

Imitating the Human Form: Four Kinds of Anthropomorphic Form

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INTRODUCTION

Today's anthropomorphic forms continue a long and rich history of the use of human shapes for functional and cultural purposes in artifacts. This history traces back thousands of years to ritual vessels and connects to contemporary design in domains as diverse as household products and robots. Although anthropomorphic forms are found throughout the history of design and within all of the various design disciplines, there is little principled discussion of anthropomorphic form that can inform designers or those interested in the study of design.

This paper is a report on ongoing basic design research into anthropomorphic forms in design. With this research, we are building a core of design knowledge to inform both design studies and design practice. Our intention is to present an understanding of anthropomorphic forms that can be used for the interpretation and critique of existing forms and provide guidance in the use of anthropomorphic forms in new products. Towards these ends we are interested in three fundamental questions; what are the kinds of anthropomorphic forms, how are anthropomorphic forms created, and how are anthropomorphic forms used. In this paper we take up the first question, what are the kinds of anthropomorphic form and we identify and describe four kinds of anthropomorphic form: structural, gestural, aspects of character, and aware.

We came to the topic of anthropomorphic forms through our research into the design of robots (Project on People and Robots). The domain of robotics is filled with anthropomorphic forms, from single-armed industrial machines to humanoid care providers. However, as we made sense and made use of anthropomorphic forms in robot design it became apparent that the problems of anthropomorphic form extended beyond the literal transcription of the human body into machine parts. Anthropomorphic forms are evidence of a larger design agenda of

fashioning our artifacts to be more like ourselves in ways that go beyond shape alone. This agenda features prominently in current technology-based endeavors such as ubiquitous and tangible computing. As Lucy Suchman has noted “At the same time that the technological project is one of congealing and objectifying human activities, it is increasingly also one of animating and finding subjectivity in technical artifacts.” (Suchman) But this agenda is not limited to high-technology. It is just as prevalent today in everyday consumer products. For example, Hello Kitty telephones and Alessi kitchen utensils use design to play on human emotions with the “cuteness” of anthropomorphic form and human-like character. It was the realization of the breadth of anthropomorphic forms in contemporary design and the lack of any principled way to discuss them that lead us to pursue anthropomorphic forms as a topic of inquiry.

All anthropomorphic forms are not the same. It is possible, and necessary, to make distinctions and relations between them. One way to do so is with the identification and description of *kinds*. The pursuit of kinds is often tied to *natural* kinds, making distinctions between entities such as bees and birds for the purpose of constructing a natural order. We pursue the kinds of anthropomorphic form as *artificial* kinds, making distinctions between the artifacts of human endeavor. These distinctions are a method of organization to support principled dialog in design research and practice. Our approach follows two traditions, that of pragmatism and of a poetics: pragmatism in the production of theory for the purpose of supporting practice. A poetics, or a science of the artificial, is used as a method for understanding the making of the human-made world.

BACKGROUND

We define anthropomorphic form as the form of human form. The topic of anthropomorphic form is distinct from the topic of anthropomorphism. Anthropomorphism is commonly defined as the attribution of human-like qualities to inanimate objects or animals. As a topic of inquiry, anthropomorphism is concerned with the ways people interpret non-human entities as being humanlike. Our concern is the imitation of human form by designers as manifested in the anthropomorphic product forms they create.

Our definition of anthropomorphic form suggests a set of questions for inquiry. First, an aspect of any form is the material properties and qualities of the form. This leads us to the question *how is the human form imitated?* How the imitation of human form is revealed in the designed object is the result of decisions by the designer on aspects such as scale, proportion, abstraction and wholeness. Second, all designed anthropomorphic forms serve some purpose. This leads us to the question *what is the purpose of imitating human form?* Examining how it functions, the ends it serves, and the intentions of the designer can reveal the purpose of an anthropomorphic form. In a previous paper we explored the uses of anthropomorphic form (DiSalvo & Gemperle). A third question concerns how an anthropomorphic form comes into being. We take this as a given; it comes to

be as a deliberate result of design. We are not interested in accidental anthropomorphic forms that result from the arbitrary configuration of parts. Finally, when we refer to the form of human form, we must clarify – what constitutes human form? This leads us to the question *what aspect of human form is being imitated?* There is a large set of things about human form that can be imitated in whole or in part. These things make up the objects of imitation that are the forms of human form. It is these objects of imitation we address with our four kinds.

The initial distinctions between the four kinds of anthropomorphic form come from a re-reading of Buchanan’s four orders of design (Buchanan, 2001). Buchanan’s four orders of design provide places for “rethinking or reconceiving the nature of design.” These four orders are things, symbols, action, and systems or thought; each emphasizes a different location and purpose of design activity. While these four orders are often used describe kinds of design practice, we found them valuable to think about kinds of designed forms. Although our four kinds of anthropomorphic form are not a literal application of Buchanan’s four orders (we have taken liberties in manipulating his interpretations for this specific topic) we acknowledge his work as grounding for our own reflective research.

Our distinctions between the four kinds came by looking at the evidence of anthropomorphic form in designed artifacts. We collected a diverse set of examples and proceeded with the inquiry described above. We documented each example in a formatted page (see figure 1) to address each of our questions: how is human form imitated, why imitate the human form and what human form is being imitated. We then proceeded to conduct sorting exercises with our examples, and described comparisons and relationships among them. What follows is the description and discussion of the four kinds of anthropomorphic form we identified.

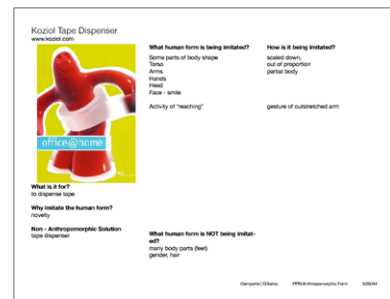


Figure 1. Thumbnail of one of the example pages.

THE KINDS OF ANTHROPOMORPHIC FORM

Structural Anthropomorphic Form

The first kind of anthropomorphic form is *structural anthropomorphic form*. Structural anthropomorphic form imitates the construction and operation of the human body with a focus on its materiality. The presence of shapes, volumes, mechanisms, or arrangements that mimic the appearance or functioning of the human body is evidence of structural anthropomorphic form. It draws from knowledge of human anatomy and physiology and reflects the thing-ness of the human body. An example of structural anthropomorphic form is a pose-able artists model of a female nude (see figure 2). This product form imitates the human female body shape and some of the major joints of the human body. It is at a roughly 1/6 scale of the human body. The imitated parts of this female body are universal to human females.

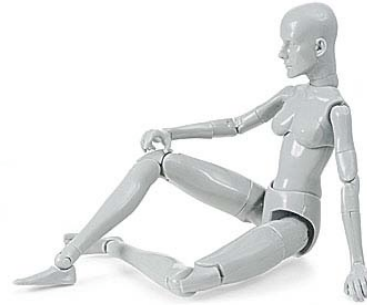


Figure 2. Artists model

Gestural Anthropomorphic Form

The next kind of anthropomorphic form is *gestural anthropomorphic form*. Gestural anthropomorphic form imitates the ways people communicate with and through the human body with a focus on human behavior. The use of motions or poses that suggest human action to express meaning, intention, or instruction is evidence of gestural anthropomorphic form. It draws from knowledge of human non-verbal communication and reflects the expressiveness of the human body. An example of gestural anthropomorphic form is the feedback provided from a Macintosh OS X login screen (see figure 3). This screen has a rectangular window with a text entry field for users to enter their password. When a user enters an incorrect password, the window quickly and briefly shakes from side to side – a common human gesture to express “no”. This action tells the user that the password entered was incorrect with a very gentle suggestion, imitating a human head-shake.



Figure 3. Mac OS 10.2 login screen shaking.

Anthropomorphic Form of Character

The third kind of anthropomorphic form is *the anthropomorphic form of character*. The anthropomorphic form of character imitates the traits, roles or functions of people. It also emphasizes the purpose of individual action. The display of qualities or habits that define and describe individuals are evidence of the anthropomorphic form of character. It draws from knowledge of societal conventions and contexts and reflects the practices people engage in. An example of the anthropomorphic form of character is the Jean-Paul Gaultier “Le Male” perfume bottle (see figure 4). Although the bottle contains elements of structural and gestural anthropomorphic form, taken as a whole it is an anthropomorphic form of character. It is not only a man in a certain style of dress, it is a type of person with specific traits. The erotically charged form of the bottle depicts male sexuality, and captures one way male sexuality is socially construed.



Figure 4. Gaultier's le male perfume bottle.

Aware Anthropomorphic Form

The fourth kind of anthropomorphic form is *aware anthropomorphic form*. Aware anthropomorphic form imitates the human capacity for thought, intentionality, or inquiry. It also recognizes the social qualities of being human. However, unlike the anthropomorphic form of character, which privileges the individual in the society, aware anthropomorphic form emphasizes a common nature of being human. Forms that suggest they possess a knowledge of the self in relation to others, the ability to construct or manipulate abstract ideas, or the ability to actively participate with others are evidence of aware anthropomorphic form. Examples of aware anthropomorphic form are difficult to find in consumer products, however it is a common device in fiction. Currently, aware anthropomorphic forms live at the boundary between science fiction and science fact. In the fields of robotics and artificial intelligence many systems are being designed that imitate the form of being human through programmed abilities to learn, adapt, reason, or interact socially.

We present these four kinds of anthropomorphic form as a starting place for designers' thoughtful and grounded discussion of designed anthropomorphic form. In many situations, whether looking at an existing design solution or making plans for a new one, designers will need to determine which kind of anthropomorphic form is at hand, or which is the goal. Table 1 presents a set of questions to begin discussion for each kind. We have found useful discussion to come from locating and studying examples of each kind; to identify the formal characteristics that indicate the kinds embodied in a given product.

Structural

Is there a body or body parts?
 Does it work like a human body?
 Are the parts universal to all human bodies?
 Does it have to be anthropomorphic?

Character

Does it imitate human relationships?
 Could you describe its character or social role?
 Does it relate to a human experience?
 Does it *not* have to be anthropomorphic?

Gestural

Is there action or expression?
 Does that action tell you something?
 Could you assign human meaning?
 Does it *not* have to be anthropomorphic?

Aware

Does it appear to be aware?
 Is there a simulation of human consciousness?
 Do you relate to it as a human?
 Does it have to be anthropomorphic?

Table 1. Questions to use when considering an anthropomorphic form.

RELATIONSHIPS BETWEEN THE KINDS OF ANTHROPOMORPHIC FORM

The four kinds of anthropomorphic form, like Buchanan's four orders of design, are not hard and fast categories; they are places for discovery and invention. In interpreting or designing an anthropomorphic form it is useful to not only understand how the kinds are distinguished from one another, but also how they relate to one another. What follows are three issues that we found particularly useful for understanding the relationships between the kinds of anthropomorphic form and tracing themes within them.

Emphasis: Human Body, Human Beings

The emphasis on either the body as an object or on human beings as subject matter marks a distinction between two broad selections of what is imitated in an anthropomorphic form. This distinction can be the result of the functional requirements of the form or a reflection the designer's interpretation of what constitutes human form.

Structural and gestural anthropomorphic forms share an emphasis on the human body. These two kinds of anthropomorphic form render human form in relation to the human body as an object with certain capabilities. Anthropomorphic form of character and aware anthropomorphic forms share an emphasis on human beings. Anthropomorphic form of character form renders human form in relation the characteristics of people and the social practices of individuals. Aware anthropomorphic form renders human form in relation to being human.

Change

Product forms change for a variety of reasons including the introduction of new technologies, changes in cultural preferences or the discovery of new human needs and capabilities to address those needs. Change is basic to human experience and has impact on the imitation of human form. Each kind of anthropomorphic form is subject to change for different reasons. Looking at the impact of human change on imitations of human form provides us with an interesting way to understand the relationships between the different kinds of anthropomorphic forms.

Because structural anthropomorphic forms are imitations of known facts they are relatively staid and put forth as representative of most all human bodies. Changes in the manifestation of structural anthropomorphic forms often come about when a new scientific discovery about the construction or functioning of the human body is made. Both gestural and social anthropomorphic forms are imitations of things people do with their bodies. Changes in the manifestation of gestural and character anthropomorphic form are subject to the changes of individuals, groups, society, and contexts. Because aware anthropomorphic forms are imitations of being human, changes in the manifestation of aware anthropomorphic forms are dynamic reflecting causes of change within both individuals and culture.

One artifact, multiple kinds of anthropomorphic form

Many contemporary products are complex in that they must serve multiple functions with a single form. Such products make use of different kinds of anthropomorphic form within single product to solve different design problems. A pertinent example of this is the robot Pearl (see figure 5) (Nursebot). Pearl was designed to research and develop robotic technologies to assist in the care of elders. Pearl has a structural anthropomorphic form; it has a head and facial features such as eyes, eyelids, and lips. Pearl employs gestural anthropomorphic form in the face; these different features animate to create facial expressions. This coupling of structural and gestural form is intended to increase the robot's communicative capacity. Pearl's function is an anthropomorphic role of character. The robot is intended to provide care to a human; this "care-giving" imitates a human function and purpose of an individual's action. Pearl is equipped with learning algorithms that map the environment and inform models for the robots awareness of itself in the physical world. The use of these algorithms aims for creation of an aware

anthropomorphic form. An issue for designers of robots such as Pearl is understanding how the different kinds of anthropomorphic forms can be used effectively and integrated into a whole product form.



Figure 5. Pearl the robot

CONCLUSION AND FUTURE WORK

From our ongoing basic design research into anthropomorphic forms we have identified and discussed four kinds of anthropomorphic forms. We arrived at these kinds from our initial question, *what aspect of human form is being imitated?* The object of imitation allowed us to delineate kinds for use in discussion among designers of anthropomorphic form and those interested in the study of anthropomorphic forms in design. This work is just the beginning of a much larger program for research on the topic of anthropomorphic form. We believe the topic of anthropomorphic form is an important area of inquiry for design research. The prevalence of anthropomorphic forms in the history of

design and contemporary practice suggests that such forms are more than a trivial motif. We believe that anthropomorphic forms are a powerful and sophisticated way for designers to shape our experience with products and that our ongoing research contributes to a dialog on how anthropomorphic forms can be understood and practiced as a manner of solving design problems.

Qualities and materials

Following from the set of questions presented earlier in the paper, the next question we will address in our ongoing research is, *how is human form imitated?* The answer to this question describes both materials and qualities of anthropomorphic form. Any effort to create an exhaustive list of human (or product) materials and qualities would be futile – there are simply too many ways to characterize the manifestation of an anthropomorphic form. Materials and qualities are two different things, but we will discuss them together. Qualities are the way materials are treated. We have identified four qualities that we find to be particularly relevant to discuss: scale, proportion, abstraction and wholeness. These speak well to the overall similarities and differences between anthropomorphic forms and their relation to human form. The qualities of scale and proportion can be addressed by comparing dimensions of designed anthropomorphic forms to those of the human form (anthropometrics). The qualities of representation and wholeness are open to more interpretation. Quality of representation can be found in how abstracted the form is from the human form it imitates. Quality of wholeness of the imitation, can be found in how whole the imitated form is; is the anthropomorphic form a whole body, partial body, or disembodied? The question of materials is still open – what are the parts out of which anthropomorphic forms are constructed? What materials distinguish human form from the forms of other living beings? The answer to this question, like the others, will begin in the collection of evidence and structured reflection.

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