

Buddies in a Box

Animated Characters in Consumer Electronics

Elmo M. A. Diederiks
Philips Research Laboratories Eindhoven
Prof. Holstlaan 4
5656 AA Eindhoven, The Netherlands
+31 40 2744874
elmo.diederiks@philips.com

ABSTRACT

In this paper it is argued that animated characters in the interaction with consumer electronics products can have four kinds of benefits. They can add fun to the interaction and realise a more enjoyable experience. Animated characters can deploy social behaviour and social rules known from daily life and thus make it more natural and easier to interact with consumer electronic products. Furthermore an animated character can set the right level of expectation and finally they can make system errors and interaction obstacles more acceptable.

Two examples are described to illustrate this argumentation. The ‘L-icons’ are virtual personal friends that live inside the television and that represent a so-called recommendation system. ‘Bello’ is a virtual pet dog that facilitates voice-controlled interaction for a television set. The evaluation results of two example applications confirm the four arguments, but they also show that the right form of animated character must be application specific in order to come to an optimal match between the characteristics of the character and those of the system they represent.

Categories and Subject Descriptors

H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems – *animations*.

H.5.2 [Information Interfaces and Presentation]: User Interfaces – *ergonomics, graphical user interfaces, input devices and strategies, interaction styles, voice i/o*.

General Terms

Design, Human Factors.

Keywords

Animated characters, Consumer Electronics, HCI, Fun, Enjoyability, Social interaction, L-icons, Bello.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

IUI’03, January 12–15, 2003, Miami, Florida, USA.
Copyright 2003 ACM 1-58113-586-6/03/0001...\$5.00.

1. INTRODUCTION

Animated characters are increasingly used in user interfaces. Research is ongoing with respect to what the beneficial applications of animated characters are, where they can make the interaction more pleasing and easy, and what their effects are on user-system interaction (for example [3],[11],[12],[13] and [4] for an overview).

Most of this work concerns professional applications optimised for task and efficiency. The Consumer Electronics domain on the other hand gives more room for fun and, at the same time, requires more natural and intuitive ways of interaction. A term such as ‘joy of inefficiency’ illustrates the contrast with the professional domain. On the other hand, the consumer-user expects products to support them in their various activities without having to heavily invest in learning to operate these products. People are very unconstrained and pragmatic in this sense. Concerning the consumer domain there are the two essential usability criteria: easy and enjoyable.

In the next sections this paper explains why and where animated characters are specifically beneficial in the interaction with consumer electronics products. This is illustrated with two application examples of animated characters: the ‘L-icons’ and ‘Bello’.

2. WHY ANIMATED CHARACTERS

Animated characters can play a specific and important role in the interaction with consumer electronics. Four basic reasons for deploying an animated character can be identified. An animated character can make the interaction more enjoyable, it can make the interaction more natural, it can be used to set the appropriate level of expectation and it can be a means to correct or overcome errors that occur during the interaction.

2.1 Fun

A consumer electronics product must perform its functions well and it must be easy to use, but it must also be entertaining and fun to use. Fun and enjoyment become major issues when moving from traditional HCI, which is mostly productivity oriented, towards the ‘living room’ [14]. Usability should therefore not only comprise effectiveness, efficiency and satisfaction [9], but also enjoyability. Enjoyable products are more attractive and, as Norman states, attractive products work better in the perception of the consumer-user [16]. Of course, *usability* in its traditional sense and *enjoyability* should be in balance. This balance can be

more at the end of enjoyability if the product, service or application is not mainly task/performance oriented. The latter is a typical characteristic of the consumer electronics context.

For those who have once seen a Disney cartoon, it is not difficult to conceive that animated characters have the potential to play an important role in adding fun to the interaction. However, this does not imply that we should try to make the user laugh all the time. When deploying an animated character in a user interface, the character is not a goal in itself but a means. In this sense, adding fun refers to livening up the user interface and interaction as a whole, and thus enabling a more pleasant experience.

2.2 Human-human interaction as a basis

People are trained for many years in multi-modal communication. We are experts in using and interpreting the expression possibilities of our bodies: emotion in speech, facial expressions, gaze, postures and gestures [2].

Therefore, the slightest notion of anthropomorphic characteristics causes people, in an 'instinctive' response, to deploy rules known from human-human interaction [18]. The major advantage of these rules is that they are known from daily life: they need not to be learned again. Therefore, deploying these rules in product interaction, and thus using human-human interaction as a basis, can allow a more natural and intuitive interaction.

An animated character is a prime means to display expressive behaviour that is known from daily life and in this way communicate system states, feedforward and feedback in a comprehensible manner. Of course, the possibilities for expressive behaviour are more extensive for an animated character compared to for example a television set. More importantly, on-screen animated characters are likely to be the first focal point for interaction [7][12][18].

2.3 Raising Expectations

Products or applications work in a certain way, behaving according a model that the creators have conceived. This conceptual model describes the ideal human-system interaction, from the creators' perspective (despite their efforts to work from a user point of view). They will do their best to make this model clear to the users by means of affordances [15], feedforward and feedback. For instance a 'play' button looks like it can be pressed, the imprinted icon represents what will happen if the button is pressed and the same icon on a small display indicates that it has been pressed.



Figure 1: Affordances, feedforward and feedback concerning the 'play' function

However, users typically have other points of view, and build up their own mental model of the interaction based on the cues provided by the creators via their product. The better these two models map, the more fluent will the interaction be, since the product will behave according to the user's expectations.

Here, an animated character can be of help if it plays the role of an intermediary between system and user (much in line with the

interaction conversation metaphor [8]). In this case the character can be specifically designed to have and communicate characteristics and capabilities that are in line with product specifics and limitations.

2.4 When things go wrong

The products we use have evolved from comprehensible traditional tools, like a hammer, to more intelligent, multi-functional but complex boxes such as a PC. Many consumer electronics products fall into the latter category and as a result the completely comprehensible consumer electronics product labelled 'crystal-clear-interaction' has yet to be put to the market. In other words, for now products will sometimes do things differently than we expect and they will make errors.

The role of animated characters can be twofold. First, an animated character can function as a buffer for errors and obstacles. Fogg and Hsiang Tseng have defined four levels of psychological targets concerning credibility assessment: on-screen characters, system qua system, brand and expert creator [7]. The same sequence is valid if it concerns getting blamed for errors. If there is no on-screen character, the system itself is the first to be held responsible for any error or obstacle. Since the product usually shows the brand name this is eventually harmful for the brand value. If an on-screen character is present it will get the blame first. Since an animated character is perceived as an autonomous entity the errors are decoupled to a further extent from system and brand.

Secondly, an animated character can make small errors or obstacles more acceptable. As Norman reasons, pleasure induced by the appearance and functioning of but also the interaction with such a product increases positive affect, which increases the tolerance for minor obstacles [16].

3. THE L-ICONS

The L-icons are animated characters that help in finding television programs of interest. They act as friends and live inside your hard disk video recorder or television set.

3.1 Context of use

In the near future the average Western household will have access to hundreds of digital television channels through a satellite connection [13]. Even today with 30 to 40 channels most of us only regularly watch about 7 channels, simply because it is too much trouble to find each and every program of interest on all channels. Additionally, the ever-increasing capacity of storage media increases this problem. Although the storage capacity roughly follows Moore's law, doubling every 12 to 14 months, the amount of stored content follows the law of 'more'. In other words people will want to keep and own content [17], and simply fill up storage space with whatever might be interesting. Thus, the pool of potentially interesting content that is available at a certain moment in time will only become larger in the future.

So-called recommender systems provide a solution to this problem. Such recommender systems aim to make a match between content (program) and user preferences, by building a user profile, which is constantly adapted to fit the user preferences. A recommender system can filter out content that does not match the profile or bring extra attention to content that matches the user profile well.

Recommender systems, however, suffer from two main flaws. First of all, there is the so-called *cold start* problem. At first time use the system has no knowledge of the user whatsoever. Of course the system could ask the user all kinds of questions or present a list for the user to fill in, but this is not in line with the experience people expect to have with consumer electronics like a television. Even in the personal computer domain where questionnaires are more accepted it would be a cumbersome task.

Second, there always will be recommendation errors, since people's preferences are subject to change and the system needs some time to properly adapt to these changes.

3.2 The Concept

The L-icons act as an interaction medium between recommender system and user. Each L-icon represents a specific lifestyle. A user can select a personal L-icon, probably one that is the closest match in lifestyle. Just as making friends in real life: similar interests and characteristics form a basis of familiarity and trust. By selecting a L-icons, the user has actually selected a starting profile, or *stereotype* [19].



Figure 2: The L-icons named Toby, Buzz, Anja, Roybot, Tsunami and Pingo

The user can summon the selected L-icon at any time. The L-icon will then state its opinion on the program that is presented or selected on screen.

Depending on the match with the user profile and depending on the kind of program the L-icon uses one of five expressions to state its opinion: not interested, neutral, interested (for serious programs) or happy (for fun programs) and excited. (See Figure 3 for an impression). These expressions are fully animated according to the Disney principles of animation [20], which results in a natural and cheerful appearance.

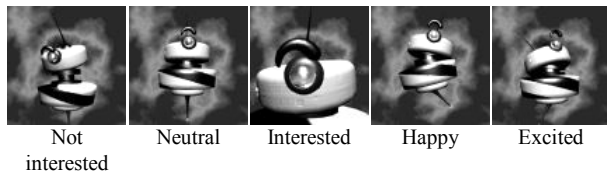


Figure 3: Snapshots of a L-icon's expressions

The metaphor of a 'friend' has been used for the design of the L-icons; they are explicitly not advisors. Although experts are perceived as more credible than non-experts [18], advisors are also expected to know best what the user would like. Any recommendation error would harm the credibility of the L-icons as experts. The form of a friend is a better match with system characteristics. Friends are still perceived as more credible than non-friends [18]. Furthermore, people perceive their friends as

being on the same team and therefore tend to trust them more and to be more forgiving towards them [18].

Moreover, the L-icons state their own opinion rather than providing recommendations. A L-icon will say "I find this program interesting" rather than "I think you will find this program interesting". It is a subtle difference, but in this way it is up to the user to decide how to deal with the remarks made by the L-icon, but ideally the user *does* mind what the L-icon states: they are friends after all.



Figure 4: An impression of a L-icon on screen

In conclusion, the L-icons add fun to the interaction through their appearance and behaviour. They use expressions that are known from daily life and therefore easy to recognise so that the user instantly knows if a program might be of interest. Furthermore, since they are particularly positioned as friends they fit the recommender system characteristics and thus raise the right level of expectation. Finally, the L-icons are more likely to be forgiven in case of 'recommendation' errors.

3.3 Evaluation

The L-icons concept has been evaluated in an experiment in which it was investigated whether people liked to use the L-icons and whether the use of a L-icon decreases the effort in finding programs of interest. A total of 30 participants were given the task to find programs of interest, half of them with and the other half without the help of a L-icon.

Most people like the L-icons quite a lot, but less people are convinced of its benefits. Possibly, some people might consider the activity of finding programs as a necessary but bothersome task. Subsequently, efficiency could be more important for them than enjoyability.

The participants indicated that a neutral L-icon opinion is useless. L-icons are not only used to confirm an opinion but indeed also to form an opinion. It actually turned out that the L-icons have more influence on the opinion of people than expected. Disparity between the opinion of a person and the opinion of a L-icon can result in uncertainty in the judgement of a program. In some instances a participant selected a specific program that they used to like, but when it turned out that the L-icon did not like that program, they doubted whether it is actually a nice program. Moreover, no one blamed the system for this mismatch in opinion: after all, everyone is free to have an individual opinion.

For most people the L-icons truly add fun to the interaction through their appearance and behaviour. They mask recommendation errors because of the way in which they present

the output of the recommendation system: they are particularly positioned as friends and therefore raise the right level of expectation. In doing so the L-icons have considerable influence on the program selection process.

4. BELLO

Bello is an animated puppy that facilitates voice-controlled interaction for screen-based systems, such as a television set [5]: your own pet-dog living inside your television.

4.1 Context of use

Voice control is considered an important input modality, especially if we want to allow people to interact with devices in their environment in a natural and social manner [1]. Moreover, voice-control is increasingly feasible for implementation in consumer electronic products. Voice-dial for cell phones is one well known application example. Also, in the home, voice control can have an added value. It is a welcome interaction modality in case of ‘hands-and-eyes-busy’ situations. Voice control offers the possibility for input with unambiguous and high semantic value, for instance “Switch to CNN” is a clear and valid command in any state of the interaction. Thus, voice control allows a less strict structure and therefore a more ‘free’ interaction. Alternatives like “Go to CNN” or just “CNN” can also be valid commands. Moreover, the user can for example say “Switch off” while walking out of the room.

There are however still basic problems in voice controlled user-system interaction. Many people feel uncomfortable and less self-assured in using voice control. Moreover, people often do not know what they can say and how they should say it. Additionally, they do not always have a clear notion of the system states and thus can lose track of the status of the interaction. Finally, voice control systems will always make recognition errors, which could lower the level of acceptance of these systems [10].

4.2 The Concept

Bello represents a command-and-control speech recognition system and acts as intermediary between system and user. Users merely need to tell Bello what should happen and Bello can be considered as the one that acts upon these commands.

During normal operation Bello is not visible on the screen. When summoned Bello appears at the bottom of the screen, accompanied by textual feedback on the recognised commands (see Figure 5). If no command has been recognised for some time Bello slowly falls asleep and then automatically disappears from the screen. Bello can also explicitly be removed from the screen by saying “Down”.



Figure 5: Bello with textual feedback

When Bello is present, the voice control system is active and commands can be uttered. Typical commands could be “Bello, start CNN” or “Switch off”. Bello responds by means of bodily and facial expressions accompanied by auditory feedback (barks), which fits the voice control interaction modality.

This behaviour of Bello maps onto states and state transitions of

the voice control system. In this way the social dimension of the interaction is enhanced and the system feedback is communicated in a comprehensible manner. The interaction is based on rules by means of expressive behaviour that is known from daily life. Figure 6 gives an impression of the animations.

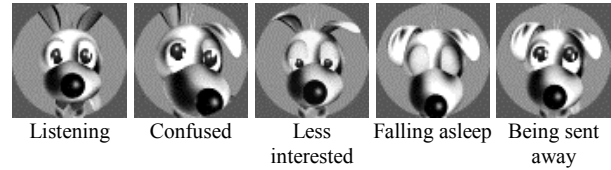


Figure 6: Snapshots of Bello's expressions

Since people realise that a system or device is not a living creature, talking to it might seem to be a bit silly. Providing the system with a face by means of an animated character can compensate for this mismatch between interaction modality and the interaction partner. The character is a clear focus point so that it is clear where to talk to and where to expect feedback concerning the state of the interaction.

Bello has explicitly been designed as a puppy pet dog to match the system characteristics. The command-and-control system uses a limited set of simple commands. Similarly, dogs are known to respond to a small set of simple voice commands, rather than to full sentences. Furthermore, voice control systems do not work error free. Where technical systems are expected to work perfectly, a dog is not expected to always respond correctly to commands. (Although, there is a minimal recognition accuracy for the system to work at an acceptable level).



Figure 7: An impression of Bello on screen

All in all, Bello adds fun to the interaction through its appearance and behaviour. Bello is a natural interaction partner for the use of voice control. The puppy's expressive behaviour allows the user to intuitively keep track of the status of the interaction. Furthermore, Bello raises the right level of expectation because the recognition capabilities of a pet dog are very similar to those of a command-and-control speech recognition system. Finally, recognition errors are more acceptable with Bello.

4.3 Evaluation

In an extensive evaluation it was investigated whether users would recognise the benefits of the Bello concept. In this evaluation, the Bello concept has been compared to a more human-like character (a butler called Jeeves) and to a concept that does not comprise an animated character [6]. The three concepts were balanced over the 36 participants so that 12 participants

worked with each concept for a week and had to perform 6 to 8 basic tasks in daily sessions.

The results of this evaluation indicate that people can work reasonably well with a voice-controlled television without an animated character. However, interacting with Bello made them feel less silly at first. Such an initial effect can be quite helpful in lowering the threshold to start using voice control. Furthermore, Bello seemed to set the right level of expectations. The form of a butler induced the perception of inappropriate behaviour, despite the fact that it represented the exact same voice control system. Finally, the form of pet-dog influenced the perception of errors: people find the same voice control system more reliable.

Technology might allow televisions to listen better than dogs. However, interacting with a dog by voice is at the moment simply more natural. An animated character in the shape of a dog can indeed facilitate voice-controlled interaction: it helps to provide a better first time experience and to make the system appear more reliable.

5. CONCLUSION

It has been argued that animated characters in the interaction with consumer electronics products can have four kinds of benefits. Two application examples show that animated characters add to the enjoyment of interaction. It is also clear, especially for the Bello example, that an animated character can make the interaction more natural and intuitive. Furthermore the appropriate metaphor can set the right level of expectation and make system errors and interaction obstacles more acceptable.

However, the appropriate shape of the animated character must be application specific in order to get an optimal match between character and the characteristic and behaviour of the application. A wrong metaphor can easily neutralise the advantages of using an animated character or even have a negative effect. Due to this application dependence the endeavour to standardise tools and methodology, as advocated by Dehn & van Mulken [4], may prove to be more difficult than anticipated.

6. ACKNOWLEDGMENTS

The author would like to thank Edwin van den Heuvel, Henk Lamers, Othmar Schimmel and Nick de Jong, for their effort in the implementation of the L-icons. Similarly, the author would like to thank Richard van de Sluis, Koen Vrielink and Leon van Stuivenberg for their valuable contribution in realising Bello.

7. REFERENCES

- [1] Aarts, E., Harwig, R., Schuurmans, M., Ambient Intelligence. in Denning, P.J. (ed.), *The invisible future: The seamless integration of technology into everyday life*, McGraw-Hill Professional, pp. 235-250, 2001.
- [2] Casell, J., Nudge nudge wink wink: Elements of face-to-face conversation for embodied conversational agents. in Cassell, J., et al (eds.), *Embodied Conversational Agents*, The MIT Press, pp. 1-27, 2000.
- [3] Casell, J., Bickmore, T., Relational agents: A model and implementation of building user trust. in CHI'01 conference proceedings, ACM press, pp. 396-403, 2001.
- [4] Dehn, D.M., van Mulken, S., The impact of animated interface agents: a review of empirical research. in *International journal of human-computer studies*, 52, pp. 1-22, 2000.
- [5] Diederiks, E., van de Sluis, R., Bello: an animated character facilitating voice control. in Hirose, M. (ed.), *Human-computer interaction INTERACT '01*, IOS press, pp. 686-687, 2001.
- [6] Diederiks, E.M.A., Do TV's listen better than dogs?: The effects of an animated character as an interface intermediary for voice-controlled interaction. in *Proceedings of the AISB'02 symposium on animating expressive characters for social interactions*, SSAISB, 2002.
- [7] Fogg, B.J., Tseng, H., The elements of computer credibility. in *CHI'99 conference proceedings*, ACM press, pp. 80-87, 1999.
- [8] Hutchins, E., Metaphors for interface design. in Taylor, M., Néel, F., Bouwhuis, D. (eds.), *The structure of multimodal dialogue*, Elsevier science publishers, pp. 11-28, 1989.
- [9] ISO/DIS 9241-11, *Guidance on usability*, 1997.
- [10] Kamm, C., Helander, M., Design issues for interfaces using voice Input. in Helander, M., Landauer, T.K., Prabhu, P. (eds.), *Handbook for HCI*, Elsevier science publishers, pp. 1043-1059, 1997.
- [11] Koda, T., Maes, P., Agents with faces: The effects of personification of agents. in *Proceedings of HCI'96*, pp. 239-245, 1996.
- [12] Lester, J.C., et al, The persona effect: Affective impact of animated pedagogical agents. in *CHI'97 conference proceedings*, ACM press, pp. 359-366, 1997.
- [13] Meuleman, P., et al, Double agent – Presentation and filtering agents for a digital television recording system. in *CHI '98 summary*, ACM press, pp. 3-4, 1998.
- [14] Monk, A., Hassenzahl, M., Blythe, M., Reed, D., Funology: Designing enjoyment, CHI 2002 Workshop, http://www-users.york.ac.uk/~djr14/CHI02_funology_extended_abstract.pdf, 2002.
- [15] Norman, D., *The psychology of everyday things*, Basic books, 1988.
- [16] Norman, D., Emotion and design: Attractive things work better. in *Interactions*, IX.4, pp 36-42, 2002.
- [17] Persoon, E., SMASH: A concept for advanced use of storage in the home. in *Proceedings of IMAGINA '98*, 1998.
- [18] Reeves, B., Nass, C., *The media equation: How people treat computers, television and new media like real people and places*, CSLI publications & Cambridge university press, 1996.
- [19] Rich, E., Users are individuals: individualizing user models. in *International journal of man-machine studies*, volume 18, pp. 199-214, 1983.
- [20] Thomas, F., et al, *The illusion of life: Disney animation*, Hyperion, 1995.