to highlight certain facial features and tight clothes to accentuate her figure. On the other hand, a stereotypical man, such as the one pictured on the cover of *Men's Health* in Figure 1b, has short hair, is tall, has muscular arms and shoulders, and wears baggier clothing and no makeup. These same physical traits are also the ones used to classify robots into gender categories based on appearance. Some robots have a whole host of gendered physical features, while others are restricted to one or two key characteristics. However, even a single feminine or masculine trait can be the embodiment of a powerful social norm about the way a woman or a man should look, and can therefore be enough to decide the robot's gender.



FIGURE 1(A)

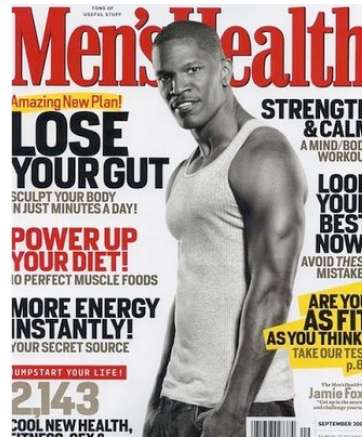


FIGURE 1(B)

Toy robotics companies often come out with male and female versions of a product that differ widely on the surface. WowWee's original robotic product, *Robosapien*, is a male toy robot that came out in 2003 (Figure 2a). Robosapien has a bulky body shape with very large shoulders and legs. Five years later, WowWee came out with a new product called *Femisapien* (Figure 2b). The female version of Robosapien, *Femisapien* has a sleek, slender figure with a small waist and

large breasts (WowWee, 2009). Another company, Robo Garage, has a product called *FT* (short for ‘feminine type’), a robot that was expressly designed to look and walk like a fashion model. According to Robo Garage’s website, “FT’s parts were designed specially to express a lean, feminine body line...FT [can] move gracefully...and walk[s] like a woman,” (Robo Garage, 2004). Robosapien has large, muscular limbs and a wide, bulky shape while Femisapien and FT both have thin figures and poised, delicate stances. The marked difference between the toys that are supposed to be female and those that are supposed to be male contributes towards the definitions of femininity and masculinity in terms of the possession of specific physical attributes.



FIGURE 2(A)



FIGURE 2(B)

Certain robotics industries place significant emphasis on the creation of androids—robots whose physical forms appear as human and realistic as possible. Since androids must resemble humans, physical appearance is an essential element of their design. Most androids are created to resemble women who possess what are considered to be ideal features such as a slender body, unblemished skin, long hair, and an attractive face (few androids are male). One example of such an android is Aiko (Figure 3), a robot created by an inventor named Le Trung who developed her as a female companion for men (Trung). Aiko’s nose and mouth are small and delicate; her skin looks soft, pale, and flawless. Although beauty is in many ways subjective, there is not a single objective imperfection in her appearance. Actroid (Figure 4) is a second example of an android whose appearance reflects the pinnacle of feminine sex appeal (“Actroid”). Her long legs are thin and toned, and her smooth skin even appears to have a healthy glow. In addition, she wears a short, tight skirt and tall boots that show off her legs even more. Aiko, Actroid, and other female androids

like them reflect society's conceptualization of what the female figure looks like in its most perfect form.



FIGURE 3



FIGURE 4

Aiko, Actroid, Femisapien, and FT were all designed to possess an idealized version of the female body. These robots propagate the idea that being “female” means having a set of key physical characteristics and that without them, true femininity has not been achieved. In reality, however, no woman is perfect and most women cannot attain the ideal body that the robots possess. Thus, many of the gendered physical characteristics that are incorporated into robot design uphold an unattainable ideal of femininity that leaves all women feeling flawed in comparison.

Robots as Behavioral Role Models

Actions and behaviors are the second critical means by which gender is interpreted. People employ stereotypes to extrapolate an individual's gender according to whether the person has behaved in a ‘feminine’ or ‘masculine’ way. Roboticians who design a robot to fill a certain function often employ this same logical connection but in the opposite direction; a robot's gender is assigned according to the functions that it is intended to carry out.

Humanoid robots are currently being developed and tested for a wide variety of consumer-driven applications. A significant number of these robots are designed with gender-specific characteristics in mind. In particular, many robots created to perform jobs that are typically occupied by women in society are given other attributes, such as physical features, that are associated with femininity. A large portion of funding and effort in humanoid robot design is currently being put toward two main

applications: robots that perform household chores, and robots that provide care to the elderly. Since these roles are both traditionally filled by women, many of the robot designs incorporate elements of femininity. Pearl the nursebot (Figure 5) is a robot that was developed as a caretaker for senior citizens by researchers at Carnegie Mellon University (“Pearl,” 2004). Pearl’s femininity is not explicit, but her name, her high-pitched voice, and her facial features—most notably her red, pursed lips—are much more reminiscent of traits associated with women than with men. As further indication of her female identity, Pearl is referred to as “she.” Saya is a female robot that was designed at the Science University of Tokyo (Boyer, 2004). Also designed as a nurse (at least superficially), Saya has many stereotypically feminine features; she has a thin, shapely figure, wears a nurse’s dress uniform and cap, has long, sleek hair, and has a round face with large eyes and lips. Unlike Pearl, Saya’s gender is unambiguously defined by her physical appearance.



FIGURE 5



FIGURE 6

Other examples abound of robots that acquire gender identities through stereotyped feminine characteristics. A Japanese android named Phorone, created to resemble a secretary, has wide hips and a small waist, and wears clothes to accentuate her figure (“Phorone,” 2008). A robot called TMSUK-4 (Figure 6) was developed as a personal shopper and appears to wear a wide, old-fashioned hoop skirt that invokes a traditional



FIGURE 7

feminine aura (“Real shopping test,” 2008). Another robot called HRP-4 (Figure 7) was created to be a fashion model (Bates, 2009). It has a metallic robot body with a girlish figure, but its manicured hands and delicate face are designed to look like the flesh of a real woman. These examples demonstrate that robots designed to perform jobs that are traditionally occupied by women are very often designed as females with many stereotypically feminine features. The gender imbalance present in robotic design for certain applications serves to reflect and even reinforce normative gender roles in society.

Robotic toys also reflect social assumptions about gendered behavior. WowWee’s Robosapien is advertised as featuring “6 different kung fu moves” and communication via “caveman” speech. Femisapien’s main feature is that she can dance; according to WowWee’s website she also “speaks her own language called ‘emotish’ which consists of gentle sounds and gestures,” (WowWee, 2009). Although these robots are toys, they embody stereotypical masculine and feminine ideals. Robosapien does kung fu, a very masculine activity, while Femisapien and RoboGarage’s FT dance or walk like models, both activities that are typically seen as feminine. In addition, the differences in the “languages” spoken by Robosapien, who communicates in “caveman speech” and Femisapien, who communicates in “emotish,” support another behavioral norm. While the former is reminiscent of grunting sounds and bare-chested male brawn, the latter is a play on the stereotype that women always display their emotions on their sleeves. All of these gender-specific characteristics reflect social ideas about which activities are fit for females (dancing, modeling) and which are fit for males (kung fu).

The group of robots that presents the most explicitly gendered facade is androids. The majority of the androids in existence today are female, and they possess strongly feminized behavioral characteristics to go along with the physical presentation of their bodies. Aiko is designed to be a

female companion who is as close to “perfect” as possible. She performs simple household tasks and responds to being touched in sensitive places by scolding whomever is around her in a manner that emphasizes her female modesty. According to the project’s website, some of the features Trung, Aiko’s inventor, wants to implement in the future include to ability to: “make simple breakfast,” “massage [his] shoulders and neck,” “clean the windows,” and “clean [the] toilet” (Trung). All of Aiko’s characteristics are very stereotypically feminine, from her appearance and the clothes she wears to the traditional wifely role she is designed to play, and represent what her creator sees as the pinnacle of ideal femininity.

It is not only contemporary androids that display idealized femininity; automata from the 18th and 19th centuries were similarly designed in the image of perfection. In an analysis of these more ancient female androids, de Panafieu argues that “[they] serve to affirm masculine identity and to represent the male projection of femininity... female automata express the masculine ideal of women,” (de Panafieu, 1984: 134-5). She then goes on to ascribe men’s conceptualization of female androids to the idea of, “the creation of an ideal woman, a woman who has all the characteristics and capacities that are expected of real women...[and whose] most important feature is her beauty and eternal youth,” (de Panafieu, 1984: 136). The design of female humanoid robots to embody an idealized form of femininity, beauty, and subservience to men enforces the idea that women’s sole purpose in existing is to please men. The creation of androids such as Aiko serves to reinforce patriarchal values in society.

A Woman’s Work, or a Robot’s?

Gendered physical and behavioral characteristics that are built into robot designs reflect social views of gender and sexuality because they come directly from their designers, who are members of society. However, in addition to how the robot is physically and socially designed, the specific functions that robots are programmed to carry out also speaks to specific gender roles that are culturally and socially accepted. Traditionally, there has been a division of labor between men and women in society. Men went out to work and earn money, while women stayed home and kept the household and children in order. An analysis of robotic design in the 18th century reveals that the automata’s “functions [were] sexually attributed and reflect[ed] the social division of labor according to sex,” (de Panafieu, 1984: 128). De Panafieu observes that male automata of the time were the only ones who wrote and spoke, while females typically played music or walked. These decisions on the part of their creators reflect cultural stereotypes about the roles that men and women should take in society.

In the article “Automata – A Masculine Utopia,” Christine de Panafieu (1988) further notes that far more 18th century robots were created as females than males, a trend that persists today. In addition, most contemporary robots are being developed to fill roles that traditionally belong to women (Boyer, 2004), which largely comprise the

types of work that are associated with running a household and taking care of others:

Within the historic bourgeois ideal, “work” has been associated with the waged-labor of men and located outside the home, while work of caring for others has fallen into the category of “social reproduction”, been labeled women’s work and associated with the space of the home...even into the new century we see a continuation of the “masculine work norm”...[which] is expressed as a tendency to normalize men’s activities in the public sphere and define them as work, and devalue activities associated within the space of the home. (Boyer, 2004: 76)

As robots become more advanced, they may eventually replace the people that currently perform these jobs. Kate Boyer asks an important question: “what does it say about how we view elder-care, and the skills of those who perform it, that robots are being developed to take up some of this work?” (Boyer, 2004: 77). Thus, the targeting by robot designers of “feminized” jobs that are mostly occupied by women may de-value the role of women in the labor force. These practices emphasize unwritten cultural norms that view contributions to society made by men as far more valuable than those made by women.

In Japan, household robots may also be serving to renew traditional patriarchal values. In an in-depth analysis of *Innovation 25*, Japan’s vision of its future, Jennifer Robertson argues that, “the ideal-type extended family and...wholly conventional gender roles...are both reified and reinforced,” (Robertson, 2007: 390). Robertson points out that the household robots envisioned by the authors of the document “are imagined to serve as surrogate housewives; that is, as devices through which a human housewife distributes her personal agency,” (Robertson, 2007: 388). As such, they interact principally with the woman of the house and rarely with her husband, reinforcing the woman’s role as a housewife, first and foremost. Robots, therefore, not only support gender stereotypes by being themselves gendered but also uphold traditional gender norms and divisions by filling social and cultural roles that are often thought to belong within the female sphere.

Gender Stereotypes in Socially Constructed Personalities

Robots such as Aiko, Robosapien, and even Pearl have gendered characteristics incorporated directly into their designs. Other robots, however, are not as explicitly gendered, if they are gendered at all. Asimo (Figure 8) is one example of an ambiguously gendered robot; another is the Roomba (Figure 9), a round, flat, non-humanoid robot that vacuums floors (“iRobot Roomba,” 2009). Even though Asimo and Roomba do not have pre-defined genders, many people cannot resist ascribing genders to them. Asimo, for example, is usually referred to as “he” (Boyer, 2004). In addition, some people come to think of their Roomba as either male or female even though they do not have any gendered, or any humanoid, features (Garfinkel, 2004).



FIGURE 8



FIGURE 9

When a human interacts with a robot in a social context, the person forms a mental image of the robot's perceived personality and character traits (Powers, 2006). One aspect of these perceptions is almost always an interpretation or assumption about the gender of the robot. At times, the robot's gender may seem obvious—perhaps it has explicitly gendered features that allow people to identify its gender much as people determine the gender of other humans based on their appearance and certain other obvious features. In other cases, the choice of gender may not be as clear. However, people will nonetheless associate the robot with a particular gender: “[The Roomba] is a girl...it's round. It's close to the floor. It ends with an 'a.' I always think of it as a wom-ba,” (Garfinkel, 2004). Here, traits such as the robot's name and shape are being used to characterize it as female. In a study carried out by Powers and Kiesler (2006), participants were asked to interact with a series of different robotic faces, each of which spoke with a voice in one of four differently-pitched voices. The results of the study demonstrated that the fraction of participants who identified the robot as male were 100%, 95%, 73%, and 17%, respectively from the lowest-pitched to the highest-pitched voice (Powers and Kiesler, 2006). These statistics indicate that voice played a significant role in these people's interpretation of the robot's gender even when facial features were no different between robots. Thus, whether we do it consciously or unconsciously, it is often the case that people make assumptions about gender when interacting with humanoid robots.

With this gender assignment comes the inevitable projection of gender stereotypes onto the robot. In another study conducted by Powers et al. (2005), participants were asked to interact with both a male-gendered and a female-gendered robot and discuss dating etiquette. The results of the experiment showed that people were more likely to assume that female-gendered robots knew more about dating than male-gendered

robots, and spent more time explaining the rules of dating to the robots that they saw as having a male identity (Powers et al., 2005). The assumption that women know more about dating than men is a cultural stereotype. Even though the robots are not true members of our society, when viewed as gendered creatures in a social context, people nonetheless applied gender stereotypes to the robots. A possible explanation for this phenomenon comes from social psychology. When interacting with other people, humans look for “common ground,” or similarities with the other person, and use this to establish a basis for the interaction. When interacting with robots that seem humanoid, people tend to take the same approach.

People...use social context cues such as a robot’s appearance or demeanor to build a mental model of what the robot knows. Social cues point to social groups such as gender, age, profession, and nationality, and these social groups convey a persona, that is, a personality with social and intellectual attributes. (Powers, 2008: 158)

This “mental model” of the robot includes associations that would normally be made with a human that fit into the particular gender, age, or nationality group in question. These associations include many stereotypes and assumptions, such as the assumption that men know less about dating than women. In this way, robot users end up projecting gender norms onto the robots with which they interact.

The characteristics that people project onto a robot while interacting with it, which are extrapolated from other traits it possesses, contribute to the creation of a socially constructed personality for the robot. As Sherry Turkle (2007) points out, when people interact with a “relational artifact”—an object such as a social robot that elicits some kind of emotional connection—people project emotions and desires onto the artifact with which they are interacting. For example, in a study with a set of children who were sent to interact with a robot called Cog at the MIT AI Lab, the children “treated [Cog] as a creature with needs, interests, and a sense of humor...[they] related to Cog as a creature and playmate,” (Turkle, 2007:504). Even though Cog is in fact a machine and does not relate to people as they do it, in their minds the children developed a personality for Cog and interacted with it according to the characteristics they imagined it to possess. “The children, who so hoped for Cog’s affection, are being led by the human habit of making assumptions based on perceptions of behavior,” (Turkle, 2007: 504). Thus, people interpret relational artifacts in a certain way, and this interpretation forms a basis for the social conceptualization of the artifact and for any interaction a person might have with it.

Because gender plays such an important role in forming a person’s identity, many people use this as a starting point from which to construct a social personality for a robot. The Roboceptionist at Carnegie Mellon University’s Robotics Institute provides an example of a robot whose

constructed personality is largely reliant upon its gender. The current Roboceptionist is a former Navy Seal named Tank (Figure 10) who has a

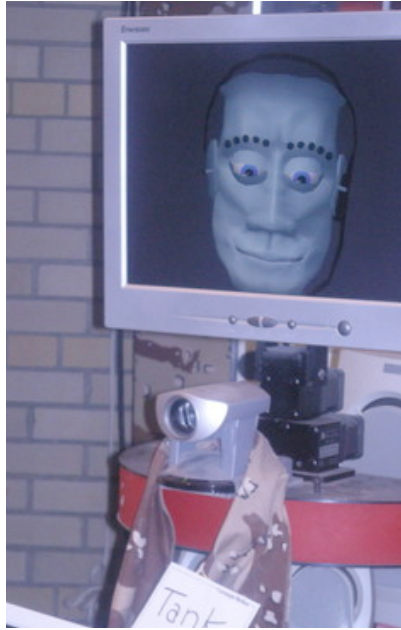


FIGURE 10

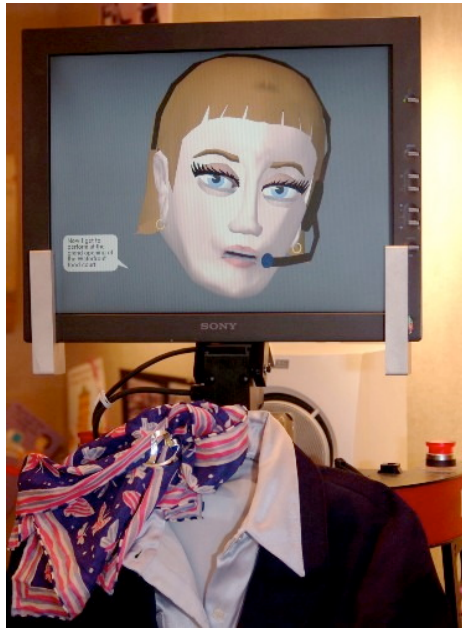


FIGURE 11

very tough, manly presence and a deep voice. When interacting with visitors to the Robotics Institute, Tank discusses his experiences in Iraq where he did recon work for the CIA. In contrast, the previous Roboceptionist was a female robot named Valerie (Figure 11), who had blonde hair and a very feminine appearance. While on the job, she would sing to visitors in imitation of Barabara Streisand. Now that Valerie has been replaced by Tank, she is supposedly “on the road with her Streisand cover band: Babs and the Babettes,” (“Roboceptionist”). Tank, a man, was given a very different background story than Valerie, a woman. These distinctions, intentionally constructed by the robots’ designers, illustrate how gender norms and stereotypes play a role in the creation of a robot’s social personality.

Tank and Valerie’s background stories do not only reflect the gender assumptions made by their designers, but also spread these assumptions through their interactions with other people. Both roboceptionists have an explicit gender identity. When a person walks up to Tank or Valerie, they can immediately discern whether the robot has a male or female identity, simply by looking at it and hearing the pitch of its voice. Once the person begins to talk to the robot and interact with it, he or she will begin to project more characteristics onto the robot because of the phenomenon that Turkle describes. Furthermore, according to the results of the study by Powers, many of these traits will be based on the robot’s perceived gender. Thus, people interacting with the robot will make assumptions

about its knowledge and behaviors according to whether they see the robot as male or female. With Tank and Valerie, many of the projected characteristics that people make are only reinforced by the gender-normative background stories that have been developed for each robot. In this way, socially constructed personalities will not only reflect designers' understanding of gender roles in society, but also reinforce many of the gender-based stereotypes people project onto gendered robots.

Conclusion

Cutting-edge robots designed with the most advanced technologies of the 21st century still reinforce long-standing sociocultural norms and stereotypes about masculinity and femininity. Gendered robots, from toys to full-scale androids, reflect idealized versions of men and women with perfect physiques and traditional gender-segregated roles. Furthermore, the targeting of robots towards occupations that are female-dominated rather than equivalent jobs that tend to be male-dominated, devalues the contributions that women make to society. Part of the reason for these trends may be the gender imbalance that exists among roboticists themselves (a male-dominated field). Whatever the cause, the effect is certainly to uphold and strengthen traditional gender norms that dictate many aspects of life in our society.

Gendered robots may serve to reinforce these norms, but may also be an indispensable tool that permits humans to see and understand robots in a social context. A critical question to ask, then, is “can you have sociability without gender?” (Garfinkel, 2004). According to Garfinkel (2004), “gender will make robots more compatible with their human masters” because gender is an essential component of humans' ability to display emotions and socialize with one another. The 2005 study carried out by Powers et al. seems to support this argument by demonstrating that humans make use of social cues such as gender in their interactions with robots. However, it could also be argued that these same social cues could lead to incorrect assumptions about what the robot knows or does not know, which may lead to confusion that would damage the human-robot interaction.

Ultimately, it is important to consider the implications of the reflection of socio-cultural values about gender in robotic design. If the effects are negative, should roboticists avoid incorporating gender into robot design at all? Would this, however, overlook the important role that gender plays in human-human interaction and the facilitating role it arguably plays in human-robot interaction? If we are stuck in a Catch-22, what are our other options?

Recently, some robots have been used to make pointed cultural critiques about different aspects of society. Gendered robots could similarly be used to critique the widespread gender norms that exist, often unseen and unacknowledged in our society. Consider the image in Figure 12. This robot, initially designed to do construction work, has a male

persona because of its sharp features and bulky form. However, here we see it in the kitchen. The resulting image is striking, and the fact that the robot initially seems so out of place only makes it all the more important that we consider the meaning of such a picture. If male-gendered robots



FIGURE 12

were designed as nurses or home assistants, perhaps that would challenge society's gender stereotypes. By creating robots that defy traditional gender roles, we can take technology into our own hands and use robots to provoke and encourage social change rather than preserve the status quo.

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