Animated Character Likeability Revisited: The Case of Interactive TV

Konstantinos Chorianopoulos

Technical University of Crete

Department of Electronic and

Computer Engineering

Chania 731 00 GREECE

choko@ced.tuc.gr

Abstract

Animated characters have been a popular research theme, but the respective desktop applications have not been well-received by end-users. The objective of this study was to evaluate the use of an animated character for presenting information and navigating music videos within an interactive television (ITV) application. Information was displayed over music video clips with two alternative user interfaces: 1) semi-transparent information overlays, 2) an animated character. For this purpose, the differences between ITV and desktop computing motivated the adaptation of the traditional usability evaluation techniques. The evaluation revealed that users reported higher affective quality with the animated character user interface. Although the success of animated characters in desktop productivity applications has been limited, there is growing evidence that animated characters might be viable in a domestic environment for leisure activities, such as interactive TV.

Keywords

Animated character, affective quality, agent, interactive TV, music video

Introduction

The inclusion of animated characters in desktop productivity applications has been widely researched, but the respective commercial implementations (most notably the infamous Microsoft® Office Clip) are reported to be annoying to end-users. An explanation might be that the attention-grabbing and interruptive nature of animated characters is inappropriate for productivity computing. On the other hand, TV use has an entertainment dimension, and the TV content has an established aspect of character or personality, which is a rather appropriate context for an animated character. In this work, we explore the feasibility of an animated character in ITV applications, such as interactive music TV.

In particular, the purpose of this study is to evaluate the integration of an animated character with TV content. One objective is to perform an evaluation of the comparative affective quality between presentations of an animated character and traditional information on TV. For this purpose, we measured the likeability of a music TV program that employs an animated character and hypothetized that including an animated character elicits higher levels of affective quality, when compared to a semi-transparent text box. Furthermore, the study collected qualitative data about the attitudes of TV viewers toward the use of animated characters as an integral part of music video TV.

Music TV channels occupy a significant share (5.4%) of television watching time (Pedder 2002) and that share is considerably larger for the younger demographic groups (Knobloch and Mundorf 2003). Moreover, adolescents and young adults are already familiar with interactive content and may be more receptive to new ITV applications, which are coupled with their favorite entertainment content. Given that music TV channels are considered to be innovative (Knobloch and Mundorf 2003), they can play the role of the Trojan horse for novel ITV applications. The interactive music TV prototype employed an animated character for the presentation of video-clip related information (trivia, what plays now, what plays next).

Background

Animated Characters in HCI

Animated characters research began in Human-Computer Interaction (HCI) as an alternative to the traditional interaction paradigm (desktop metaphor, direct manipulation) and as a visual user interface (UI) for agent-based systems (Laurel 1990; Maes 1994). This genre of research has raised the debate about the use of anthropomorphic user-interface elements in place of the popular direct manipulation style of user interaction with computer systems (Shneiderman and Maes 1997).

Overall, considerable research activity has occurred in related disciplines, such as Computer Graphics (Muller et al. 2001), while this genre maintains a strong following in the user studies (Rickenberg and Reeves 2000, Bickmore and Picard 2005) and in the Intelligent User Interface domain (Diederiks 2003). There is also some evidence that animated characters are suitable in the entertainment domain (Diederiks 2003, Koda and Maes 1996). Overall, animated characters represent a considerable body of existing and ongoing research in HCI.

Animated Characters in ITV
In the beginning, researchers at the Fraunhofer Institute (Burmester and Koller 1996) proposed alternative UI metaphors for ITV applications. In a usability evaluation (Koller et al. 1997), they found that the use of human characters as virtual guides for available TV programs raised the least amount of negative opinions, while at the same time such guides raised the majority of suggestions for improvements, in relationship to other UI metaphors borrowed from the Web and PC computing paradigms. The former might be the result of the TV viewers being familiar with the idea of having human presenters for television shows. Regarding the latter, subjects' might want more natural and conversational interaction.

Immediately after Fraunhofer, Philips Research (Kohar and Ginn 1997; Meuleman et al. 1998; Diederiks 2003) continued to investigate the use of animated characters in ITV applications. These approaches employed anthropomorphic objects (Meuleman et al. 1998), or an animated puppy dog (Diederiks 2003). The respective usability tests have reported positive user attitudes for a number of issues, such as trust, expectations, and preference. Nevertheless, animated characters were solely used for presenting TV program recommendations from the personalization engine. From this perspective, animated characters have been tested only as a UI for a personalized EPG application.

Still, there is no comparative affective quality evaluation between animated characters and traditional information presentation for TV. Furthermore, there is no previous research regarding the use of animated characters as an integral part of TV content.

Interactive Music Television Issues
MTV was the first TV channel to offer information related to video-clips, and since then, there have been many followers. MTV has been also showing which music video comes next. Music information usually contains trivia about the artist, biographical information and discography. Music TV channels had originally adopted the informational video overlays, because they make viewers spend more time in front of the TV set, instead of using it like a radio.

Previous research in media psychology has thoroughly investigated the effects of music and music videos on audiences. Besides the aesthetic pleasure that listeners experience during the music listening activity, communication research has also documented many additional effects (e.g., therapeutic). For example, listening to music may affect the emotions (Knobloch and Mundorf 2003). It is suggested that these parameters might be also be affected by the introduction of animated characters in Music TV. Therefore, there is a need to investigate whether an animated character has an effect to the affective responses to music TV.

Animated Character Programming Toolkit
The first commercial implementation of an animated character for desktop systems was made by Microsoft®, as an alternative UI metaphor for the Windows oper-ating system under the name Bob. It was a failure in the marketplace, despite the fact that it was based on the widely acclaimed research by Reeves and Nass (1996). Microsoft Research was committed to the notion of the anthropomorphic UI and developed the Microsoft Office Assistant, which offers adaptive help in the Office suite of productivity applications.

Furthermore, Microsoft released an API for the animated character system (MS Agent), allowing third-party developers to create and control animated characters, without having any requirement for licensing fees. The ease of use and the wide availability of the MS Agent API has motivated a community of researchers, practitioners, and hobbists to develop and perform further research on animated characters.

Method and Process

The MS Agent API was employed in a music ITV prototype. Two alternative UIs were developed for presentation of related information and simple navigation (skip-track) in a linear flow of music videos. The first UI, displayed information in a semi-transparent orthogonal box, while the second one displayed the exact same informaiton with an animated character (**Figure 1**). The objective of the evaluation was to assess user attitudes with regard to an animated character UI in ITV applications. For this purpose, there are two requirements for the evaluation method: 1) The evaluation method and process should be appropriate for the ITV domain, and 2) the evaluation process should conceal the real purpose of the study.

Next, the details of the approach employed to tackle these requirements is presented and justified.

Traditional HCI settings, involve a task-oriented approach where the human interacts with an application to accomplish a particular goal. Accordingly, usability evaluation techniques measure successful task completion, efficiency, and error-rate. In many cases, these parameters correlate positively with user satisfaction. Nevertheless, there is growing evidence that traditional desktop usability principles do not account for the pleasure of the user experience (Hassenzahl et al. 2000).

Most notable among the findings about ITV applications is the realization that users' subjective satisfaction is at odds with performance metrics. For example, a usability test of three video-skipping interfaces (two commercial and one novel) revealed that user satisfaction is higher for an interface that required more time, clicks, and had the highest error-rate. In other words, the most efficient (and thus usable) interface was not the one most users preferred. Users justified their choice on the basis of the fun and relaxation offered by the interface (Drucker 2002).

The context and user goals in ITV applications require a fresh view of current interaction paradigms. Affective quality studies provide an alternative idea of user goals such as enjoyment and relaxation. Accordingly, the Hassenzahl et al. (2001) Hedonic Quality instrument was selected because it is validated, freely available, short, and features an easy-to-understand verbal scale[*].

Method

The hypothesis tested was: "The reported hedonic quality of an ITV music video program is higher, when the presentation of related information is done with an

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[*] In this study, the hedonic quality instrument is a seven-point semantic differential scale with reversed polarity of every other pair: outstanding-second rate, standard-exclusive, impressive-nondescript, ordinary-unique, innovative-conservative, dull-exciting, interesting-boring. Scores were summed and then scaled from 0 to 10.

animated character, instead of the traditional transparent information box."

The within groups experimental design was used in order to reduce the effort of recruiting new users and in order to have the same variance for the two groups. Each participant received two experimental treatments of the UI: 1) The animated character and 2) the transparent box. After the end of each session, participants evaluated separately the hedonic quality of their experience for each. Users were not asked directly about the particular features, but they were asked to provide an evaluation of the overall experience they had.

Figure 1 First row portrays the animated character UI, while the second UI displays the same UI in the traditional way

The study was performed in a relaxed setting, using a TV set and a remote control (**Figure 2**). Multiple usability engineering techniques were employed: (a) user observation during the testing session, (b) users completed questionnaires, and (c) each user was interviewed after the end of the testing session.

Participants
Tests were run with 21 users (recruited with convenience sampling from the post-graduate and under-graduate departments of the university). The total number of users who completed one part of the study was actually 31, but some of them did not show up for the second part of the study, or they were excluded because they were negative to TV in general—the latter said that they participated to the first part of the study out of curiosity. Ages were between 22 and 35 (13 men and eight women) for the final set of 21 people who completed the experiment.

Users were assigned at random to each one of the two UI manipulations. Eleven users saw the animated character first, while 10 users saw the traditional text-box first. Subjects did not complete the two evaluations on the same instance, but they were called back to use the second UI at least two weeks after they had used the first one. In this way, any direct comparative evaluations between the two UIs were reduced to a minimum, since users had likely forgotten the details of each UI.

Procedure
Maguire (2002) raised the question: 'Should tasks be fixed or should users be allowed to use the service as freely as they wish?' In accordance with the selective expose theory (Zillmann and Bryant 1985) the users

were allowed to use the service for a certain amount of time, without any other goal or task to complete.

Figure 2 The experiemental setup is seamless and unobtrusive, because it consists of conventional TV set, remote control. The portable computer, which controls the ITV prototype, could be easily hidden away

To ensure selective exposure, the users were allowed a maximum of 1/3 of watching time, out of the total session duration (Knobloch and Zillmann 2002). This is a maximum of approximately 20 minutes out of the 1h total program duration. Users could press the power-off button on the remote to end the testing session and they were told to watch as much as they liked, but between 10 and 20 minutes. This process facilitates the replication of the selection of particular TV programs, within a wide availability of competing content. In contrast with the task-based usability evaluation paradigm, users were not given any task to perform or any goal to complete, besides the suggestion to watch

music TV for a flexible amount of time. During the testing sessions, users were free to choose the music video clip they preferred to watch and to call-up related information, which were presented as the main features of the ITV prototype.

Materials
The central element for the experimental setup was a portable PC. The ITV application was designed to run in full-screen and windowless mode and was set to display on the TV screen. The PC's serial port was connected to an infrared sensor (http://www.evation. com/irman/) that receives the signals from the remote control. The whole setup was unobtrusive and seamless to the television viewer (**Figure 2**). The testing session contained 16 music video-clips and three advertising breaks with three ads every 4 songs (approximately every 15 minutes), just like the average commercial music TV channel (MAD TV executive, personal communication). The system was also programmed to display music-video-related information automatically (e.g., trivia and discography about the artist). In both versions of the prototype (with and without the animated character), the interactive features included simple music video track skip and on-demand information about currently playing video and the one coming next.

Video skipping is not available for all viewers, but only for those who own advanced digital video recorders (e.g., TiVo). On the other hand, skip-track is a popular feature on all CD players and most young people could be safely assumed familiar with skip-track. In the present work, the ITV music prototype included a simple skip-track feature. This feature might have influenced the attitudes of the subjects and the effects

of the two UI manipulations, but it could not influence the relative findings, because it was included in both UI manipulations. Additional justification on the process and instruments follows next.

Justification
Four research design parameters need to be addressed, in order to measure the quality of the above experimental design: 1) Construct validity, 2) internal validity, 3) external validity, and 4) reliability.

Construct validity refers to the establishment of the correct operational measures for the concepts being studied. Both the concepts studied (i.e., affective quality of a UI) and the respective instruments (i.e., hedonic quality) were retrieved from previous research. Thus, the concepts and instruments employed in the present study have been used and validated in previous research.

The internal validity is assured by: 1) randomizing the video clip play-list, 2) assigning participants in random order to the alternative UIs, and 3) concealing the real purpose of the evaluation. Thus, the differences in the results may be attributed to the differences in the UI and not to other factors of the ITV prototype, or to personality attributes of the subjects.

The external validity is assured by employing a high-fidelity ITV prototype in a relaxed setting. In this case, a high-fidelity ITV prototype consists of a TV and a remote control for consumer interaction, while the portable computer that runs the input-output software is easily concealed. A relaxed setting consists of a quiet environment and a comfortable place to watch and interact with TV. An additional aspect of the external

validity considers the use of a convenience sample. On the one hand, the participants (university students) belong to the target group of music TV channels. On the other hand, the use of convenience sampling restricts the generalization of the results to some subset of the target demographic. Still, the use of convenience sampling is justified in the case of novel systems that have not yet been widely deployed. Thus, the results could be generalized to the real environment, subject to the above limitations.

Finally, the reliability cannot be assessed, since there was no probability sample and the sampling framework was restricted to university students. Therefore, it is unlikely that the study can be replicated with the exact same values (although the results might be the same, in terms of relationships between the parameters studied). Yet, the usability test is in accordance with the standard usability engineering practice (i.e., informal experiments). This is further justified by the fact that usability experiments during the product development aim to inform the design process and not to draw final conclusions for an experience that does not yet exist in the real environment.

Results

It was predicted that viewers' affective attitudes are different between the animated character and the transparent information box for an ITV UI. The results confirm this prediction and provide further details with regard to an animated character UI in ITV applications.

The usability evaluation results have been organized into two categories depending on the type of the data collected about the inclusion of an animated character in ITV applications: 1) qualitative and 2) quantitative.

In addition, there are qualitative results that concern the design of interactive music TV.

Qualitative
Most users considered the character funny and less obtrusive than human presenters, who interrupt the flow of the music video clips to present related information. Moreover, users suggested that there should be a variety of animated characters (e.g., cartoons, heroes, personalities). Users also asked for more control of the character, like changing its placement on the screen.

Most of the users disliked the solid balloon dialog that stands over the head of the character. According to them, the best place for the animated character balloon dialog would be across the bottom of the screen. Unfortunately, that implementation of the MS Agent API did not support transparency and screen position adjustment for the balloon dialog.

Those who have been exposed to the Office Assistant (through Microsoft Office) recognized the similarity (e.g., the style of the balloon dialog) to the animated character in this study, despite use of a different character (the genie), instead of the Microsoft Office default paperclip.

Users who recognized the Microsoft Agent technology of the prototype were observed to transfer their attitudes from the desktop to the ITV environment, which means that there is a carry-over effect of the opinions about the animated character.

Quantitative

It was found that the "hedonic" quality for a music video television channel is significantly higher (two tailed t–test, p=0.0002, n=21) when using an animated character to present dynamic video overlays (average 7.0/10) compared to the traditional transparent information box (average 4.4/10). Subjects were neutral toward the traditional information box, since it is widely used and presents information related to music video clips in a familiar style. Therefore, an animated character could be used to enhance the consumers' ITV entertainment experience.

Table 1 Mean Hedonic Quality Scores for an Animated Character Compared to Traditional Box

Hedonic quality (p=0.0002, n=21)	Average	Std Dev
Animated char.	7.0	1.5
Standard Overlay Box	4.4	2.0

Moreover, the analysis of the log files revealed that subjects asked for information more times when presented with the simple text-box than when presented with the animated character. Nevertheless, this difference is not statistically significant. In addition, the level of interactivity with the prototype might be attributed to other factors of the experimental setting, as discussed in the next section.

Table 2 It appears that users asked for information more times when using the simple text-box, although the difference is not statistically significant

Ask Info. (p=0.07, n=21)	Average	Std Dev
Animated char.	4.8	2.9
Standard Overlay Box	7.4	5.6

Interactive Music Television

The users who stayed most engaged to the interactivity during the test session were those who continuously tracked the text-boxes. These users asked for more control on the flow of information. Especially, they asked for the option to select the type of information to attend to (for example: biographical, discography, trivia, concerts) and the option to browse through the available information at their own pace. Furthermore, users reported that even after selecting their favorite type of information to watch, or after having a short burst of information browsing, they would still prefer returning to the auto-pace style of information presentation, thus reconfirming the need for relaxed control and time-driven UI design.

Discussion

The participants were very emotional when interviewed about the animated character. Most of the participants were very positive, while a few were very negative. It could be argued that there is a love-hate attitude toward the animated character. Therefore, product designers should assess the attitudes of prospective users or provide the option to turn-off the feature.

It was also found that there is a carry-over effect for the users' opinion about the animated character from the desktop to the TV. Therefore, users already negatively predisposed to animated character will continue to be so, at the expense of their overall satisfaction with the entire TV program. Taking those users into account, we suggest that the animated character be an option; an alternative UI should be available.

Nevertheless, during the exploratory interviewing sessions, most of the users considered the character funny and less obtrusive compared with human presenters, who interrupt the video clip to present related information. Yet, it is not clear if those opinions will have a lasting effect after long periods of use. Therefore, the animated character may be employed as a surprise feature in TV programs, but there is also a need for adapting it to individual user preferences, in order to avoid user boredom from repetition.

The evaluation methods were employed during the limited duration span of an experiment, instead of spanning through everyday living in consumers' homes. Previous findings regarding the usability of everyday technology demonstrate that the consumers' perceptions and especially the mental models they form about new domestic technologies are very elastic and prone to change in the passage of time (Petersen et al. 2002). Therefore, a longitudinal study would have provided additional information about the animated character and interactive music TV.

Overall, the animated character was regarded as the most innovative feature in the results of the study. The positive user evaluations and suggestions complement related research in the home infotainment domain (Diederiks 2003). Viewers had neutral attitudes toward the overlay box for the presentation of related information, which is an effect of the familiarity they have developed with the respective presentation style. Moreover, it appears that users asked for information more times when presented with the simple text-box, but this finding is inconclusive, because it was not statistically significant and because users of novel prototypes might be exploring the application's features

and they are more active than they would normally be. In addition, the character's balloon dialog box was not as efficient as the simple text-box in displaying information, due to MS Agent API limitations, which were discussed in the Qualitative Results Section. Therefore, further research is required before reaching any conclusion about the effect of characters on interactivity behavior.

Previous approaches to ITV applications applied mainly qualitative methods and performance testing, without much consideration of the leisure context and entertainment goals. In this work, an adaptation of the performance evaluation method proved useful for the assessment of the ITV prototype. In particular, user tasks were replaced by free exploration and an affective quality instrument (Hedonic Quality) was employed to assess user attitudes. It is suggested that the traditional usability engineering methodology is necessary to ensure ease-of-use and efficiency of the user interface, but it should also be augmented with an additional toolset that regards the differences of the ITV domain.

In summary, it is argued that the effects of ITV applications cannot be conclusively assessed, unless there is a longer-term deployment and a longitudinal study of their use, using an appropriate data collection instrument. Nevertheless, the suggested adaptations of the traditional usability evaluation method and the employment of affective quality fit adequately in the early development phase of ITV applications and provide valuable feedback for the UI design and the application features.

Practioner's Take away

The following points summarize the contribution of this research with regard to animated characters, programming toolkit, and interactive TV applications:

- Animated characters might be appropriate for ITV entertainment applications.
- Animated characters have a carry-over user attitude effect from the desktop to the ITV environment.
- The Microsoft Agent user interface programming toolkit provides a flexible and easy to use platform for research.

Further research falls broadly into the following disciplines: Communication research about the media effects of animated characters and intelligent user interfaces research about adaptive behavior of animated characters and agents.

Communication Research

Media studies have contributed a lot to the theory and the approach employed in the present work. In turn, it is likely that the research issues have implications for further research in that discipline, too. Media psychology researchers assessed the entertainment value of a movie based on the parasocial interaction of viewers with the protagonists (Vorderer et al. 2001). The animated character introduced in the music ITV application may also have an impact on the parasocial interaction.

Intelligent User Interfaces

Previous research has studied the use of animated characters as a visual UI for mediating the recommendation results (Diederiks 2003). In the present research, the animated character was integrated with the TV content by presenting related information. Further research should consider and investigate an even tighter integration of animated characters with the TV content. That would require further research in developing an emotional connection between the character and the TV content. In addition, further research should elaborate and quantify on the carry-over effect of user opinions between desktop applications and other domains of animated character's inclusion.

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Konstantinos Chorianopoulos holds an MEng (Electronic and Computer Engineering, 1999), an MSc. (Marketing and Communication, 2001), and a PhD (Human-Computer Interaction, 2004). Since 1997, he has been a member of four academic research labs (Greece, UK, Germany), which specialize in the areas of multimedia, e-commerce, intelligent systems, and interaction design. He has participated in many EU research projects in the field of human-computer interaction for information, communication and entertainment applications in TV, mobile, and ubiquitous appliances. In 2002, he founded UITV.INFO (http://uitv.info), which is a newsletter and web portal for interactive television research resources (papers, theses), news, and events.