Chapter 9
Kawaii/Cute Interactive Media

9.1 Introduction

The word "cute" is used to describe a number of things, usually related to adorable beauty and innocent attractiveness. The cute aesthetic is something that it not new and has been a component of art since the beginning. The contemporary world is still grappling with the aesthetics of cuteness, and digital interactive systems are just beginning to find the strengths and weaknesses of cuteness. Cuteness in interactive systems is a relatively new development, yet having its roots in the aesthetics of many historical and cultural elements. Symbols of cuteness abound in nature as in the creatures of neotenous proportions; drawing in the care and concern of the parent and the care from a protector. In this chapter, we provide an in depth look at the role of cuteness in interactive systems beginning with a history. Although we aim for a general understanding and examples from different cultures, we particularly focus on the Japanese culture of Kawaii, which has made a large impact around the world, especially in entertainment, fashion, and animation. We then take the approach of defining cuteness in contemporary popular perception. User studies are presented offering an in-depth understanding of key perceptual elements which are identified as cute. The concept of cuteness is analyzed by examining the individual components and by projecting the future of cuteness in a research-oriented design approach. This knowledge provides for the possibility to create a cute filter which can transform inputs and automatically create more cute outputs. The development of the cute social network and entertainment projects are discussed as well, providing an insight into the next generation of interactive systems which bring happiness and comfort to users of all ages and cultures through the soft power of cute.

9.2 The Cute Aesthetic

9.2.1 Kawaii: Cute Culture History and Development in Japan

> The Emptiness (kyomu), the Nothingness (mu) of Japan and of the Orient ... is not the nothingness or emptiness of the West. It is rather the reverse, a universe of Spirit in which

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everything communicates freely with everything, transcending bounds, limitless.
Yasunari Kawabata, 1968 [12]

Japan is a country with a unique culture. Influenced by Chinese high culture from the early days, isolated deliberately from the outside world for centuries, absorption of and adaptation to western cultural elements marked the cultural history of Japan. The overwhelming disappointment in World War II, the nuclear bombing of Hiroshima–Nagasaki, a recent end of the Cold War and subsequent political changes are decisive moments for Japan, which gradually altered its geopolitical attitude towards supremacy. Embracing the western oriented popular cultural ideologies is part of this metamorphosis. Kawaii is a sub-culture of the modern popular culture of Japan. We focus at first on the historical journey of Japanese Kawaii culture that is shaping one of the most technologically affluent nations, its impact on global scale and its modern edition that is contributing to the Japan's universal image as a "soft power." This study in Kawaii is an attempt to decrease the gulf between cultures by understanding the aesthetics of Kawaii, and employing such culture for the increase of comfort and happiness in the design of interactive media systems. To understand the development and importance of Kawaii culture in Japan, let us take a brief look at some relevant history and culture of Japan.

Japan is a small island nation with a long history and a strong sense of cultural identity based on homogeneous people. The first settlements on Japan were recorded during the Palaeolithic period circa 30,000 BC. Primarily a hunter–gatherer culture, the invention of earthenware, and the aesthetic sensibility to beauty of the natural world are the characteristics of the Jomon culture[1] which paved the way for the development of wet-rice farming, iron working, wheel-turned pottery, superior bronze ware and Shinto religious practices. According to Jaroslav Krejčí [16], Shinto bestowed on Japanese a sense of unreserved allegiance, while Confucianism gave all goodness and dignity, and Buddhism contributed the tendency towards submission to inevitability. The arrival of Zen Buddhism which brought simplicity and discipline and already well established Shinto ceremonies influenced the development of distinctive arts of graceful gestures, elaborate rituals, composure and contemplation, gardens, architecture, and the tea ceremony. Haiku poetry and Noh Theater followed by Bunraku and Kabuki marked the classical cultural development.

After almost two and a half centuries of a "closed country" policy by which Japan totally isolated herself from the outside world, the Meiji Restorations arrived, which essentially was a civil war between the Satsuma-Cho-shu Alliance and the Tokugawa Shogunate. Incidentally this period began to ascertain the absolute sovereignty of the emperor. Japan materialized as a world power with colonial inclinations towards Asia. Following World War II, Japan had surfaced to form a new nation, without the constitutional ability to build up an army that could act globally; yet, the same setting has pushed Japan towards the development of another manner with amiable approaches and to became a nation of technological advancements

[1]The first documented culture in the Japanese history. Horticultural and earthenware related ceremonies of Jomon culture are still a part of Japanese Culture.

and drive towards business superiority. Japan started fresh with new, mostly North American cultural models.

The techno-cultural suppleness of nowadays is the result of a difficult and temporary disruption developed out of a very long period of being culturally isolated. Today many cultural transformations in Japan are essentially obsessed with technology [37]. It has also been analyzed that the obsessive relationship that binds Japan with America after World War II initiated people to produce without having a sense of autonomy and to create new popular cultural identities, such as Kawaii [20].

The description of the meaning of Kawaii first appeared during Heian period in 794–1185 AD. A new manner of literature aided by the formation of two forms of simplified Japanese systems of writing in characters based on phonetics was created by the sophisticated aristocratic court society at Heian. Makura no Shoshi (The Pillow Book) written by Sei Shanogon [34], one of the court ladies of the Heian court and an essayist, is a collection expressing the more urbane aspects of the contemporary society. The behavior of the chipping sparrow, the small leaf of a crest and a lazuline jar were among her list of cute objects. Furthermore, the game played at Heian court by aristocrats was named kaiwase, the clam shell game, which involved competing to compose the most refined Waka (31-syllable Japanese poems) while moving 360 clamshells from left to right. Sei Shanogon had applied the word utsulushi to denote the meaning of Kawaii. The old mode of Kawaii, kawayushi first appeared in Konjakumonogatarishu (Tales of times now past), which was the greatest collection of tales of Buddhism in Japan compiled at the end of Heian period. In it the word kawayushi means 'pity.' Vocabvlario da lingoa de Iapam (Vocabulário da Língua do Japão in modern Portuguese), which is a Japanese to Portuguese dictionary published by the Society of Jesuits in Nagasaki, Japan in 1603, contains the word 'Cauaij', and it is considered as the original meaning of Kawaii [31]. From Taisho period till 1945, the word Kawaii was printed in dictionaries as kawayushi, followed by the change of kawayushi to kawayui.

9.2.2 History of Manga

A very related historical effect to understanding Kawaii culture is the development of "Manga" (visual comics arts), as these directly project the Kawaii aesthetic. While being restored to its former glory in 1935, Horyuji temple, the oldest wooden structure in Japan, which was burned down in 670 AD, revealed caricatures of people, animals on the backs of planks on the ceiling of the temple. These caricatures are among the oldest surviving Japanese comic art [11].

Cho-ju–giga, also known as Cho-ju–jinbutsu-giga, is a famous set of four picture scrolls belonging to Ko-zan-ji temple in Kyoto, which incidentally is considered to be the oldest work of Japanese manga. The first two scrolls, illustrating animals (frogs, rabbits and monkeys) frolicking, are assumed to have been drawn in the mid-twelfth century, whereas the third and fourth scrolls date from the thirteenth century. The brush strokes are lively portraying the actions and movements which are central to various episodes.

Instead of hand painted manga, in the Edo period (1603–1867) woodblock techniques for the mass production of illustrated books and prints were developed. In the middle of the Edo period, in 1720, woodblock print publishing method emerged in Osaka. It was considered as the first published manga book that became a commercial success. Uncomplicated lines and exaggerated expressions are essential elements of manga, and the cinematic technique creates an even more expressive medium. To lay the foundation for modern day manga, the artists of long ago imaginatively combined these elements [10].

The earliest usage of modern manga was recorded in 1770s. The growth of the urban middle class during this period resulted in the development of the popular consumption pattern in entertainment where mediums such as manga flourished. Kibyoshi were story books for adults with narrated story placed creatively around the ink brushed illustrations. Most famous were the 1819 AD wood block prints published by Katsushika Hokusai. The turn of the twentieth century marked the arrival of the physical form of modern manga. It was during the Sho-wa period (1926–1989) when manga became a part of everyday life of the Japanese people. Amazingly, the first example of modern day manga was dedicated to the children, the comic strip, "The Adventures of Little Sho" (Sho-Chan no Bo-ken), which is a story about a little boy and a squirrel. Even though Japan provides sufficient evidence to support the historical roots, the ancestors of the modern manga are the European/American-style political cartoons of the latter nineteenth century and the multi-panel comic strips that flourished in American newspapers during the Post War years. In the midst of the defeat, massive destructions and Hiroshima–Nagasaki initiated the new form of modern manga, picture card show and rental manga. Picture card show is a miniature theater with the story drawn on cards which were displayed in theatrical style. And the crowd of young destitute rural youths, who had scaled the cities as migrant workers, were the consumers who created a market for the rental manga.

The 1960s observed the rapid expansion of the story manga relating it to radical political movements and experiments in counter cultural inclinations [14]. Commercial manga advanced and diversified during 1970–1980s, its contents maturing to accommodate the rapidly transforming tastes and attitudes. In 1990s, manga encountered a challenge, the challengers being the computer games, personal computers and the Internet. To Kinsella [13], Modern Japanese manga is a synthesis, a long Japanese tradition of art that entertains. The physical appearance was an invention copied from the West. Manga characters express cartoon tendencies with exaggerated emotional articulations. They convey human emotions in their basic form; swooning to visible excitement, unabashed embarrassment to hopping madness [13]. These are the personal characteristics that are cute, which the generations associate themselves with, developing their individual selves to portray some, if not all, of these cute qualities in varying degree of appropriateness.

The artistic experience of manga gradually developed into cultural production, a collection of imageries with vulnerable qualities which are dreamily adorable, that set out to conquer the popular culture world. The image based culture products at face value seem little more than decorative characters. However, while manga is

identified with the masses, these culture products explore the technological landscape of Japan, giving the individual user a means of self expressions and individualization. Kawaii is the sentiment expressed in these aesthetics and culture products.

In the 1970s, Kawaii emerged as a new form of pop culture, which is an integral part of the Japanese culture. Kawaii is a very unconscious obsession. To Takashi Murakami, Kawaii culture is an expression of Japan's post-war impotency and the child-like relationship to the United States [19]. Both the dynamics of manga and Kawaii are inter-related, each enhancing the existence of the other, and both epitomize Japan's susceptibility towards childish tastes and the shelter and safety those tastes offer [23].

9.2.3 Kawaii Culture Development in Modern Japan

During the mid 1970, Japanese teenage females developed a form of handwriting which had become the rage [17]. Written in child-like fashion to communicate with one another, this new childish character style became a phenomenon during the 1970s. A survey conducted in 1985 revealed an estimated crowd of about 5 million were using this new form of writing. The new script was described by a variety of names such as marui ji (round writing), koneko ji (kitten writing), manga ji (comic writing), and burikko ji (fake-child writing) [13].

Romanization of Japanese text could be the birth of cute handwriting. Japanese writing is in vertical strokes, varying in thickness. The new style produced thin even lines, stylized and rounded characters in a blend of English, katakana, and diminutive symbols in cartoon style, like stars, hearts, and adorable faces. The fixation for this style developed to an extreme so that the schools across Japan had to ban using it to discipline school children.

By inventing this new form of handwriting, the younger generation was aspiring to establish themselves as individuals, identifying as a separated entity from the adults and their traditional cultural values. Kawaii, in point of fact, is seen as a rebellion against the traditional cultural values and a belated reaction to the destruction of World War II and its aftermath. Their apparent babyish attitudes conveyed the unexpressed desire to be recognized as a new culture which will not be outmaneuvered or blindly led. They faithfully embrace the cuteness portrayed in Kawaii cultural development. Association of Kawaii with the technological landscape of Japan by customizing and humanizing it [9] gives the Kawaii worshipping generation an inspiration to articulate themselves individually, yet also as a group.

In 1971, a stationary company "Sanrio" established a Kawaii consumer market, developing their strategies targeting the cute crazed teenagers by introducing cute style fancy goods such as cuddly toys, toiletries, pastel in color with frills and ribbons. Hello Kitty [32], a beribboned kitten with an inexpressive face, in pink and white hues with a petite stature is one of the most popular Sanrio cuties. She is now an adored trend enhancing the consumer appeal of products and services of over 22,000 worldwide. Since 1983, Hello Kitty acts as the Ambassador of the children of United States for UNICEF. Sanrio had introduced a range of characters for

the Kawaii consumer market such as Chococat [32], Little Twin Stars [32] and My Melody [32].

The commercial appearance of the Kawaii cute is that it should be modern and foreign in design, shape and size must encourage cuddling, adorably soft to senses, pastel in color with frills and ribbons. According to Sharon Kinsella [13], the essential anatomy of a cute cartoon character is small, soft, infantile, mammalian, round, without bodily appendages (arms), without bodily orifices (mouths), non-sexual, mute, insecure, helpless or bewildered. A circle with the bottom half having three dots, two for eyes and one as a smiling mouth is how Takashi Murakami describes the Kawaii scale [19]. Kawaii characters are an inspiration in the first place, manipulated by consumer culture to exploit the cute elements, basically the cheerfulness and optimism.

When Takashi Murakami explored the aesthetic capabilities of the pop culture, he introduced his famous theory of superflat visual culture, a theory which emerged from cultural, political and historical perspective regarding the interaction between high art and subculture, Japan and the United States, and between history and the present day [5]. Arthur Lubow [19] writing for the New York Times mentions Murakami's argument that the flattening process liberated the contemporary Japanese from contemplating the contradictions of Japan's image during World War II and the post-war economic and political maneuverings.

"Becoming Kawaii" with infantile behavior and adaptation of frivolous mannerism and superficial attitude towards profundity and values is the aspiration of the most of the young Japanese. Cute fashion and surrounding oneself with all things Kawaii are not adequate for them to elevate themselves to the blissful stage of Kawaii. Living in a fantasy Kawaii world where every available space is filled with cute things, Japanese cute brigades deliberately disregard the harshness of the realistic world and refuse the maturity that comes with time. Sharon Kinsella [13] noticed that in Kawaii culture young people became popular according to their apparent weakness, dependence and inability rather than their strengths and capabilities. According to Anne Allison [1], cute characters provide a sense of security, intimacy, or connection for people who, in this post-industrial age, lead busy, stressful lives often detached from the company of family or friends, thus making cute attachments their "shadow families."

9.2.4 Kawaii Globalization

Joseph Nye Jr. [26] who introduced the term "soft power" to highlight the importance of cultural factors in world politics, identifies Japan as a "one dimensional" economic power marked by a cultural insularity. Present day Japanese culture is software and service economy oriented, and with the globalization of Japanese soft culture, Japan is recreating its national identity. As Kawaii-craze is becoming the cultural vogue across the continent, mesmerizing the younger generation around the globe whose dream is to associate themselves with the values and lifestyle of Japan,

it indicates the emergence of a new Japanese identity. As Saya Shiraishi [33] noted, Japan may be developing what Nye calls "co-optative" behavioral power.

Kawaii is, in fact, now a strong consumer culture. Japan is years ahead of many other countries in adopting strategies and modes for customization; especially dominant mode of customization is Kawaii culture [9]. It has spread all over the world as a universal trend with arrays of inspirations and inventions. Even though they are not directly recognized as Kawaii, most countries are producing their own brands of cute subcultures and not just as an alien impostor but as a culture legitimately their own with aspects that can be trailed back to centuries ago.

In India, Kawaii elements in its culture are reflected in its various mythical literary masterpieces such as Ramayana [36], ancient Sanskrit epic, dated from 500–100 BC, where the character of human/monkey (Hanuman) coveys all cute attributes. Today Indian artists are introducing a baby version of the monkey, appropriately named Baby Hanuman as an animated figure. Lately some of the leading artists in Indian cinematic art cultivated an image of cute nature which has taken Indian fans all over the world by a storm.

South Asian countries have their own cute characters and temperaments, though they cannot be described as Kawaii culture, the basic aspects are visible. "Kolam," a folk dance of Sri Lanka the origin of which is in India, where the dancers wear intricately carved masks, is one of the folk dances famous for its comic wit and hilarious made-up stories and cute characters. Though a strong tangible culture has not developed out of this ritualistic theater it is still attached to the Islanders' sense of innocence and mischief.

In the USA, Kawaii elements are found in the highly cultivated animation industry. Mickey Mouse, a mouse created in 1928 that has become an icon for the Walt Disney Company, Warner Brothers' Bugs Bunny, a harebrained rabbit created in 1939, and Alvin and the Chipmunks, the story of a singing trio of chipmunks created in 1958, are not only a major portion of the present day American culture but also a universal fascination. European attachment to cute can be traced to the appearance of Moomin, a hipo look like round and furry character created originally by a Finnish writer, and Miffy, a female rabbit created in 1955.

The modern electronic era beginning from 1980s is witnessing the Kawaii inspired computerized electronic innovations which are dominating the world as a global phenomenon. Larissa Hjorth states that the use of Kawaii features to familiarize new commodities or technologies has been common practice in the material culture of post-war Japan [9]. The world, it seems, is finding similarities with the technological optimism expressed by Japan's popular cultural creations. Within the cyberspace and interactive games enjoyed all over the world, subcultural Kawaii has lost its submissive nature. Instead, in the dramatic world of consumer culture where consumption is speedy and threshold of boredom is a slender line, each Kawaii character battles for supremacy and then survival. What is greeted today with a squeal of "Kawaii" will not received the same rejoinder tomorrow. As a soft power the surviving grace of Kawaii culture is its undeniable universal appeal which has crossed the cultural and political borders.

9.3 Contemporary Perceptions of Kawaii/Cute

Have you ever found yourself smiling when presented with a cute character on a website or in a video game? Maybe you have noticed that the way a virtual character moves displays a personality of youth or excitement or friendly demeanor. These are often carefully selected elements utilized by the designers to draw in the user and establish a micro-relationship and impart positive feelings. We noticed that in the Japanese culture, the cute aesthetic is widely used by many organizations and for many purposes including mascots for the police, warning signs for dangerous areas, pedestrian detours in public places, company mascots, and video game characters, among others.

Upon further examination, using cute to motivate and inform might seem a strange match; however, there may be something that cute can do which deserves more focus and research to understand. We noticed that the Japanese style of Kawaii embodies a special kind of cute design which could be used to inform designers of interactive media how to engage users in a way which reduces fear, and makes dreary information more acceptable and appealing. An analogy could be thought of as the bitter pill with a flavored layer which makes the consumption of the medicine more agreeable. The medicine itself is beneficial to the patient, but the process of swallowing a bitter pill detracts significantly from his or her happiness level. We draw a parallel to the cold, digital, electronic, and unsettling internal components of a system to the bitter pill. The "flavored coating" is the cute user interface which is made more agreeable by establishing a relationship with the user and delivering the content of the system in a more friendly and attractive way.

This manipulated perception is not only a flavored coating that makes content easier to consume, but also brings the user to a desired frame of mind and attitude and then delivers content that might not otherwise be received. We can imagine this being used to improve educational materials by reducing the fear and apprehension to learn new concepts, and therefore improve the speed of learning. Taking this concept further, it is conceivable to take an engineering approach to cute design to carefully customize the interaction based on individual preferences and transform various inputs into more cute outputs that appeal to the user, stimulating the emotions involved in the cute experience. This automatic transformation could lead to design possibilities not seen before, resulting in new sounds, smells, foods, and visual content in interactive systems. This represents a unique approach, not aiming at replacing the designer, but providing tools to the designer in the pre-production phase and then to the end user, enabling new self-customization of products.

9.4 Cuteness in Interactive Systems

Aside from carefully designing toys to have a special appeal, we feel that cute interactive systems can draw in the user in a special way and motivate action in a way that is unique. In this section, we describe the benefits of using cute. For example,

the creation of educational games which help the students learn challenging material, cute companions which help people get through painful rehabilitation sessions, enabling interesting ways for people to interact, and increasing the happiness level in general.

9.4.1 Child-Like Innocence and Play

Kawaii and its predecessors have been associated with an innocent and cute attitude. This attitude is not as helpless as it may seem. It can be tied to the child-like way of seeing the world and allowing oneself to wonder in the beauty and the unknown and to approach things with an inquisitive attitude. Mitchell Resnick's concept of "Lifelong Kindergarten" [21] captures this sentiment. In this example, the philosophy is that the learning process should continue throughout life and that people should set aside the constrictive mindset of the adult world and explore in a child-like way. It frees the user to explore and interact more honestly in an environment that is consequence-free. As Brian Sutton-Smith mentioned in a recent article, the child uses play as a way to learn and move forward, and the adult uses play as a way to move sideways [35]. He mentions that play is a way to raise spirits.

9.4.2 Moments of Surprise

One of the most essential components of a designed Kawaii object or experience is the user being surprised or caught off guard. This disruption to the user plants the initial emotion through which the continuing experience is colored. In the case of signage and static jewelry charms, there may only be one surprise revealed to the user and the micro-relationship is built on this alone. While it may be possible, it is unlikely that richly interactive Kawaii systems have only one moment of surprise. In fact, we find that successful interactive systems have more than a few moments of surprise. Some of the systems involve few moments of surprise and accomplish the intended user impact with these special moments of relationship building. Moments of surprise can come from many aspects of the experience. Manipulation of size and proportion draws the user in and activates the nurturing feeling or simply astonishes the user at the novelty of miniaturization. Also from the visual sense, the expressions of a character are conveyed. If a character is displaying an exaggerated emotion such as happiness or harmless stubbornness, the user recognizes the symbols mostly from visual cues as in the notion of affordances [25], which are design clues that a user perceives that help formulate the realm of possibilities of the potential interaction. For example, in the interaction with musicBottles [22], the user is presented with bottles having stoppers that display to the user an affordance that the bottle could be opened. We are pleased when we make a guess based on clues and the end result confirms. When the user manipulates the first bottle top in the musicBottles, the user in a moment may think "ah, this is just as I expected." The user

is then surprised when the action also sets in motion other aspects of the interface such as the music and the lights. musicBottles is crafted to unfold these affordances and guide the user in an elegant way. After the first bottle top is removed, the user may replace the bottle top. The music stops. This may instill a sense of wonder and connection with the interface. The user may then choose a different bottle top to remove. The user is delighted with the fact that music and lights are also envoked, but that the music and sound are different and specific to that bottle delights the user more, and the relationship is strengthened with each bottle and the group of bottles as a whole. With more time, the user manipulates various bottle tops and experiences the individual contribution of each and is compelled to be a conductor. This change of role from a passive observer to a conductor of music is not expected, but is a happy experience. The user is continually surprised when various combinations of bottle tops are removed or replaced and by its compounding effect on the music and lights. When the user has taken inventory of the possibility space, he or she is delighted in solving a puzzle [15]. The moments of surprise can unfold quickly, or in a more slow and controlled manner to extend the amount of excitement and happiness. The unfolding of these moments of surprise could be compared to the narrative construct of aporia and epiphany [24] which are used by game designers and authors to present the user with climactic moments at appropriate times to reward the user and to develop a sense of connectedness to the experience. There is also the possibility that the systems can continually unfold new moments of surprise on an ongoing basis.

9.4.3 Relationship with Object's Personality

When the user exclaims "Kawaii!," the user is acknowledging the fact that the experience is unique and special and involves something that is willfully cute. The most widely used tool to develop the relationship with the user is the projection of a personality of an object. In the case of the Hello Kitty symbol, the gesture and expression of the character is of utmost importance. The cartoon cat is in a sense announcing "Here I am!," and the user attaches emotions and develops an internal narrative explaining the emotions and attitude of the cute animal character.

The viewer is pulled into a relationship with the kitten. Its personality and attitude is conveyed in a non-verbal way to the viewer utilizing the small changes in facial expressions and small symbolic accessories and outfits. The personality of the character itself is a strong element in the Kawaii experience; the viewer is asked to perceive the emotions and understand what motivates the character.

9.5 Studying Cuteness

While we recognize that some design companies tightly guard their secrets of cute in order to maintain their market share, we also recognize the benefits of the power

of cute and couldn't help but look deeper into the design of cute. At a conference "Designing Interactive Systems" in Cape Town, South Africa in 2008, we conducted a workshop, "Designing Cute Interactive Media," pulling together researchers also interested in uncovering the aspects of the cute aesthetic.

Among the presentations were scientific user studies which focused on understanding the key elements of user perception of cute including analysis of colors, shapes, proportions, textures, and sounds across users from all ages and genders. Some of the findings showed surprising differences in user preference among the ages and genders. We will include the highlights of our results below, and take a closer look at the concept and definition of cute from a design and engineering perspective.

9.5.1 Defining Cuteness

The first portion of the study was conducted via online questionnaire in which the respondents were asked to provide a definition of cuteness in their own words. Using word frequency analysis, we developed a definition of cuteness as follows:

"Cuteness includes the feelings and emotions that are caused by experiencing something that is charming, cheerful, happy, funny, or something that is very sweet, innocent, or pure. It can stimulate a feeling of adoration, sympathy, or stimulating the care response."

In addition to coming up with a definition of cuteness, we also see that responses included the mention of colors, sounds, motion, feelings, among others. We took the most commonly mentioned variables as input to the design of the subsequent portion of the study.

Using an interactive online survey, 72 respondents from 20 countries were polled, including representation from Asia, Europe, North and South America. Some interesting trends emerged which showed some similar preferences amongst the groups, but also some key differences as well.

9.5.2 Color Selection

When respondents were given the freedom to choose colors from 16 hues in the visible spectrum, the respondents selected as shown in Fig. 9.1. This isolation of color values explored the limits of the trend towards bright and primary colors. The preferences focused on the primary and secondary hues of red, blue, purple with fewer respondent choosing green and yellow.

When the respondents were presented with just a few color samples from a limited number of hues, child respondents showed a very similar preference for selecting brighter colors. When presented with hues that presented ranges of colors with less variance of the individual intensities, there was a tendency for selecting the

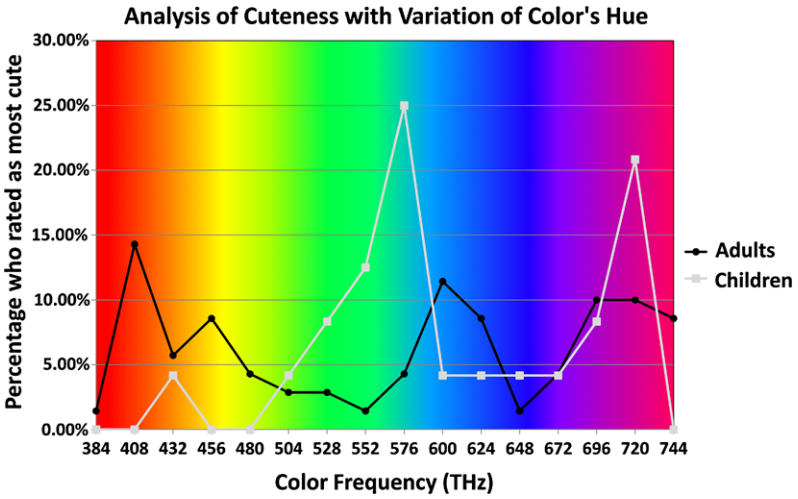

Fig. 9.1 Chart showing the summary of selections of most cute color

colors on the pure ends of the spectrum. In other words, the trend showed stronger preference for primary hues and less preference for grey. Children showed a stronger preference for the greenish blue shade than the older respondents. They also shared a preference for the reddish shades as leading in the selection as shown in Fig. 9.2.

9.5.2.1 Why These Colors?

These trends in the selection for the pure hues and the primary colors could originate in a complex mix between the natural symbols which are instinctual, culturally conditioned symbols, and personal differences in preference and perception. From the natural world, warm colors including red, orange, and yellow, are often seen as a symbol of youth and vitality. The flushed red cheeks of a baby, the bright red of roses and other flowers are examples. It could be that bright pure hue colors convey a sense of willful expression which is not muted with darker shades (mysterious) nor washed out with the paleness of white (less confidence). From a cultural perspective, many cultures especially the Western cultures use the bright primary hues for children and babies as a way to show innocence and purity. Regarding personal preferences, it is not always clear in which cases the selections for cute and colors would deviate from the cultural and instinctual choices, but it could involve other influences from past experiences and/or personal acceptance or rejection of contemporary trends. The influence of color is a complex and well debated issue in the research and philosophy of aesthetics and psychology of perception as mentioned on page 337 of the tome by Arnheim [3].

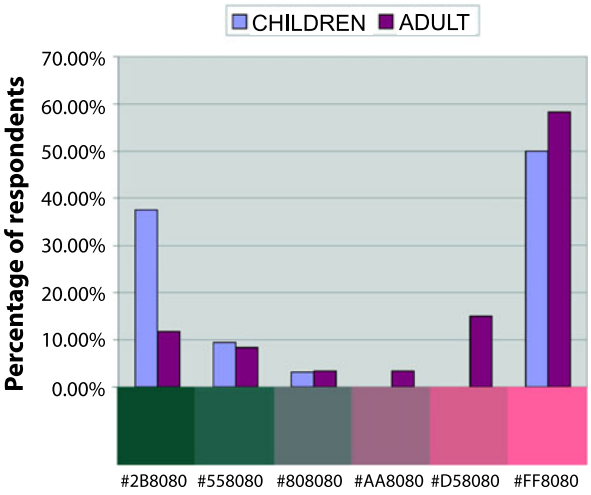

Fig. 9.2 Chart showing the summary of selections of most Kawaii color in the range from a greenish hue to a reddish hue

9.5.3 Texture

The survey for cute ratings and texture was performed by presenting the users with texture samples administered to the respondents such that they could not see the texture, but only make a judgment based on the sensation of placing the hand on the texture sample as instructed by the survey facilitator. There was a noticeable trend in the softness and pile of the textile sample and the cuteness rating. The results showed that as the texture becomes softer and has a longer pile the rating increases. A stronger association with cute was shown only to a certain point beyond which the ratings showed a decline. This showed us that there is a "sweet spot" in the isolated perception of textures and their affect on eliciting Kawaii feelings.

9.5.3.1 Texture Study Details

The user is presented with a texture number, and the test facilitator prepares the texture for the respondent to feel without looking at the color and shape of the sample. The respondent selects the Kawaii rating from the Likert 5 position scale ranging from "Very Cute, Somewhat Cute, Neutral, Somewhat Not Cute," and finally "Not Cute at All." This is repeated until the respondent has experienced all 12 textures. The textures range from very soft to the touch faux fur to rough canvas. The table below shows the types of materials used. The average rating given for each of the textures is shown in Fig. 9.3.

The most highly rated Kawaii texture is shown in Fig. 9.4.

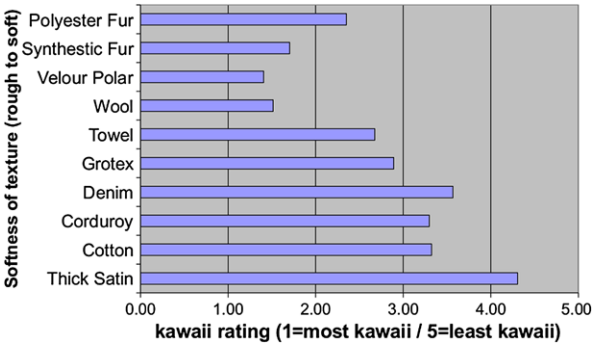

Fig. 9.3 Chart showing that the softness and increase in pile results in a stronger association with Kawaii

Fig. 9.4 Picture depicting the most highly rated Kawaii texture

9.5.3.2 Why These Textures?

These trends in the selection for the longer pile, soft textures is likely related to the examples seen in nature. In the natural world, babies begin their lives as soft and cuddly creatures. The thoughts of kittens or puppies may make a connection with the respondents when they feel the texture samples. It may be this connection to nature which also leads to the lower scores for the unnaturally long pile samples. This feeling of obvious exaggeration and declining scores might provide lessons which show limits to the power of abstraction and manipulation from the real to the surreal.

9.5.4 Motion

Users were presented small animations showing movement of a small black circle on the screen. For each "motion clip," we instructed users to give a "cute" rating to each of the clips. In addition to the rating, we also allowed for open-ended feedback from the users. The open-ended feedback was helpful in illustrating the rating summaries.

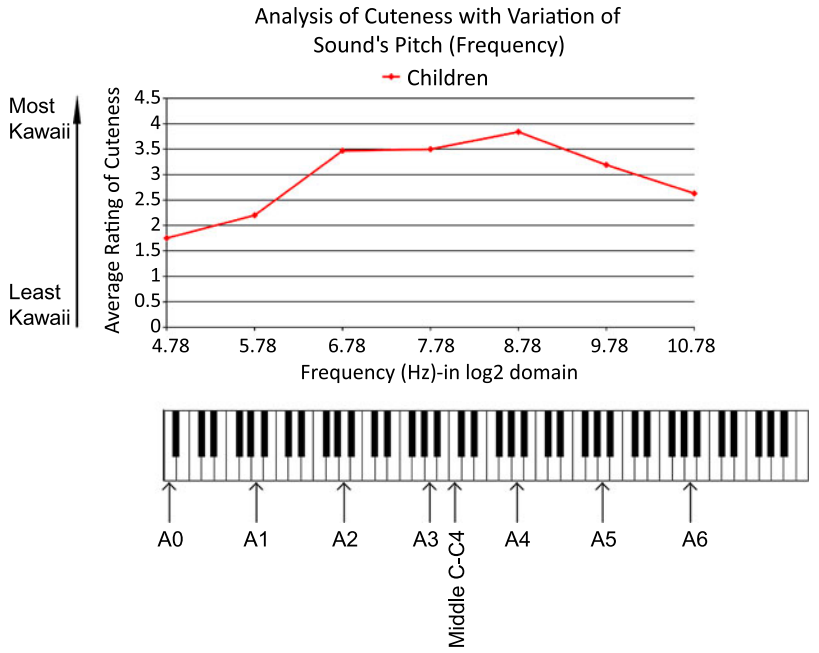

Fig. 9.5 Chart showing that a higher pitch results in a strong association with cuteness

The "motion clip" rated as the most cute depicted the circle moving left to right with small hopping motions. In the open-ended feedback, many responses likened the movement with animal movements and small steps.

9.5.4.1 Why These Movements?

The selection for movements which resemble small hopping motions are likely related to the examples seen in nature such as was provided in the open-ended feedback from the respondents. In nature, the movements of power and aggression are fast and precise, but the movements of the young creatures who are exploring the world and stumbling in awe and wonder covey a more harmless and friendly expression.

9.5.5 Sound

In this test, users were instructed to listen to audio clips and select a "cute" rating for each. We asked the respondent to listen only once and provide their first impression. Each clip presented the same melody, but each clip used a different range of notes. The respondents showed preference for the higher pitch in melody as association with Kawaii as shown in Fig. 9.5.

Additional sound variables such as tempo, rhythm, instrument or voice, sound envelope, echo, and timbre, among others, have shown some interesting results.

9.5.5.1 Why Are These Sounds so Cute?

Again, sounds in nature which convey cuteness are consistent with the results of the perception study. Some examples of high pitched sounds include the chirp of a baby bird, the bah of a baby sheep, even the crying of a human baby are all much higher in pitch than their adult counterparts. This higher pitch signals to the others more easily the signals of need and requests for attention and is understood to have direct connections to the emotions in the adult as shown in empirical studies on pitch [7]. When our mind processes visual cues and recognizes faces and emotions, there is a message of context and intent which is understood. For example, a smile means "I am happy and approachable." This is an association we make very early in development, and it helps humans navigate the social world. In a similar way, when the brain processes auditory signals, the perception of sound calls the person to identify and understand the symbols behind the stimulus. Most objects in nature which are cute and happy transmit higher frequency sounds. Of course, some exceptions apply here as well, including bats, eagles, and other animals who use the special properties of increased propagation of higher frequencies.

9.5.6 Size and Proportion

In this test, users were presented with a paper survey and were asked to show their preferences for size, proportion and association with "cuteness." In the first section, the respondents were presented with three different scenes containing several objects. Users were asked to select the scene showing the object in its size that was the most "cute." This same test was repeated for each of the other objects in the scene. During the test for each object, other objects in the scene remained in the original sizes. The results of this test showed a preference for changing the size of the object to be small in relation to the other objects. An example of the results which were taken is shown in Fig. 9.6 where respondents reported that a smaller sized flower in a scene was cuter than the larger sized flower.

An additional type of proportion test was also presented, involving various ratios of two parts of an object. Respondents were provided with characters including a human, a cow-like animal, and a mushroom. For each character, there were four proportions presented. Users were instructed to choose the picture of the figure that was the most "cute."

The objects which the respondents were presented with and the indication of the two sections noted as "head" and "body" sections are shown in Fig. 9.7.

The respondents selected proportions that were similar to the proportions of a baby, in which the head is disproportionately larger than what is natural in relation to the size of the body. Our description of cuteness is consistent with the emotions of the nurture response and the resulting selections by the respondents confirms the definition and agrees with theories of the nurture response of Konrad Lorenz [18]. In

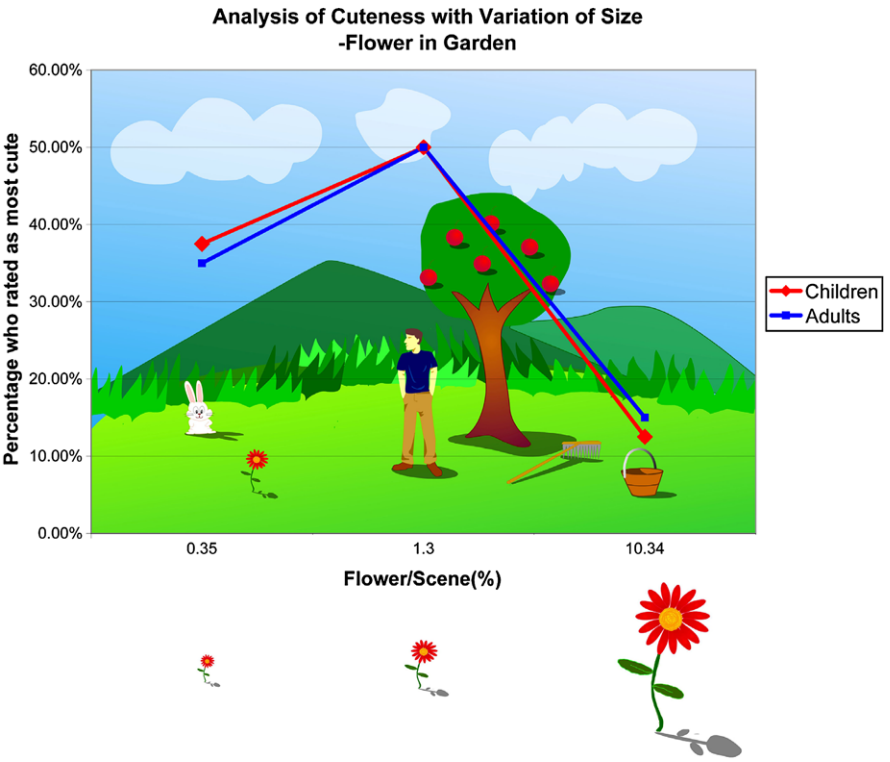

Fig. 9.6 Diagram showing the difference in the preferences for flower size between the adult and child respondents

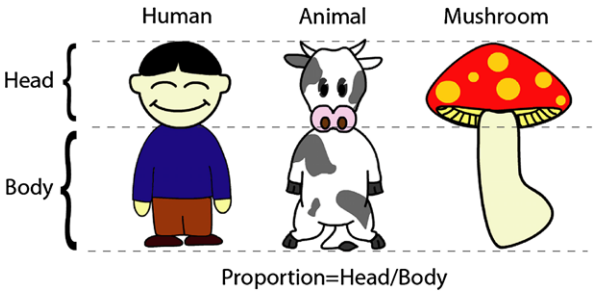

Fig. 9.7 Diagram showing the Head and Body sections of the objects whose proportion the user manipulates

our studies, we found some differences in user preference by the older and younger respondents. For example, adults showed some tendency in selecting proportions of a larger head as shown in Fig. 9.8, yet in the selection for proportions of the cow-like character, the adults selected a smaller head (0.64 proportion of head/body)

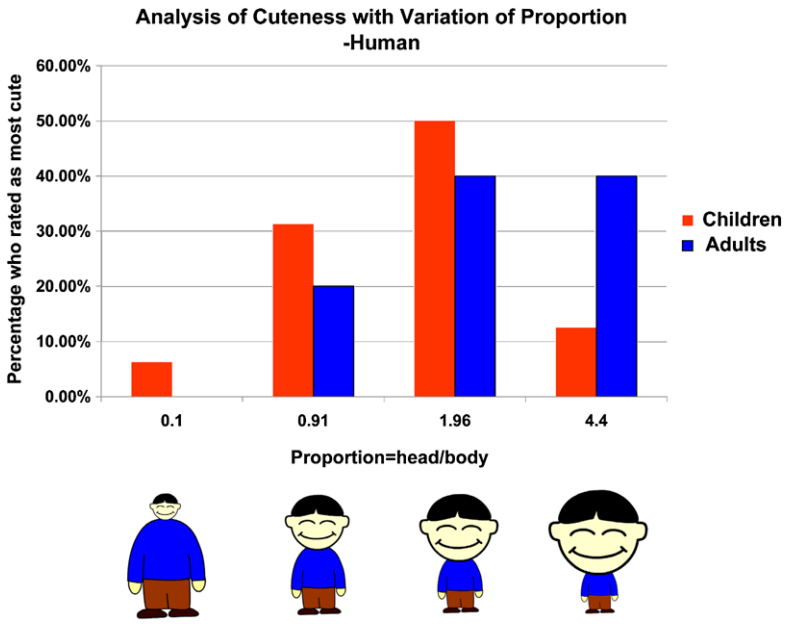

Fig. 9.8 Diagram showing the ranges of proportion selected for the human character

than the children respondents as shown in Fig. 9.9. In the proportion selections for the mushroom, both age groups selected in a similar way to each other as shown in Fig. 9.10.

9.5.6.1 Why Are These Proportions Cute?

With most respondents selecting for the proportions showing a clearly larger head, the connection to the proportions of a baby are natural metaphors. The difference in selection for the cow character in which the adults chose a smaller head, we may need to do more testing, but it might be that the adults prefer to see the proportions that are more natural and less exaggerated for certain characters or animal species. We will explore other animals in the future to determine if there are additional trends unique to mammals and the unique perceptions of the other phyla.

9.5.7 Shapes and Form

We presented the respondents with simple shapes and instructed them to choose the shape which is the most cute. As shown in Fig. 9.11, the preference for roundness

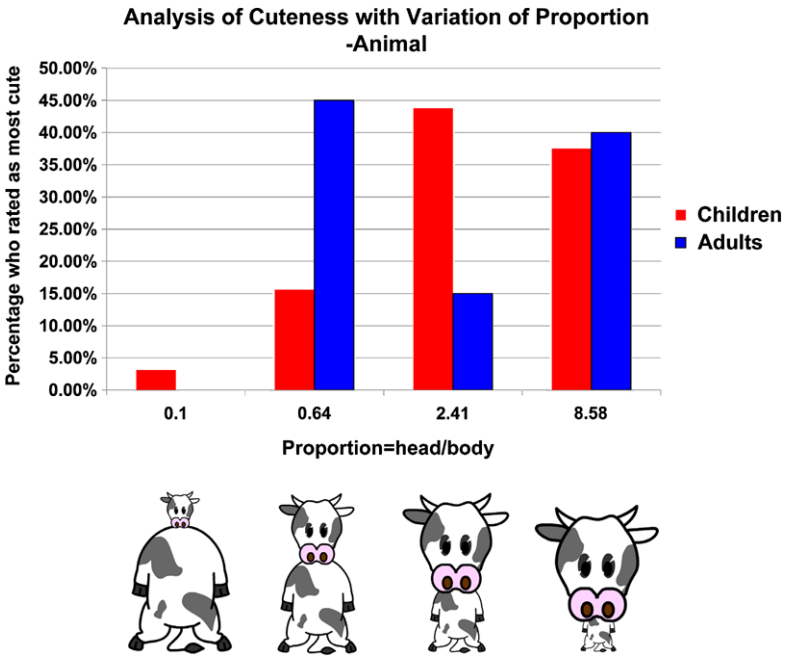

Fig. 9.9 Diagram showing the ranges of proportion selected for the animal character

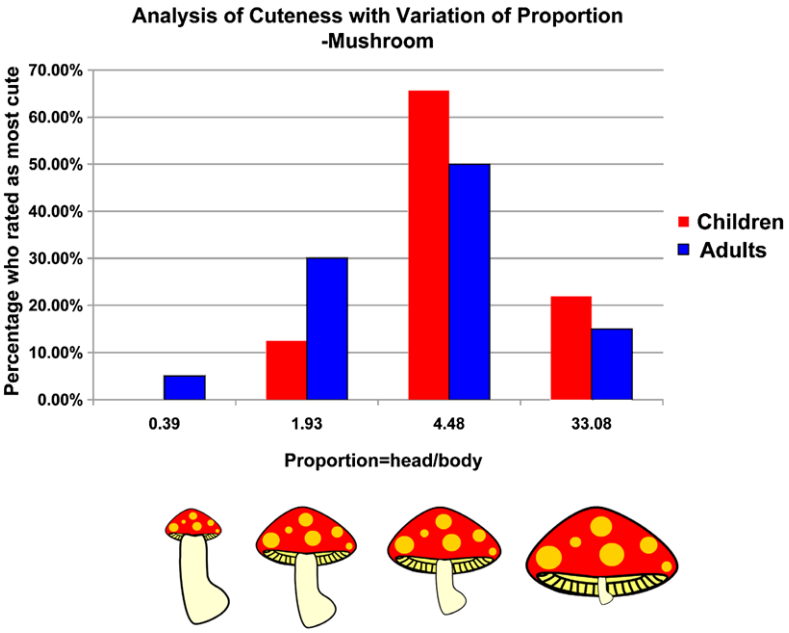

Fig. 9.10 Diagram showing the ranges of proportion selected for the mushroom

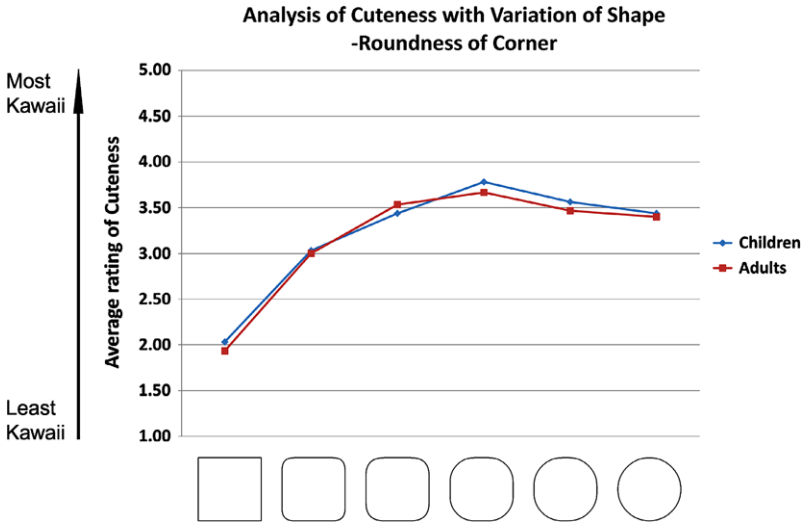

Fig. 9.11 Diagram showing effect of roundness of corners on cuteness

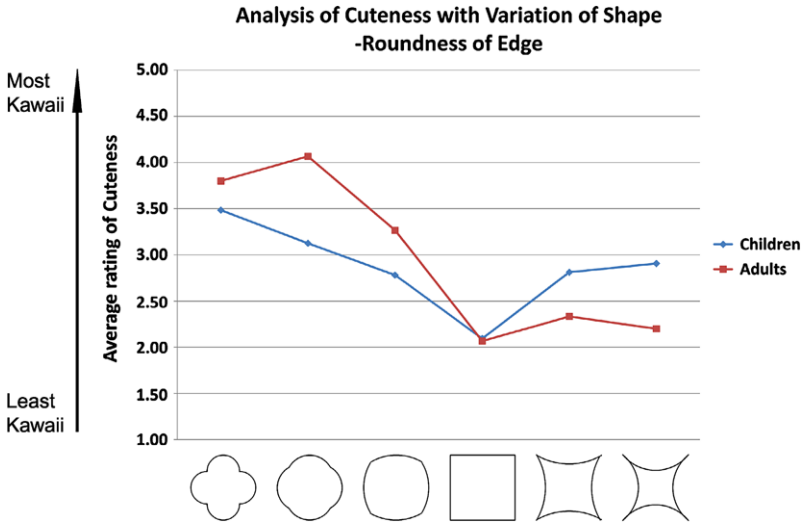

Fig. 9.12 Diagram showing effect of roundness of edge on cuteness

is consistent. There was an interesting result as shown in Fig. 9.12 in which the younger respondents selected objects with sharper edges, possibly due to reading into the image as being more like a star or another symbol.

In Rudolf Arnheim's research, there is much focus on the psychology of shapes and perceptual forces, and he describes the concept of the circle as conveying the infinite and purity [4]. This could give good reasons why we associate cute and

orderliness with this. On the other hand, too much order and sharp corners lead to disinterest or a challenge to restriction.

9.5.8 Smell and Taste

So far, there has been no formal research to measure the cuteness of smells scientifically, although there are a number of cute toys and fancy goods that smell nice. The specially intertwined chemical senses of olfactory (smell) and gustatory (taste) have a very short and simple connection to the brain and the exact functioning of the parts including the olfactory bulb are not fully understood. It has been shown, however, that memories can be tightly ingrained in the long term memory if accompanied with stimulation of the sense of smell. Future research can help to reveal the brain activities related to interactive experiences focused on cuteness.

9.6 Related Works. Cute Interactive Systems

It serves well to look at other interactive systems that utilize the cute aesthetic as well. We now briefly review some of these more recent works.

Topobo [29] is a 3D constructive assembly system with kinetic memory, the ability to record and playback physical motion. Unique among modeling systems is Topobo's coincident physical input and output behaviors. By snapping together a combination of Passive (static) and Active (motorized) components, people can quickly assemble dynamic biomorphic forms like animals and skeletons with Topobo, animate those forms by pushing, pulling, and twisting them, and observe the system repeatedly play back those motions. For example, a dog can be constructed and then taught to gesture and walk by twisting its body and legs. The dog will then repeat those movements and walk repeatedly. The same way people can learn about static structures playing with building blocks, they can learn about dynamic structures playing with Topobo.

Crickets [30] are small programmable devices that can make things spin, light up, and play music. Users can plug lights, motors, and sensors into a Cricket, then write computer programs to tell them how to react and behave. With Crickets, users can create musical sculptures, interactive jewelry, dancing creatures, and other artistic inventions – and learn important math, science, and engineering ideas in the process. Crickets were designed especially for making artistic creations.

Papero [28] is a prototype robot developed at NEC's Central Research Laboratories. Using visual recognition, voice recognition, mechatronics and Internet communication technologies, the robot can recognize individual faces, understand verbal commands, and move smoothly around the home, avoiding such obstacles as tables and chairs.

KKobito developed by a team of Tokyo Institute of Technology is a digital agent, which instills a sense of wonder augmenting the digital world, yet interacting and

influencing the physical world even when they are invisible. Because they are not as predictable as robots, they bring a sense of warmth that a real companion gives and can act in surprising ways.[2]

Unazukin developed by Prof. Watanabe of Okayama Prefectural University also provides a warm feeling in the form of an interactive doll toy, which answers with a simple nod or shake of the head to questions spoken to it. Although it is a very simple embodiment of AI, the illusion of a personality is perceived and the personality of the character captures the simple feelings of cuteness.[3]

9.7 Cute Engineering

Engineering is the application of technical and scientific knowledge to solve problems. This is very closely related to design work, and, in fact, design is one of the tasks of the engineer. Our focus is more closely related to testing and exploring the concept of cuteness as a means to activate cognitive structures, emotional responses, and user behavior, so we have chosen to call this vector of research, "Cute Engineering" instead of just using the more simplistic title of "Cute Design."

9.7.1 Cute Filter

Part of our focus is to uncover the influence of elements in the cute interaction and quantify as much as possible. This will enable the digital representation and manipulation of these elements. Therefore, the results of the perception studies can be applied to the creation of new interfaces and objects and could allow for automatic transformation of inputs and outputs into a new and possibly unexpected result in a sort of "cute filter."

The shift to user experience design focus emphasizes the importance of aesthetics and form over function. Consider as an example the iMac, which was virtually the same computer as previous versions but with an added stylish cover, which persuaded traditionally non-computer users to buy into the world of computing, and hence sold more units. We propose a series of cute filters that take advantage of the 'cuteness' factor, transform inputs from the user or environment, and provide a digitally calculated output which appeals to the user (see Fig. 9.13). Using a cute filter, users can freely choose the cuteness parameters such as color, size, motion, smell, and taste to adjust their desired cute output. The cute filter converts the sensor input and sends it for actuation. We propose five filters which are based on the five human senses. We aim to decompose each sensory cue (visual, audio, tactile, smell, and taste) into individual streams of digital values. Similar to the way in which a

[2] http://www.siggraph.org/s2005/main.php?f=conference&p=etech&s=etech3.

[3] http://rainbowspice.jp/unazukin/index.html.

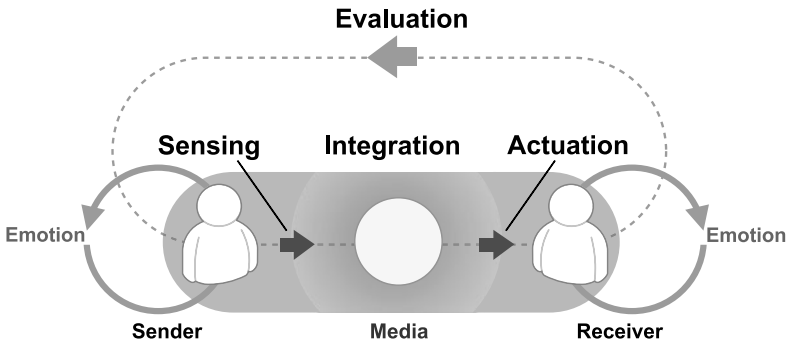

Fig. 9.13 Architecture of cute filter

sound equalizer adjusts the components of audio, the cute filter can boost the color, texture, shape, taste, smell, or motion in the output via the automatic processing and deliver happiness with individualized precision. Our research seeks to uncover the meaningful aspects of sensory perception which can be manipulated to increase the cuteness factor. Our vision extends to building novel modules such as tactile sensors and actuators for texture processing. Present research addresses the texture sensing for only a selected amount of textures. But our research will mainly focus on feeling the different kinds of textures. It also widens our research areas in to developing a tactile glow such that when you wear it and use the glow to touch textures, you can feel different touch feelings (ranging from hard and cool, to soft and furry). Such research of texture sensing and actuation presents immense technical challenges which may include even some degree of bioengineering or a fusion of miniature cameras and pressure sensors for a clearer sensing and actuating. This also broadens our research in to the areas tapping the physiological aspects of the human brain that controls the touch senses of human anatomy, smell and taste. In addition to the challenges presented above, the devices are required to be of high speed in regards to performance, especially when combined with cute filtering. Our research on smell and taste filter will develop a real-time cute smell/taste changing device which can be used to create a cute fragrance automatically to replace uncomfortable bad smells. The research will aim to conclude what are "opposite" smells to produce for smell the technique similar to noise cancelation headphones for sound. In the research, we will address the taste-reconstructing device which is used to reconstruct the perception of a taste by stimulating the taste buds using actuating mechanism. Also we propose empathetic media, using elements of cuteness to appeal and motivate users, present surprising elements, build relationships with them, and leave them with positive feelings.

If we imagine that such a cute filter exists, then the adjustment of the cute factors would need to be tailored to the individual user preferences and perceptions. We can consider the calibration of a joystick as a metaphor for this process of adjusting to the user. When we plug in a joystick, we have to test the extremes along the x and y axes, after which the system understands the nature of the joystick and its limits. The same could be said for other perceptions, for example, cute. We can think of

an applet in which the user is asked to reorder some objects from most cute to least cute. This could be on the spectrum of colors, or on movements, etc. Then, after this simple calibration exercise, the system understands how to set the variables in the cute filter. Not only does this have good uses for the initial setup of the understanding of this unique user regarding cute, but it allows for similar testing and calibrations for other emotions, for example, scary, or happy, etc. Then, throughout the system, the ongoing "tweaking" of this calibration takes place based on the user choices.

9.7.2 Research-Oriented Design

The next step to develop and refine the cute engineering approach is to create applications which are based on our Cute engineering research and in a research-oriented design approach, to explore the human interaction and experience issues. In order to conduct this research, two open platforms are being developed, a 3D virtual world for social networking and a small portable robotic interface to the virtual world. These systems will provide a platform to conduct user studies which will explore general user experience issues, but more importantly, the strengths of cuteness in our contemporary world. Research questions include large social issues, for example, 'How can cuteness reduce aggression in online communication?'. This and other research questions are being answered through ongoing user studies with the prototypes.

9.8 Qoot Systems. Petimo and Virtual World for Social Networking

Social networks are becoming the latest trend for online communication and making new friends, while helping people keep old friends in close contact. With the expansion of digital media, the attraction of teenagers and younger children to social networks and other activities in the cyberworld is growing. However, cyberspace is becoming an unsafe and more exploited environment, especially for children [6]. This results in conflicting messages between parent and child, social isolation, and communication with unknown online people with unverified identities [38]. Psychologists have theorized about the meaning of online relationships during adolescence, and have warned about the dangers of sexually exploitative online relationships [38].

The motivation behind this research is to provide a safe path for children to make friends in online social networks. "Petimo" (see Fig. 9.14) is designed to protect children from potential risks in the virtual world and help them make a network of friends in the real and virtual worlds. The name is a combination of "Petit," meaning *small* or *little* in French, and "tomo," meaning *friend* in Japanese, which resembles a small friend. It is a small RISC (Reduced Instruction Set Code) microcontroller

Fig. 9.14 Petimo

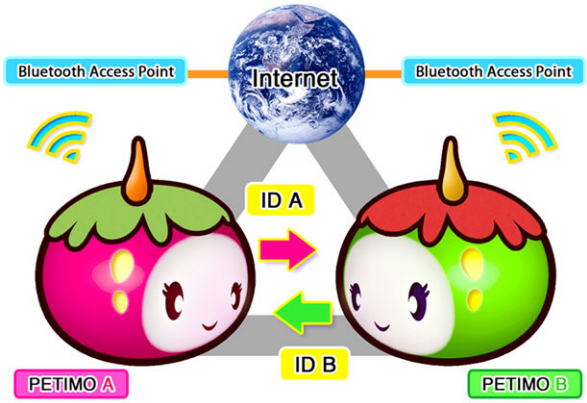

Fig. 9.15 Physical friends adding feature

based robot that includes a close proximity RFID based contactless friend identification and exchange function as described in Fig. 9.15. This adds a new physical dimension to social networking through physical touching of the robots to authenticate new friends through a centralized database. The physical touch requirement will help prevent malevolent adult strangers being added as friends, and allowing children to fully exploit the new digital social world. In addition, with the system, children experience enhanced relationships with their friends through interactions in the real and virtual worlds by sending gifts and emoticons mediated by their robots with haptic, visual, and audible events.

Children can add friends by selecting the "Add Friend" option on Petimo's menu and touching their friends Petimo. This results in exchanging of a unique 64-bit identification key between two robots and simultaneously sending this event to the online user verification system for authentication. Upon successful authentication, the relationship between the two friends is established. The user input sensing mod-

Fig. 9.16 Petimo-World together with Petimo

ule includes a smooth scrolling enabled capacitive touch sensor pad, primarily for child-friendly menu navigation. With the pressure activated squeeze areas of the robot surface, not only messages but also hugs and gifts can be sent over to other Petimos. This novel conceptual robot design comes with a full colored miniature OLED graphics display, an embedded sound synthesizer, and an embedded vibro-tactile effect generator. These features enable a rich interaction between a Petimo and the user which includes a multimodal engagement feature not only audibly or visually but also tactually.

In futuristic scenarios, Petimos may be extended to any social network in order to create a safe and secure interactive environment for children. As a proof of concept, we have developed a 3D virtual world, "Petimo-World," which demonstrates all of the realizable basic features with traditional online social networks. Interactions are furnished through Petimo in both online and offline modes, thus acting as a tangible extension towards a more meaningful social network experience (Fig. 9.16). Petimo-World is primarily focused on social interaction and cultural education, oriented towards youth and family, extending to harmonize with the society.

For instance, two children will not only be able to add friends securely, but they can also play with their own Petimos or interact with friends directly (see Fig. 9.17) by squeezing the device. Petimo allows children to easily exchange personal thoughts and feelings with friends. In another scenario, parents can be relieved that their children are in a safer online environment by monitoring the activities of their children and being comfortable with the physical interaction which enables a two-factor authentication model including a parental authentication module, which overcomes the traditional security hole of other social networks. Parents can also build a closer relationships with their children in the virtual world, which is more familiar to children, by exchanging virtual gift items.

Fig. 9.17 Two children interaction with Petimo

There are mainly three kinds of interactions in the overall design:

1. Petimo to Petimo Interaction
2. Petimo to Petimo-World Interaction
3. Petimo-World to Petimo-World Interaction

Except for the last mode, it requires the presence of a physical robot, Petimo. Exchanging gifts and sending messages (predefined emoticons only) in Petimo-World are then sent to the Petimo. By default, all interactions are copied to the Petimo and Petimo-World at the same time.

Technically, it consists of several main modules. A high level system illustration is given in Fig. 9.18.

9.9 Sensing, Actuation and Feedback

Unlike existing software extensions to social networks, Petimo provides a physical extension which expands the multimodal engagement not only audibly or visually, but also tactually. Considering humans strong positive bias towards physical touch [8], a squeeze and touch sensing mechanism has been added as the primary input sensor. To ensure the rich content and feeling delivery, for actuation,

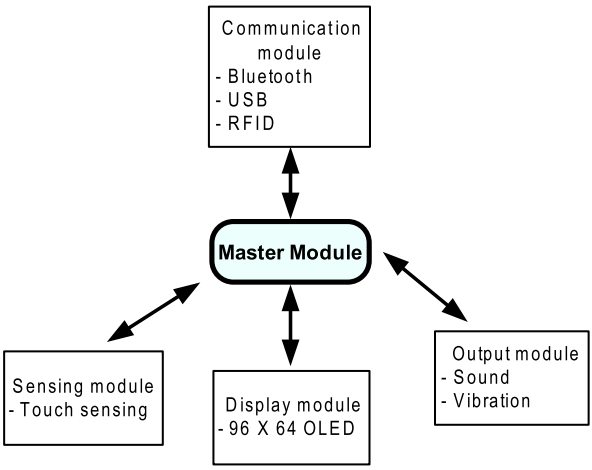

Fig. 9.18 System overview of Petimo

vibrotactile effect generators, sound output modules and OLED display have been used. The following sections will provide details about sensing, actuation and feedback.

9.9.1 Sensing

9.9.1.1 Touch Sensing

Petimo targets typical users as children of ages 7–9. When a system is being designed for the children, it is necessary to pay careful attention to their interpretation of objects and interactions. Important considerations were taken into account when designing the menu with less complexity, the outer shape with that is more cute and easy to fit into a child's palm, easy operation steps, smaller size and lesser weight.

Petimo menu is used for scrolling through friends, sending gifts (see Fig. 9.19), sending emotions (see Fig. 9.20), etc. Menu navigation design was done considering the easiness of use for children and to provide a new interactive experience of menu navigation. Initial design considerations were focused on having a scrolling switch or jog dial. However, a touch screen type menu navigation was found to be less complex and easy to use for children due to touch screen's [2] direct menu manipulation.

A jog dial menu navigation, which is an indirect manipulation of the menu items, does not provide the user with a clear relationship about what exactly he or she is doing. But, in this touch sensor, a child can actually place his/her finger on the menu and move the menu to the direction he wants. And he can see the changes he has made in real time as the menu moves. Thus, the touch sensor based controlling of the robot will allow the child to easily relate his actions. Secondly, to preserve the cuteness of the robot, we have eliminated the input mechanisms such as scrolling switches or jog dials which disturb its cute look. Finally, the use of touch sensing reduces the size of the design space in the robot.

Fig. 9.19 Gift menu

Fig. 9.20 Emoticon menu

9.9.2 Actuation and Feedback

Petimo would be less interactive if it did not have a good feedback mechanism. Thus, a touch enabled OLED display, vibrotactile effect generator and a tone generator have been used to enhance the user experience through continuous touch feedback.

9.9.2.1 Display Module

The display module is an important media for interacting with users. It transforms digital and analog information into visual spectrum. Visualized information and the related user-interaction techniques have the advantage of being simple, fast and straightforward while transmitting the abstract and large amount of data into human perception. Especially the graphics display is more convenient, quicker and direct for users to easily digest the information exchange.

Fig. 9.21 Gift notification

Fig. 9.22 Different emotions display

We now outline the core functionalities of the module:

- Robot's display module aims to visualize emotions through gestures and animations on the mini, low cost, energy saving color Organic Light Emitting Diode (OLED) [27] display. That is to express the user's emotions, such as happiness, sadness, and love, to the another user by displaying facial animations which can be more lively and intuitive for users than reading texts. For example, a user, say, John, knows that Jane did well on a school exam, and can send his happiness by sending a joyful facial animation. The visualization of joy can express John's emotion to Jane more clearly than only sending text messages.

  Figure 9.21 shows one example of the cute elements display. A user, say, Jeena, sends a gift to her friends. The message *Milk from Jeena* will be displayed on the screen. When Jeena's friend receives the gift, he/she can choose to ignore or to reply with another gift in return. This is meant to increase the interaction between users.
- The display module is used also for setting up a simple interface for the user to manipulate the robot. For example, a scroll menu is used to display a friend list, and the user can select the friend with whom he/she wants to communicate. It is associated by touch sensing.
- The display panel is the face of the Petimo (see Fig. 9.22). Therefore, by changing the display, it is possible to express different emotions in the robot. Figure 9.22 shows the different display animations for different emotions. For in-

stance, Fig. 9.22(a) presents the image for the happy feeling. It is possible to show a number of emotions similarly, adding fidelity to the degree of emotions and giving rise to the resolution of feeling it can handle.

9.10 Conclusion

In this chapter, we have taken a look at the cultural phenomenon of cuteness, exploring its possible historical beginnings and the impacts on popular design. As with other attempts at emotional design, "cute engineering" seeks to capture the essence of human feelings and emotions in order to understand ways to motivate, engage and shape the user behavior in a positive way. We have presented some recent empirical studies into user perception of cuteness and have shown the transferability from the 2D paper realm of the manga through to the 2D world of websites, the 3D onscreen world of Virtual worlds, and on to the 3D real world involving robots.

In a more radical approach, we entertain the idea that the users of today and tomorrow are in a process of co-creation of their experiences in the virtual world and of their realities in general. We have shown examples of how users can share in the co-creation of cute and gain a sense of belonging and happiness in the world. Although the focus of the research presented in this chapter is based on cuteness, the individual concepts gleaned from this process can be widely used in other contexts. For example, the same rigor can be applied to the emotional feeling of "safe" or "smart" for that matter, with possible outcomes being radical new interfaces which could not have been imagined before extending its capabilities to fundamentally change social networks and providing a novel approach to helping children make friends easily in a more protected and safe social networking environment.

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