Life-like Agents for the Internet: A Cross-Cultural Case Study

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Introduction

In the following we describe Flirtboat, a commercial multi-user application for the internet where users design their representatives and send them off to a virtual community (a *net environment*), and we present user data we have collected so far from launches of this application in three different countries: Austria, the UK and Croatia.

A net environment in our definition is a virtual space inhabited by embodied characters which have been created and are subsequently visited and instructed by users via the internet. We refer to these user defined characters both as avatars and as agents: avatars because they correspond to templates filled by the user, agents because each avatar, after creation, has its autonomous existence in the net environment. The terms avatar and agent are differentiated from the term Embodied Conversational Agent ECA [Cassell et al 2000], as the latter focuses on the verbal and nonverbal communicative potential of the agent, whereas in the current implementation of the agents verbal communication is restricted to written text, and animation is rudimentary, i.e., some smiling and eye blinking of the avatars. Despite the fact that verbal and nonverbal channels of communication are not yet integrated, the net environments discussed here are a useful means for studying user behaviour.

We have collected basic usage data from cross-cultural launches of the Flirtboat application, such as the number of agents in an application, the frequency of user logins to their avatars, the distribution of female and male characters, the assignment of a certain age, personality and particular looks to one's virtual representative. As we have gathered data from the same type of application but from launches in different countries this help us to lay a foundation for a better understanding of the potential of applications featuring animated characters.

The roles which can be filled by ECAs in internet applications are already manifold. They can support customers in e-warehouses and e-showrooms; they can offer guidance in decision making processes, e.g. acting as an interface to job or partner-matching algorithms; they can simply present information, as do virtual newscasters; or they can enact the role of a character in a game as do avatars in computer games. Although users can be entertained and supported and informed without the use of embodied agents, such agents introduce a social dimension to the applications. The success of such an application however will depend on its appropriateness or believability, i.e.,

agents must be identifiable as belonging to a particular social and cultural group, and they must be recognizable as individual characters requiring a notion of personality and affective agent behaviour.

The main reason for bringing life-like characters onto the internet is commercial. They may attract users to a particular page and encourage them to log on more often and/or stay longer than otherwise in the application. This is of course advantageous for providers selling advertising.

If users are able to interact with a sales ECA in an intuitive and natural way, they may be more comfortable buying goods and services from this source. Moreover, as users tend to build relationships with such characters, they may prefer to buy from an ECA they 'know' rather than from any other source, and tend to trust ECAs which they percieve to be similar to themselves in terms of age, personality, culture and standing. Furthermore, since interaction with ECAs can be entertaining, they may also prefer to return to a site which they know will be fun.

Even though the Flirtboat data have been collected with regard to business customer interests, such as how large is the number of visitors to the application, how persistent are users, what are the user characteristics, the data are also helpful for setting the ground with respect to questions concerning the socio-cultural grounding of animated character technology, andthe individuation and design of animated characters. This will be explored in the remainder of this chapter. In particular, we first of all summarize the main factors which contribute towards making agents life-like, and then give some examples of existing ECAs. See section 0. In section 0, we introduce our notion of net environments and describe Flirtboat. The user statistics we have gathered based on the cross-cultural launches of Flirtboat are presented and analyzed below.

Life-like Agents

What Makes an Agent Life-like

The degree to which animated characters appear life-like depends on how they function in face-to-face interaction with either the user or other agents, or both, depending on the application. They need to be able to simulate establishing contact and forming social relationships, and in order to do so, they need to be able to exhibit personality and express emotion. Furthermore, their communicative behaviour needs to fit into a specific (application driven) socio-cultural setting.

In full scale, this requires analysis of human communicative input, including high quality speech, gesture and facial expression recognition, and generation of animated conversation, including high quality speech synthesis and animation of facial expressions, posture and gesture. In general, the more life-like a character appears, the more important it is to provide it with a socio-cultural identity.

While verbal aspects of communication, including discourse related ones, have been studied to a great detail in computational linguistics, nonverbal aspects of communication have been accounted for only recently.

In the following we will discuss a number of aspects relevant for the display of appropriate communicative behaviour.

Audio channel – Speech: The naturalness of spoken communication is strongly determined by the quality of the speech produced. The currently favoured option is to use canned speech, since the quality is naturally very high. However, this is not an option for sophisticated applications, since it denies flexibility and makes further development of a system dependent on the availability of the person whose voice is used. Forward-looking systems rely instead on the state of the art in speech synthesis technology. Apart from ensuring the intelligibility of the verbal message, or actual words spoken, speech synthesis has to be able to express the illocutionary force (or dialogue act) of an utterance. Speech synthesis must also be able to provide appropriate cues for turn management and discourse structure.

The interpretation of spoken utterances is also influenced by the socio-cultural expectations of the spectators/listeners. There are many differences, even across languages which are closely related. Take Standard Northern German and RP English, for example. Superimposing the typically higher pitch range of English females onto a German female voice makes the voice sound "aggressive and over-excited" [Gibbon:1998]. As for voice quality, it is well known that both male and female Northern German speakers have a tenser voice than their English counterparts. Such a voice quality does not imply the same personality, attitude or emotion in both languages.

Animation – Facial expression, gestures, posture, etc.: It is crucial that animation is closely timed with speech. This synchronisation ranges from rudimentary synchronisations of lip movement and speech sounds (rounded lips on and around [u] sounds; spread lips on and around [i] sounds, cf. visemes in MPEG-4, e.g. [Ostermann et al. 1998]), to timing of intonational events with facial actions (such as raised eyebrows, eye flashes or head nods on accented syllables to highlight words [Pelachaud et al 96]. The use of facial expressions, gesture and posture (and even eye-gaze [Colburn et al., 2000]) are crucial for realistic dialogue simulation (especially for turn taking), and for the expression of emotion and affect. Although Ekman's [Ekman:1999] research on facial expression of emotion has suggested that there are universally recognised expressions, the specific connotations and implications of such expressions are largely culturally determined and are greatly affected by social conventions. (Also largely variable across cultures are how the distance between interlocutors and the extent of eye gaze are interpreted.) In addition, each culture has restrictions on the degree to which specific emotions are allowed to be expressed, cf. display rules [Ekman 1979]. ECAs have therefore to be situated in a particular cultural environment in order to function successfully. This is in part influenced by their graphical representation.

The way speakers manage turn-taking is at least to some extent culture-specific, depending on a given culture's interactional norms (e.g. how much overlap across speakers is allowed). There is a close interaction between signals from the different channels (facial expressions, gaze, nods, hand gestures, posture on the visual channel, and intonation and voice quality on the auditory channel)

Graphical representation of the virtual character: It is not clear where to best position the depiction of characters on a continuum between being completely life-like and fully-fledged cartoons, and what the relevance of 3D versus 2D representation is. For internet applications, a major aspect to be considered is bandwidth restrictions. With respect to socio-cultural aspects, situation-specific dress codes need to be considered in the graphical representation, especially as the depiction of the characters gets closer to the life-like end of the continuum.

Emotion: Modelling of emotion in ECAs is closely tied to the notion of believability of ECAs. A definition of believability which refers to the emotion aspect of ECAs is given in [Badler et al., 2002]. It says, "A character is believable if we can infer emotional or mental state by observing its behavior (even if is not portrayed as a human form)". This, however, does not necessarily mean that the agent actually has an internal representation of emotion, a smiling ECA for instance is likely to be interpreted by the user as being happy, cf. [Stronks:2002]. An observation which closely relates

to the findings of the CASA (Computers Are Social Actors) studies where it is shown that (experienced) users interact with computers as if they were human, see [Nass et al., 1994] for a brief overview of studies.

For consistency of behaviour, however, explicit modelling of conditions that evoke emotional state in the agent is necessary. A widely used approach to the computation of emotional state is the OCC model [Ortony et al. 88] where three aspects of the world are distinguished as underlying 22 emotion types. These aspects are: the desirability of events, the praiseworthiness of actions and the appealingness of objects. The OCC model has been further extended by two other emotions -- love and hate – and been used in a system which is capable of reasoning about the emotional states of agents and emotion induced actions in a multi-agent world, cf. [Elliott:1992].

Another approach to emotion modelling is based on emotion dimensions (see for instance Cowie et al., 1999) and is particularly useful in speech synthesis, where shades of emotions need to be expressed in the voice quality and changes of emotional tone over time need to be conveyed. An analysis of a database of emotional speech [Schroeder et al:2001] has found correlations between emotion dimensions and acoustic parameters, in particular the activation dimension, which correlates positively with higher F0 mean and range, longer phrases, shorter pauses, larger and faster F0 rises and falls, increased intensity and a flatter spectral slope.

In addition to manipulation of speech parameters such as pitch, intensity, articulation rate and voice quality, emotion/emotional state is also expressed by means of animation, mainly in the facial expression but also via posture.

MPEG-4 for instance specifies high-level animation parameters for the visual representation of emotion allowing affective states such as anger, joy, disgust, sadness, fear, and surprise to be specified. Facial animation in MPEG-4 is based on work by Ekman and Friesen, [Ekman;Friesen:1978].

The animation markup language MPML provides functions mapping the 22 emotion types defined in the OCC model to certain actions and to particular voice characteristics. These mappings, however, are specified “by common sense (intuition) rather than according to empirical investigation” [Zong et al. 2000].

Personality: The incorporation of personality is indispensable for modelling life-like agents, as it functions “as a generative engine that contributes to coherence, consistency, and predictability in emotional reactions and responses” of agents [Ortony:2003].

A study with North American probands presented in [Cassell;Bickmore:2002], provides evidence that human assessment of trust, familiarity and naturalness of interaction with an ECA is correlated with the personality (extro-, introversion) of the human assessor. In particular, small talk is an important factor for extroverts to establish a feeling of trust and familiarity, and to consider communication successful. That is, it appears that an agent simulating similar degrees of extroversion as the user is more easily accepted, where degree of extroversion is modelled in terms of amount of small talk. These findings can also be made use of in the design of avatar-avatar communication.

However, there are also cross-cultural factors influencing the correlation of extro- and introversion with the appreciation or dislike of social communication, which need to be taken into account. In [Järvenpää and Immonen, 2002] for instance it is reported that small talk has a different importance for Americans than it has for Finns in cross-cultural business environments. While small talk is an important factor in conversation for Americans, this is not the case for Finns. In particular,

“Americans find silence and long breaks during discussion negative”, and take this as an indicator “that the other party does not know the issue or has not considered it enough”.

Other evidence for the relation between user/spectator/listener expectation/perception and personality traits comes from natural language studies. For instance, [Moon and Nass 1996] have found that users prefer to work with computers which produce natural language messages adapted to the personality type of the user, i.e., dominant-type users prefer computers presenting dominant-type messages. [Oberlander and Brew 2000] use the above findings to promote natural language generation which controls the output language such that a personality is projected which matches the personality of the user.

Evidence presented in [Nass et al, 2000] also supports the assumption that users generally tend to trust ECAs which are similar to them in age, culture and standing, since they can identify with them more easily.

Situational and socio-cultural grounding: One vastly important area in communication which is heavily affected by cultural differences is nonverbal behaviour such as the distance between communication partners, body orientation, touching behaviour, eye gaze patterns, the length of pauses and the intonation of turn-taking in speech, see for instance [Isbister, 2001], [Allbeck & Badler, 2001].

Another important aspect of situational and socio-cultural grounding is the role being played by an agent. Allbeck and Badler [Allbeck & Badler, 2001] assign a role to every character in a virtual environment, because roles involve expectations (a) from the character playing the role, and (b) from the others interacting with that character, thus constraining the actions to be taken. Role assignment to ECAs is particularly useful to constrain the users’ actions, as is pointed out in [Isbister;Hayes-Roth:98]. In order to enable successful communication, the roles must be agreed on by the communication partners. In terms of [Ruttkay et al., 2002], “The ECA is believable if it acts according to the expectations of the user.”

The expression of emotional states is governed by social and cultural norms, so called display rules, that have a significant impact on the intensity of emotion expression [Ekman, 1972]. Display rules are cultural conventions about withholding, disguising, or exaggerating expressions. According to several theorists, spontaneous emotional expressions do not convey accurate emotional information because people have been socialized to cover up their natural expressiveness in many circumstances. The kind and extent of this socialization is thought to vary from culture to culture. There is some empirical evidence that different types of events make different groups of people appear happy, sad, joyful, etc.

The White Anglo-Saxon culture, for example, attaches great importance to the notion of independence (satisfying ones own needs creates positive feelings) whereas in the Asian culture interdependency appears to be more important (group conformity feels good), see for instance [Heaton, 2001].

Some Examples of Current ECAs

As far as research systems are concerned, one of the most elaborate full-body ECAs to date is **REA** [Cassell, 2000]. REA is a virtual real estate agent which is able to engage in sales-talk with one human client at a time. REA is a life-size animated life-like character which is able to analyse human verbal and nonverbal communication and to generate human-like conversational output. On the generation side, it is capable of presenting facial displays, eye gaze, head moves, and hand

gestures. REA has a speech synthesis component and conversational skills such as the ability to produce non-verbal cues for discourse structure [Cassell et al., 2001], and to establish social relationships through engaging in small talk [Cassell & Bickmore:2002].

An example for the realization of an ECA by means of a talking head is the medical agent developed in the Magicster[1] project. In this project a system has been developed which focuses on the expression of communicative functions via facial animation and speech. For speech synthesis the Festival[2] system is used. Greatest attention is paid to the generation of subtle facial expression. See [De Carolis et al., 2001], [Pelachaud, 2001] and [Pasquariello & Pelachaud, 2001].

Agneta and Frida are two animated female characters, mother and daughter, which sit on the desktop and watch the browser like one would watch TV. They comment on browser functions, make remarks on computer technology in general, and provide the user with their own background story. The approach works with a library of pre-recorded short films with the texts spoken by two actors, which enables the communication to be fairly critical and ironic in tone. Cf. [Persson, 1999], [Höök et al., 2000].

Examples of commercial ECAs are the newscasters Ananova and Chase Walker. **Ananova** (`http://www.ananova.com`) is a female talking head with speech synthesis and facial expression which allows for the display of emotion. Emotions are triggered by the emotionality of the news text. **Chase Walker** (`http://www.headpedal.com`) is a male character with speech, facial expression and hand gesture, an example of further integration of communicative channels.

Another type of commercial ECA are chatterbots. Chatterbots simulate human-like conversation with a machine. Typically chatterbots sit on company's web pages, and engage the user in communication. Usually the user is presented with a cartoon-like character with a rudimentarily animated head and chest. Communication with chatterbots is heavily text centered. The user may type arbitrary text into a window/line to which the chatterbot reacts producing text which is intended to create the illusion of a reply. The communicative behaviour of a chatterbot is comparable to ELIZA [Weizenbaum 1966]. A representative example for a current chatterbot is **Cybelle** (http://www.agentland.com/).

Two fundamental observations can be made concerning the design of these ECAs:

1. Cultural aspects are in the first place indirect, i.e., the cultural background of the designers, programmers and researchers influences the design and modelling of the respective agents.
2. Research in the field of Embodied Conversational Agents is just at its very beginnings, and there are also still shortcomings concerning the state of the art in related areas of research and technology such as: natural language and speech processing; graphical representation, especially surface realization of personality and emotion; theories concerning the integration of verbal and nonverbal behaviour; as well as (computational) models for socio-cultural aspects of ECAs.

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[1] Magicster (IST-1999-29078) is an EU-funded project.

[2] http://www.cstr.ed.ac.uk/projects/festival

Net Environments

The General Concept and its Realisation in sysis NetLife

In the context of the sysis NetLife platform, the basis of the applications described below, we define a *net environment* as a multi-user application for the internet

- where the users are represented by avatars which are situated in a virtual location, engage in social relations and fulfil specific tasks depending on what is required of them in a given application;
- where the user is able to design her/his avatar with respect to its graphical representation, its personality traits and emotional disposition, as well as its interests. The amount of freedom the user has for defining her/his avatar is application-specific;
- where the agents are autonomous after creation by the user; the user may influence the agents by giving them advice, which the agents may or may not take into account, depending on the agent's personality and mood, or on parameters set within the application.

The sysis NetLife platform is the basis for implementations of such a net environment. The motivation of any action performed by the SAFE agents is the wish/necessity to satisfy needs and pursue specific goals.

Needs arise from a multi-dimensional 'need-system' inside the agent, covering aspects like hunger, thirst, arousal, curiosity. The environment or habitat in which the agents are situated offers all resources to satisfy the needs of the agents. The simulation of a NetLife application is 24 hours a day, 7 days a week, although there are reserved time slots where agents normally rest (i.e. from 02:00 to 07:00). Goals are determined by the particular application scenario and relate to the game-like character of NetLife applications. For illustration see the following examples.[3]

Austropolis is a virtual, democratic state and a playing field for politically minded users. The agents have their individual ideology, and use democratic methods. Their overall goal is to run for president.

Cool School deals with teenage life on and around the topic of 'school'. The avatars are schoolboys and schoolgirls which have a 'cool time' trying to gain popularity among their peers.

Flirtboat is an application where the agents are on a cruise and try to find interesting partners for a flirt. In the following we are going to discuss Flirtboat in more detail, as this application already exists in three versions -- for the Austrian, the UK and (more recently) the Croatian market. As already mentioned, in the current paper we present user data from two Austrian, one UK and one Croatian launch.

From the user's point of view, an important aspect of sysis NetLife applications is virtual storytelling. The stories which are created by the system can be influenced by the user interactions

[3] More information can be found on the SYSIS home page `http://www.sysis.at`.

with their avatars. These stories are the core of the individual applications and create the application-specific feeling.

Sysis NetLife applications are good community building tools as they are designed for particular interest and user groups. At the same time, they are flexible enough to allow the user to actively take part in the environment. They are a promising interface for e-commerce as they can offer information and customer support in a discursive and jocular manner. At a further stage of sophistication when the animation of the characters has improved, natural language processing and expressive speech have been incorporated, and verbal and nonverbal aspects of communication have been integrated, sysis NetLife applications will also be a valuable test bed for socio-cultural modelling and learning. At the current stage, they are already a useful tool for various kinds of data collection, as questions can be seamlessly integrated into the applications themselves, thus increasing the chances of collecting responses.

The Flirtboat Application

In the following section we give a short overview of the most important characteristics of a Flirtboat application from a user perspective , i.e., we describe the steps a user typically takes through the application.

As a first step the user creates her/his own avatar, a virtual representation of the user's self by answering a number of questions about the avatar's personality. Based on the user's answers, the model generates a personal profile for the avatar. This profile can be refined throughout the game as the user answers additional questions about the avatar's preferences and way of thinking.

A question might be for example:

> *"Got up late, missed the bus, left my shoes at home. Do I go berserk or do I keep calm?"*

The user is also asked to add personal interests, a motto and choose a graphical appearance for the avatar. Personality and looks can be changed at any point during the game. The profile is visible for other users during the game and makes it possible for users to see at a glance, what they have in common.

One of the most interesting features of Flirtboat is the possibility of getting into contact with other users while staying anonymous. The avatar will meet other user avatars, will make friends, and maybe even find the partner of her/his dreams, but also dislike others. All this is reported by the avatar to her/his user who is asked to decide on the next steps, e.g. arrange another meeting, send e-mail to another avatar, and select a certain action her/his avatar shall take during the next meeting. It is also possible to cancel previously arranged dates.

After every meeting the user is informed of what happened by means of a message in a setting as shown in Figure 1~~Figure 1~~.

Figure 1: Interface to the user visiting her/his avatar

During the cruise an avatar/user will repeatedly be approached by other virtual characters which will try to talk to her/him. These avatars are part of the game logic and provide a particular contextual setting, see for instance Pick-up Pete below. They turn up regularly, tell funny stories, and give advice or ask questions. The users are awarded points for answering these questions.

Pick-up Pete is an expert on everything concerning flirting and dating. It's his task to give advice to the users. He asks one question per day and the user is awarded points for answering these questions. A question from Pick-up Pete might be:

> *Your date could talk the hind leg off a donkey. By the end of the evening, you know every detail of their life, even all about their Uncle Arthur's hip operation. Can you handle it?*

The user gets two possible answers:

> *I let the jabbering go on for as long as it takes and just switch off*
>
> *I listen attentively and comment on several details*

Depending on which one is chosen, the user is given feedback on how clever the particular course of action is:

Be careful! Your partner will see through you straight away. This behaviour suggests you're interested in a one night stand rather than a relationship.

Even if it seems tiring sometimes, that´s the right option. And it´s also a way to get to know your date.

This basic functionality is common to all Flirtboat applications and represents the core of this particular metaphor. In the following sections we will look into those aspects which are prone to cultural differences, the design of the user interface on the one hand, and usage and user behaviour on the other.

Cultural Diversity in the User Interface Design of Flirtboat

The Flirtboat was originally conceived in early 2000. At that time websites which covered aspects such as flirting and finding a partner were among the most sought after. This fact supported the choice of a fun metaphor where communication between users was put into the center.

The next step was to define the target group. Given the basic idea of autonomous agents representing the user within a virtual environment and given the strategic goal of creating an application which would be accessible for a large number of users, above all, attention was paid to common aspects rather than dividing ones. However, strategically, localisation was taken into consideration from the very beginning.

As regards the socio-economic characteristics of the user group, the design principles were defined as follows. The application should be:

- Easy to use, and intuitive: This aspect was particularly important, as the simulation of a parallel world with autonomous creatures can be rather complex and difficult to grasp.
- Individual: The user is given the opportunity to equip a virtual representative with some of her/his characteristics and make them accessible to other users without being personally exposed.
- Young, progressive, and socializing: The application aims at mainly addressing a younger, progressive audience who use the internet as a tool to communicate and establish social relations.
- Playful: The focus is on the fun aspect in dating. Dating is treated as a game.
- Encouraging: Special emphasis is placed on addressing women who are underrepresented in many online communities.

As the application is conceived to be largely culture-independent, the graphical design, especially the characters are also designed to be culture independent, at least to a certain degree.

Figure 2~~Figure 2~~ below illustrates the importance of design, depending on the definition of the target group. The characters on the left were created for Austropolis, a specifically Austrian application. Their appearance has a lot of associations for Austrian users, i.e., users can easily gleen information as to social background and character traits because of their stereotypical representation. The characters to the right, taken from the Flirtboat application, bear much less

culture-specific but more target group-specific associations. It is common for the Flirtboat characters to depict young, fashionable adults with a variety of styles to dress, different skin and hair colours, and hair styles. The intention here is not to communicate stereotypes via graphical representation.

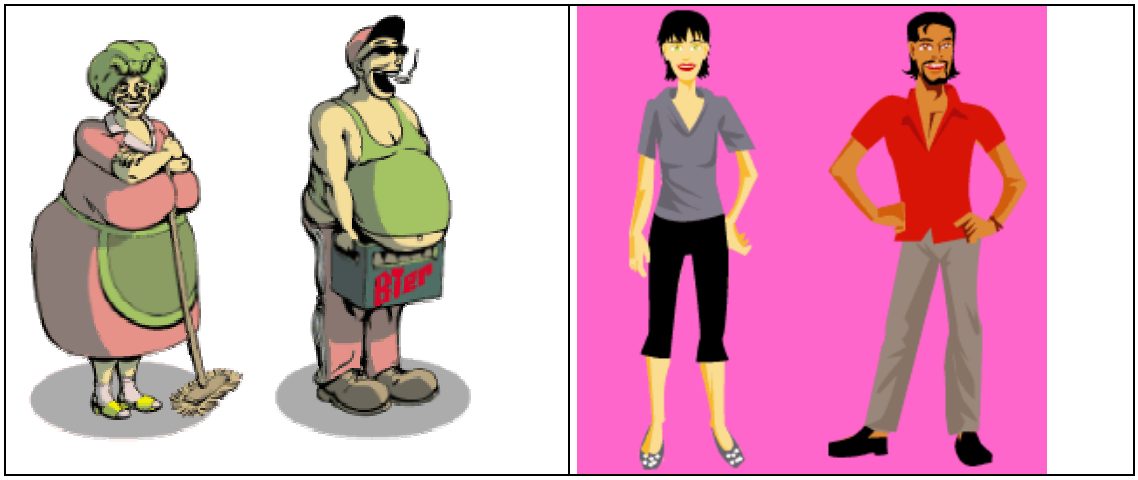

Figure 2: Character design in Austropolis and Flirtboat

A central issue in user interface design is text – especially in a system like Flirtboat, where ”feeling” and model output are mainly communicated to the user via text. This is also the aspect where cultural considerations become most important. To ensure the cultural validity of the application, the translators were invited to create new stories that were more appropriate to convey the intended meaning in the target country (the UK and Croatia respectively).Below we give an example, comparing text which has been created to convey one and the same story/information in UK Flirtboat and in AUT Flirtboat.

UK Flirtboat*: “I went to sculpture classes at the South Pole. The most beautiful snow sculpture won a prize. Pete had got the wrong end of the stick and was looking for powdered snow, while the captain collected icicles to stick in his drinks. Brrr! Babe Brighton got stuck to her ice dressing table. I showed what a megalomaniac I really am and made a penguin the size of the Taj Mahal. Had a photo done with all the stiff-upper-lip guys. It was like a royal visit.”*

AUT Flirtboat*: “War beim Bildhauer-Wettbewerb auf dem Südpol. Gekürt wurde die schönste Schnee-Figur. Sascha Hahn gleich am falschen Dampfer. Sucht den 'Pulver-Schnee'. Käpt'n Flinn warf sich erst mal Eiszapfen in seinen Drink. Brrr! Bibi Bibione klebte an ihrem aus Eis gehauenen Schminktisch fest. Ich, im Größenwahn: zwei Meter hohen Pinguin gebaut. Siegerfoto mit hundert Frackträgern. Wie Lugner-Stargast auf dem Opernball!“*

(Literal translation: Was at a sculpture competition at the South Pole. Elected was the most beautiful snow scuplture. Sascha Hahn immediately gets it wrong. Looks for the powdered snow. Captain Flinn first of all threw icicles in his drink. Brr! Bibi Bibione got stuck to her ice dressing table. Myself in megalomania mood: built a two meter high penguin. Winner photo with hundred tail-coat-wearers. Like Lugner’s celebrity guest at the Opernball!)

Localization in the example story is achieved via a number of well known Austria-specific and UK-specific references: In order to characterize the photo shooting with the winner as a rather posh event, in AUT Flirtboat a reference is made to the Opernball, an annual ball at the Viennese opera

house which is *the* Austrian high society event. In order to provide the right connotation, the winner feels like a celebrity guest of Richard Lugner (Lugner-Stargast). Lugner is a well known local Viennese figure, owner of a shopping center, who for publicity reasons each year invites afemale celebrity, preferably a movie star, to the Opernball. These guests are always discussed controversially in the Austrian media. In UK Flirtboat, the photo shooting is characterized as being "like a royal visit". The posh connotation is further achieved via the expressions "stiff upper-lip guys" (UK) versus tail-coat-wearers (Frackträger). In order to characterize the winning sculpture, i.e., an oversized penguin, in the UK version it is described as "the size of the Taj Mahal", while in the Austrian version it simply says that the penguin is two meters high.

Another example of localization are the names of the virtual characters who approach the user time and again. Two of which appear in the example story, namely the charming steward Sascha Hahn versus Pete (alias Pick-up Pete) (Figure 3~~Figure 3~~), and the Flirtboat beauty Bibi Bibione versus Babe Brighton (Figure 4~~Figure 4~~). See Table 1~~Table 1~~ for a more detailed discussion of the meaning conveyed by the individual names. In the Croatian version Sascha Hahn is Frane Galeb and Bibi Bibione is Marina Neverina.

Figure 3: Sascha Hahn/Pick-up Pete/Frane Galeb

Figure 4: Bibi Bibione/Babe Brighton/Marina Neverina

Table 1: Naming of avatars built into the system

Sascha Hahn	in the Austrian version	Sascha Hahn refers to a steward character who was featured in an Austrian and German television series called „Traumschiff“[4] played by an actor called Sascha Hehn. Hahn means rooster in German – the name implies that he rules the roost.
Pick-up Pete	in the UK version	Pick-up Pete represents a completely different approach. His name implies that this character is master of the art of „picking up“ a flirt.
Frane Galeb	in the Croatian version	Galeb means the same as Hahn and implies the same in Croatian as in German.
Bibi Bibione	in the Austrian version	Bibione is one of the northern Italian beach resorts which are mainly frequented by Austrians. The name Bibi implies a beach babe.
Babe Brighton	in the UK version	The English equivalent of Bibione is Brighton.
Marina Neverina	in the Croatian version	The literal meaning of neverina is "bad weather" or "stormy weather", but it also means trouble. Used together with the name Marina, the meaning "party girl" or “girl that is full of action” is conveyed. In the Flirtboat connotation “girl that is experienced with respect to the sea and to love”.

As can be seen from the above examples, even though Flirtboat was conceived to be culture independent, a lot of culture-dependent issues have arisen during conception and implementation of the applications. The next section will look into data collected during runtime of three versions of Flirtboat, one launched in Austria (AUT Flirtboat, the second run in Austria, unless otherwise mentioned), one in the UK (UK Flirtboat, the first run in the UK) and one launched in Croatia (CRO Flirtboat, the first run in Croatia). It should be noted, that data collection was not performed with the aim of identifying inter-cultural differences. Nevertheless such differences can be observed

[4] “loveboat”

from the available data. The current data in the first place allow for impressionistic interpretation, but are also a valuable resource for further experimentation.

Cultural Diversity in Usage

Data Collected

With the Flirtboat data, we have for the first time a resource at hand, which is based on a large number of users and launches in three different countries. Apart from the launches mentioned above, results from the first and third launch in Austria will also be given where appropriate. Thus cross-linguistic and cross-cultural data are available as well as data from subsequent launches of the application in one country.

Generally, The data available can be divided into the following groups:

- user attraction and persistence, i.e., the number of registered agents (users) over time, the number of user visits (logins) to their avatars;
- user definition/selection of avatar characteristics such as gender, age personality and the look of the avatar.

It must be understood that the data on age, gender and personality used in the following analyses were attributed by users to their avatar. However, informal feedback as well as the survey on user satisfaction based on AUT Flirtboat 1 indicate that a large number of users understand the avatar to be their virtual representative. Thus there is some justification for the assumption that avatar design, at least to some extent, reflects user characteristics. However, it is still an open question as to how we can reliably assess how far this is the case. Thus especially the data in discussed below is taken primarily as avatar and not user characteristics.

User Attraction and Persistance

As previously mentioned, user commitment and persistence is measured according to the following parameters: number of registered agents (users) over time, and user visits (logins) to their avatars.

Number of Agents in the Game

AUT Flirtboat had a total of 11,053 agents registered, 4,233 (38.3%) of which were inactive, i.e., the user did not visit her/his avatar (i.e. log into the application) for more than one day. For comparison, UK Flirtboat had a total of 22,681 agents registered, 12,421 (54.8%) of which were inactive and for CRO Flirtboat 6,718 avatars were registered, with 2,126 – or 31.65% - inactive. The figures show a clear difference in user commitment between the individual launches of the Flirtboat application in the three countries.

A potential explanation for this user behaviour is that initial launches of web applications tend to attract large numbers of users simply for curiosity reasons. This assumption is supported by the data on user commitment from the first launch of Flirtboat in Austria (AUT Flirtboat 1) where a total number of 16,165 avatars was registered of which 44,48% (7,190 avatars) were inactive.

However, the Croatian numbers imply that we are in fact looking at a cultural difference in this case, which is most likely determined by the state of development of the online market.

An interesting feature of the Flirtboat application is that the number of registered users seems to rise constantly over time. See Figure 1 which shows the development of the number of registrations during the first 90 days runtime of AUT Flirtboat , CRO Flirtboat and UK Flirtboat. According to the data, the effect holds for an initial launch as well as a relaunch. From experience with the Austrian Flirtboat the development of user numbers over a period of a year can be shown (the data refer to AUT Flirtboat 3 and to the period from 7.11.2001 to 7.11.2002). The development of these basic usage figures shows that marketing measures are much more important than the question how long the application is kept running. As Figure 5~~Figure 5~~ shows, there is a – however small – increase in total registrations, whereas daily logins stagnate considerably after such a long runtime (see Figure 7~~Figure 7~~ and Figure 8~~Figure 8~~). Note that AUT Flirtboat 3 was launched directly after AUT Flirtboat 2 and all avatars which had been visited within 35 days of this launch were taken over which is why the initial number of avatars in this case is higher than zero (Figure 6~~Figure 6~~).

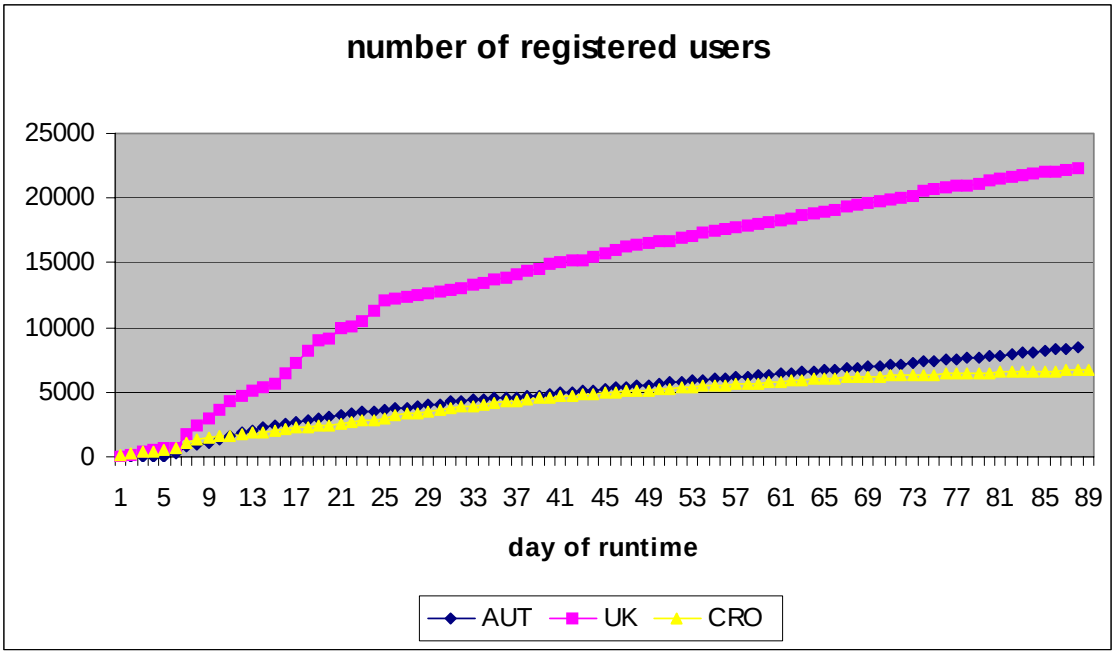

Figure 5: Number of registered users for 90 days of runtime

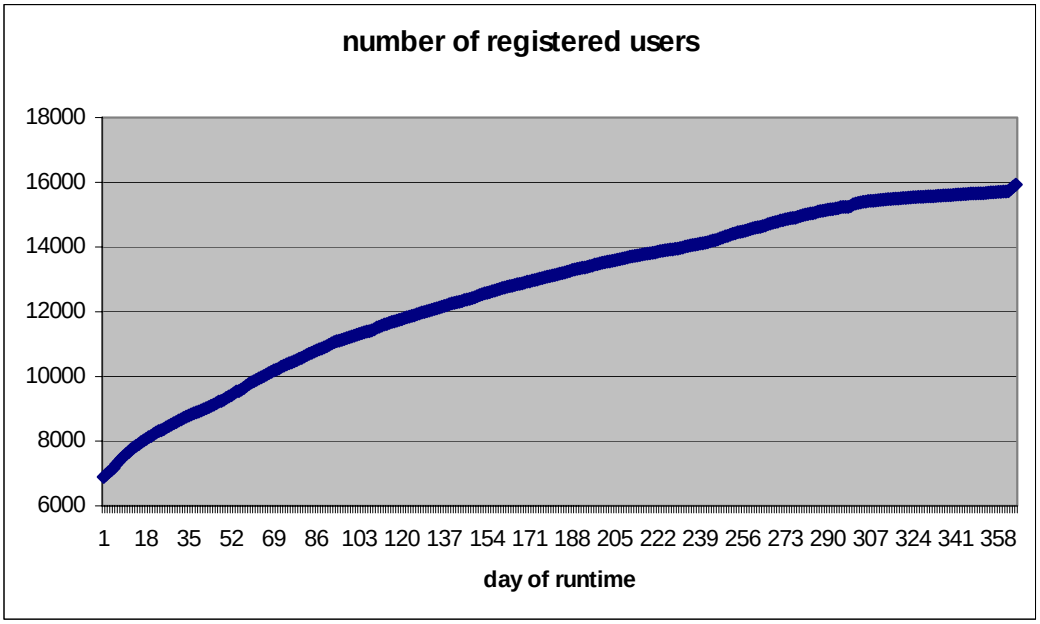

Figure 6: Number of registered users for 365 days in AUT Flirtboat 3

Visits and time on board

Note: unless stated otherwise, all further analyses are limited to those avatars which were visited by their users for more than one day (>1d).

Average number of visits: The average number of visits to the game per registered user was just under 35 in AUT Flirtboat, with average time on board amounting to 36 days. In UK Flirtboat on average an avatar was only visited 21 times over a duration of 27 days. In CRO Flirtboat avatars were visited on an average nearly 47 times during a period of 37 days on average. In AUT Flirtboat, 25% of the users had a time on board of more than 60 days, visiting their avatar more than 34 times. The duration is the same for the top quartile[5] in CRO Flirtboat, but the number of visits for the top user group is with more than 52 the highest of all three countries. In the UK, the quartile with the most visits had over 20 visits and an average duration on board of more than 42 days. The fact that the median (50% quartile) of visits is much lower than the mean, and only the 75% quartile is about as high as the mean, leads to the conclusion that among the top 25% of the users the number of visits is actually well above the mean. In fact, the maximum number of visits by an individual user in AUT Flirtboat was over 1,000, 1,174 in CRO Flirtboat and over 800 in UK Flirtboat.

Daily logins: As can be seen in Figure 7~~Figure 7~~, after approximately one and a half months of runtime, daily logins were established at a fairly constant level for all three applications. The

[5] A quartile refers to 25% of the users. All data are spilt into equally large groups for analysis. This concept is particularly well known for analysis of income groups in a population. The 50% quartile equals the median. It means that 50% of the users show a lower value, 50% a higher value than the median.

average number of logins per day amounted to 2,734 in the UK, 1,941 in Croatia and 2,265 in Austria. As we learn from AUT Flirtboat 3, the application with the longest runtime up to date, the number of daily logins stagnates at a considerably lower level after a while. See Figure 8~~Figure 8~~.

Summing up, based on the development of user numbers over time, and the consolidation of daily logins at a range of 2 to 3000, we can conclude that the Flirtboat application has a high potential to attract users over time, and that this general potential is not particularly affected by the repetition of a launch in one country or by launches in different countries. In the remainder of this chapter, we will discuss the distribution of gender and age in the applications, analyze the personality traits the users have assigned to their avatars, and examine which looks the users have assigned to their avatars.

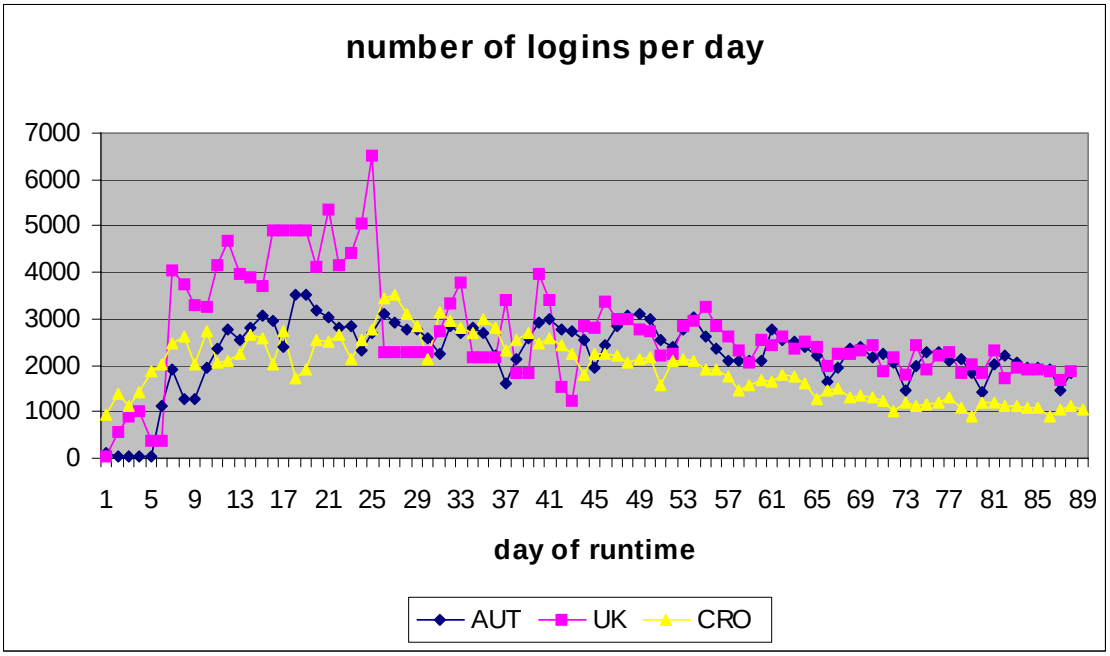

Figure 7: Daily logins for UK Flirtboat , AUT Flirtboat and CRO Flirtboat

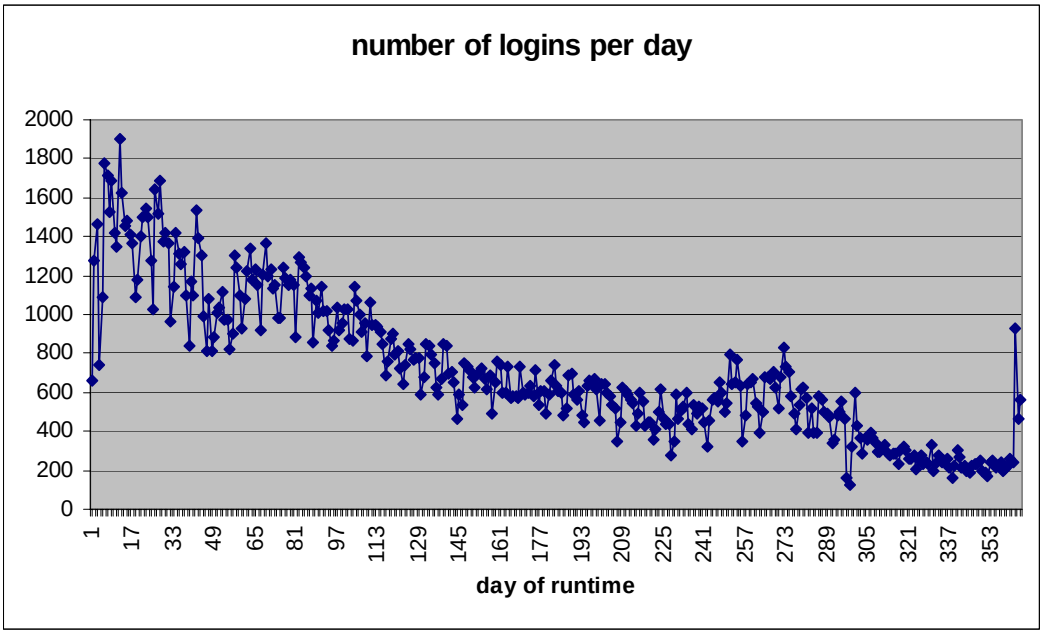

Figure 8: Daily logins in AUT Flirtboat 3 over one year

Logins and avatar gender: As regards gender, there are hardly any differences between the UK and the Austrian application. In general the average number of visits is slightly lower for males than for females, but the difference is less than 1 average visit. The difference in the average duration of visits in days to female and male avatars is four in the Austrian sample and three in the UK sample again male avatars are visited less often than female ones. CRO Flirtboat shows a different picture. Here male avatars on average have 9 more visits than female ones, although the average time on board is slightly higher for female avatars (39 and 37 respectively).

Logins and avatar age: The average number of visits is highest in all three samples among the 30 to 39 year olds. In the Austrian data the difference is more pronounced than in the UK data. See Figure 9~~Figure 9~~.

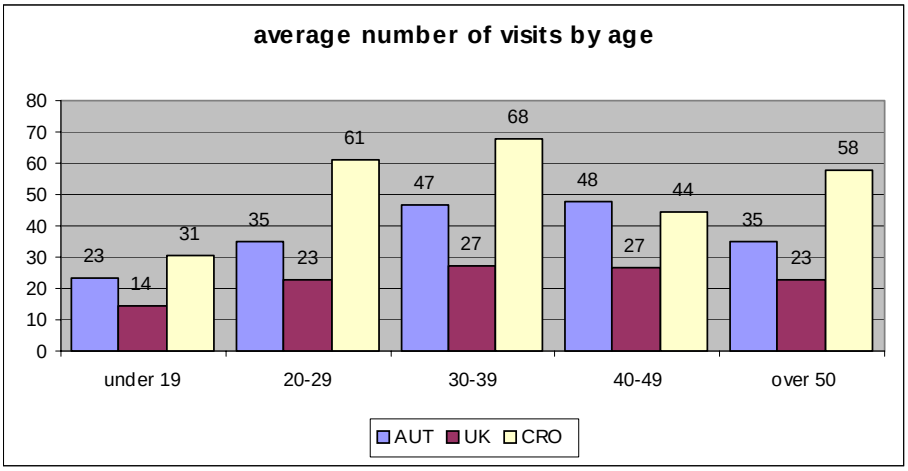

Figure 9: Visits per avatar age in AUT Flirtboat, UK Flirtboat and CRO Flirtboat

Avatar Profiles

In the following we discuss data reflecting the user assignments of age groups, and gender distribution to their avatars as well as personalities.

Age Groups of Avatars

Figure 10~~Figure 10~~ gives an overview of the distribution of age groups of the avatars in the three applications. Age is grouped into five broad classes by the system, and the users assign one of these age groups to their avatars.

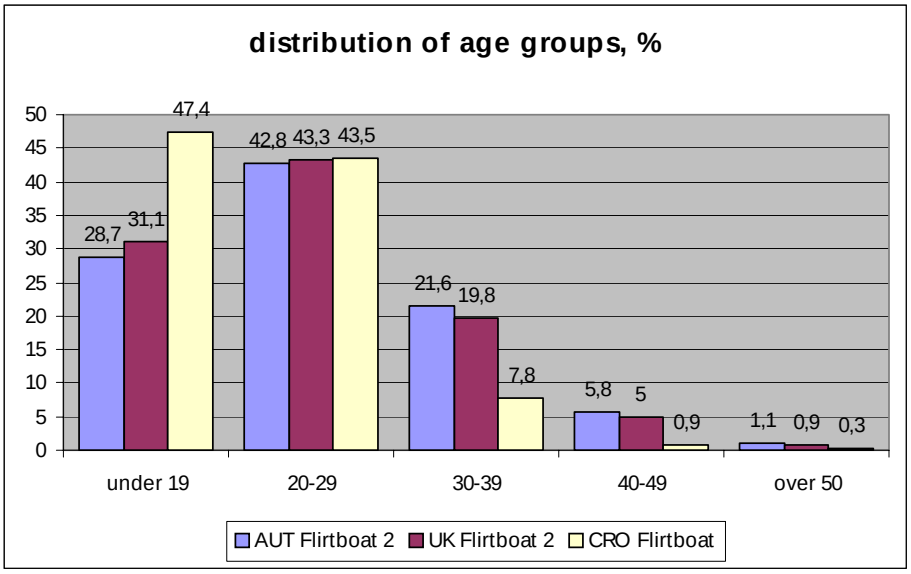

Figure 10: Distribution of age groups in AUT Flirtboat , UK Flirtboat and CRO Flirtboat

From the figure we can see that the age distribution of avatars is fairly constant for UK Flirtboat and AUT Flirtboat. The vast majority of avatars belong to the group of under 30s, i.e., 74.4% and 71.5% of the avatars in UK Flirtboat and AUT Flirtboat, respectively. CRO Flirtboat, however, shows the strongest tendency towards the under-thirties. In this application as much as 90.09% belong to this group. On the other hand 40+s are strongly underrepresented, i.e., 5.9% in UK Flirtboat, 2 6.9% in AUT Flirtboat 2 and 1.2% in CRO Flirtboat. In particular, there are very few avatars in the age group over 50, i.e., 0.9% in UK Flirtboat 2, 1.1% in AUT Flirtboat 2 and 0.3% in CRO Flirtboat. But again we have to keep in mind that we do not have any reliable means of finding out the true age of the users behind the agents.

If we consider the distribution of Austrian internet users according to age group (see Table 2~~Table 2~~) we find that the younger age groups (15-20, 20-30) are over-represented in the Flirtboat application, whereas the older age groups (40-50, over 50) are increasingly underrepresented.

The age distribution reflected in the avatar ages may partly be due to the theme, i.e., people of the upper age groups are not particularly interested in dating; partly due to social conventions or set ideas, i.e., net dating is not the proper thing to do at a certain age. Alternatively, it could be that users believe that younger agents will be more successful in dating and that the graphical representations of the agents suggest a specific age range which excludes the upper age groups. Even though there are more "younger" avatars in the game, the "older" avatars are taken more care of, i.e., are more often visited by their users, see Figure 9~~Figure 9~~. This is particularly the case in AUT Flirtboat and CRO Flirtboat.

Table 2 compares the distribution of age groups relative to Austrian internet users in general, and specified avatar ages in AUT Flirtboat. These figures are based on ÖSTAT, census 2001, **http://www2.statistik.gv.at/gz/einwohner1.shtml**, and AIM, Austrian Intenet Monitor, http://www.integral.co.at/Download/ergebnisse.php?level1=6

Table 2 distribution of age groups in AUT flirtboat

age group	15-20	20-30	30-40	40-50	over 50
proportion of Austrian internet users	11.76%	19.83%	23.80%	18.65%	25.97%
proportion of AUT Flirtboat avatars	28.70%	42.80%	21.60%	5.80%	1.10%

Gender Distribution of Avatars

As can be seen in table 3, female avatars outnumber male ones in UK Flirtboat and CRO Flirtboat, with 51.5% versus 48.5% and 53.2% versus 46.8% respectively. In AUT Flirtboat, however, the distribution is inverse, with 58% male avatars versus 42% female ones. These data refer to avatars visited more often than once (>1d on board). Considering that in all cases the proportion of femlaes among all registrations is lower than among those staying for more than one day we find that there is obviously a higher dropout of male avatars from the game than of female ones.[6]

Table 3: Gender distribution

Flirtboat-Version		> 1d on board		registered	
	gender	Frequency	Percent	Frequency	Percent
AUT Flirtboat	female	2,866	42.0	4,134	37.4
	male	3,954	58.0	6,919	62.6
	Total	6,820	100.0	11,053	100.0
UK Flirtboat	female	5,279	51.5	10,914	48.1
	male	4,981	48.5	11,767	51.9
	Total	10,260	100.0	22,681	100.0
CRO Flirtboat	female	2,442	53.2	3,534	51.5
	male	2,150	46.8	3,330	48.5
	Total	4,592	100.0	6,864	100.0

The distribution of male (58%) and female (42%) avatars in AUT Flirtboat is comparable with the distribution of male and female internet users in Austria, i.e. according to AIM, 57.43% of the internet users are male compared to 42.57% females. We take this as evidence to support the assumption of correspondence between the true gender of the user and the gender of the avatar.

[6] For calculation of the dropout rate the total number of registered avatars was compared to the number of avatars that have been visited more than once. See " registered Frequency" and ">1d on board Frequency".

Gender and age

As is shown in figure 9, the distribution of (avatar) gender over (avatar) age groups is comparable for the Flirtboat applications in the UK, Austria and Croatia. In all three launches female avatars clearly outnumbered the male ones in the age group < 19. For all other age groups in all launches the tendency is reversed, i.e., male avatars outnumber female ones.

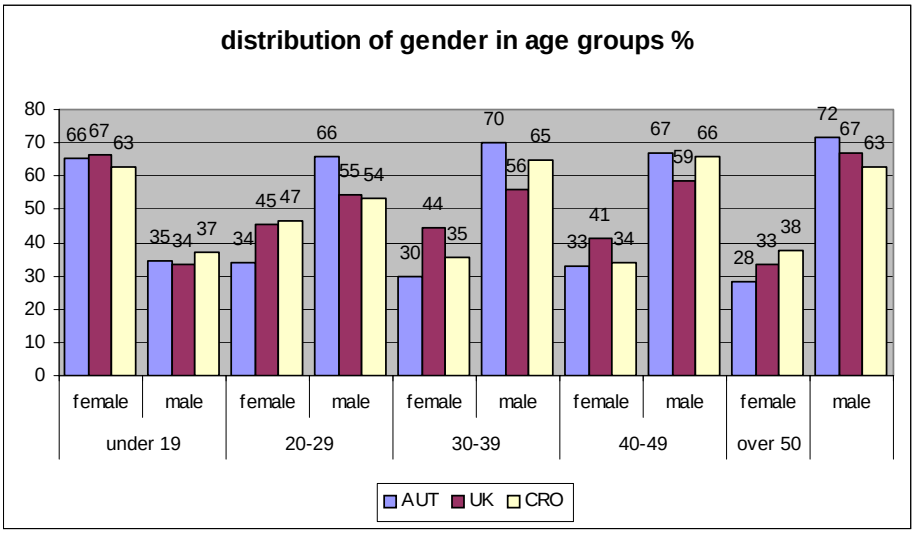

Figure 11: Distribution of gender in age groups

Aspects of Personality

The personality model -- together with a need model which controls the agents -- forms the core of the virtual life in Flirtboat. The model is based on the Jungian theory of personality. In particular it is an adaptation of the Myers-Briggs Type Indicator (cf. [Keirsey;Bates:1984]), a paper-and-pencil personality test, according to which personality is modelled along four dimensions:

- extroversion (E) – introversion (I),
- intuition (N) – sensing (S),
- thinking (T) – feeling (F),
- judgement (J) – perception (P)

Combinations of these dimensions lead to 16 personality types.[7]

This particular approach has been chosen, because it is easily operationalizable for the matching and dating mechanism underlying the application, and also for the assignment of personality to the avatars by means of an online questionnaire which is presented to the user as part of the registration

[7] See also http://www.socionics.com/main/types.htm and

http://www.socionics.com/advan/prof/ respectively.

process of a new user/avatar. As regards the former, the approach allows for very precise assumptions about the personal relationships each personality type may have with any of the other types and how they are expected to develop over time, see http://www.socionics.com/rel/rel.htm. With respect to the latter, question-answer lists in the style of Flirtboat texts have been designed for each personality type by a psychologist addressing several areas of (the users') life such as social behaviour, partnership, career etc. The answers to these questions are used to decide for individual Jungian dimensions whether a person belongs to the one or the other extreme, resulting in profiles like ESFJ which stands for a personality type characterized as extroverted feeling with sensing, see http://www.ship.edu/~cgboeree/jung.html for an online description of the Myers-Briggs types.[8]

Examples for question-answer pairs as presented in the UK Flirtboat are given in Table 4~~Table 4~~.

Table 4: Examples for question-answer pairings for the assignment of avatar personality

Imagine your date is keeping you waiting. How long does it take before you start to feel annoyed?	5 minutes 10 minutes 15 minutes 30 minutes
What would you say sounds more like you: "Hello, here I come!" or "Let´s wait and see."	"Hello, here I come!" "Let´s wait and see."
Are you a dreamer or more of a practical type?	Dreamer Practical type
Are you a rational or an emotional person?	Rational Emotional
Do you like to keep everything in good order or are you inspired by chaos?	Order Chaos
How do you feel when you are in a crowd?	Relaxed Tense
What do you think about visionaries?	They're tedious They're fascinating
Be honest: Are you likely to be impressed by an emotional speech or will only hard facts convince you?	Emotional speech Hard facts
Do you like to check things out first or do you act on the spur of the moment?	Investigate first I'm impulsive

Comparing the personality types assigned to the avatars in the Flirtboat applications in Austria, the UK and Croatia, we find that there is little variation in the most frequently assigned personality types in all three counties. In particular,

- ENFJ (extroverted feeling with intuiting) is the most frequently assigned personality type in UK Flirtboat (10.64% of the avatars) and in CRO Flirtboat (17.51%), and it is the second most frequently assigned personality type in AUT Flirtboat (11.22%);

- INFJ (introverted intuiting with feeling) is the most frequently assigned personality type in AUT Flirtboat (11.41%), the second most frequently assigned personality type in CRO Flirtboat (12.18%) and still the third most frequently assigned one in UK Flirtboat (9.48%).

Interestingly the two types differ only in the dimension extroversion-introversion.

[8] For a description of this particular type see http://www.socionics.com/advan/prof/esfj.htm

Considering the least frequently assigned personality type, we again find similarities, with ENTP (extroverted intuiting with thinking) being assigned to 2.37% of the avatars in AUT Flirtboat and to 2.42% in CRO Flirtboat. ENTP is the third least frequently assigned personality type in UK Flirtboat (4.08%).

When we separate male from female data, we find complete divergence of the most frequently assigned personality types of male avatars, i.e., INFJ in AUT Flirtboat (10.48%), ISTP (introverted thinking with sensing) in UK Flirtboat (10.35%) and the generally high scoring type ENFJ in CRO Flirtboat (14.68%). While the most frequently assigned male personality types in AUT Flirtboat and CRO Flirtboat differ only in a single dimension, the introvert Austrian versus the extrovert Croat, there is little or no convergence with the most frequently assigned UK male type.

Looking at female avatars the similarities between Austrian and Croatian types is even more pronounced, with ENFJ having been assigned as most frequent type in AUT Flirtboat (14.37%) and CRO Flirtboat (20.18%). It is again the UK sample whichare distinct, with INFP (introverted feeling with intuiting) as most frequently assigned personality type (13.49%).

Interestingly much more convergence can be found with regard to the least frequently assigned personality type, ENTP which has been assigned least in five of six clusters in total, namely in AUT Flirtboat (1.99% of the male avatars, 3.00% of the female avatars), CRO Flirtboat (2.43% male, 2.41% female), and UK Flirtboat (3.34% female).

Summing up, with respect to personality assignment there seems to be a stronger convergence between Austria and Croatia than between Austria and the UK or between Croatia and the UK. Note, the data discussed refer to all avatars registered.

Choice of Representation

For each gender there was a choice of 16 representations for the avatar.[9] For AUT Flirtboat and UK Flirtboat we have evaluated which avatars were chosen most and least frequently. Generally, it is interesting to note that there seems to be little difference between the two countries at both ends of the spectrum as regards choice of appearance, i.e., the two most frequently and the two least frequently chosen appearances are the same.[10] See Figure 14~~Figure 14~~ for pictures of the most and least frequently chosen avatar appearances.[11] The most obvious difference between the two groups is skin colour, i.e., all least frequently chosen characters have pale skin, whereas all most frequently chosen characters show a darker complexion. Another uniform characteristic of the most frequently chosen characters is the type of dress, i.e., all characters wear sporty dresses. Dress code is not this uniform for the least frequently chosen characters. In order to find out why particular optical representations were especially popular or unpopular in AUT and UK, a qualitative analysis is necessary. More details in the differences between UK and Austrian users can be found in Figure 12~~Figure 12~~ and Figure 13~~Figure 13~~. Here we find that differences are a bit more pronounced among the female avatars, whereas the selection of appearances of male avatars is fairly similar in both countries. We also see that the difference (in terms of how often they have been chosen) between the three most frequently chosen female appearances in AUT are rather small whereas the

[9] We are not able to show the full range of 32 pictures, because of space limitations.

[10] Note that comparisons can only be made gender specifically, as male and female avatars have different appearances.

[11] For printing, the original colour scheme has been reduced to grey scale.

variation in UK is quite large. In the UK, Pic 6 is much more popular than Pic 1 which is the most popular female appearance in AUT. There is no such large difference between AUT and UK as regards the least popular female appearances, Pic 16 and Pic 4. All in all the data we currently have, are a useful resource to derive a number of items based on which initial qualitative investigations shall be directed, such as the connotation of skin colour or dress code, and their relevance in the context of Flirtboat.

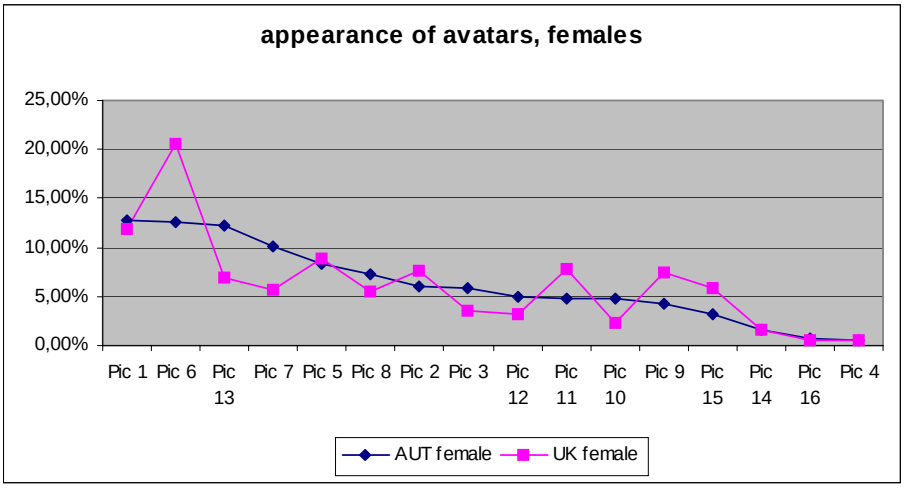

Figure 12: Ranking of avatar appearance, females

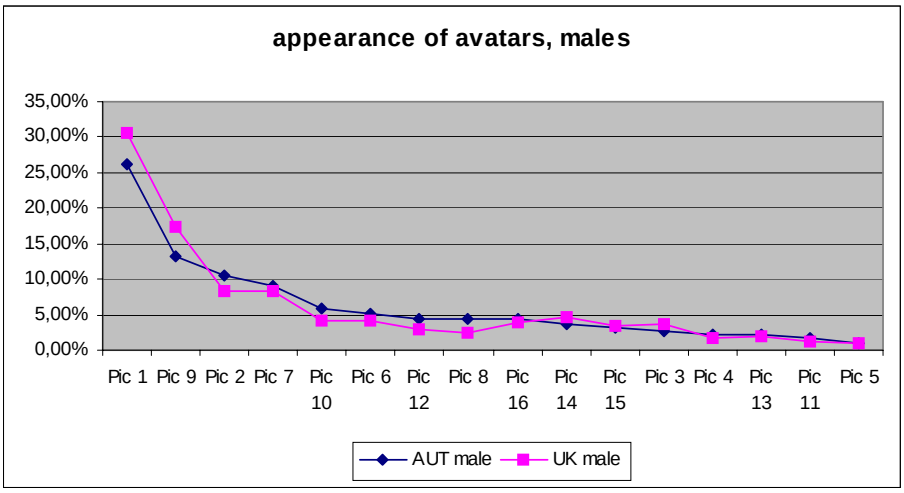

Figure 13: Ranking of avatar appearance, males

Most frequently chosen Pic 1	Pic 9	Pic 1	Pic 6

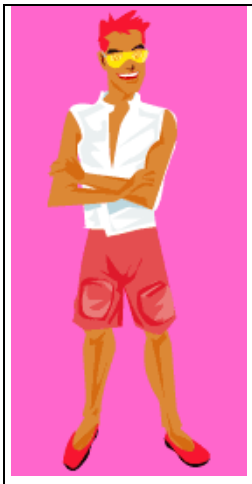		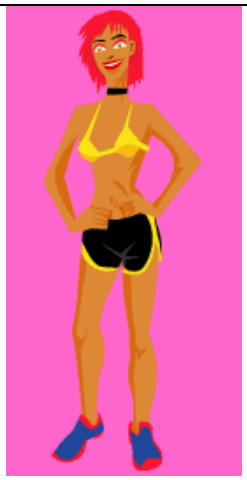	
Least frequently chosen Pic 11	Pic 5	Pic 4	Pic 16
			

Figure 14: Most frequently and least frequently chosen avatars in AUT Flirtboat and UK Flirtboat

Conclusion and Outlook

Summing up, the most striking difference across the launches of Flirtboat in three different countries (Austria, UK, Croatia) was the assignment of personality traits, the Austrian and Croatian groups being closer to each other than either of them were to the UK group.

As regards other properties such as the development of user numbers and logins over time, or findings related to avatar characteristics such as age and gender, we have found a number of similarities across the launches of Flirtboat in the different countries. This can be summarized as follows.

Based on the development of user numbers over time, and the consolidation of daily logins at a range of 2 to 3000, we can conclude that the Flirtboat application has a high potential to attract users over time, and that this general potential is not particularly affected by the repetition of a launch in one country or by launches in different countries.

Even though there are more "younger" avatars in the game, there is a tendency that "older" avatars are taken more care of, i.e., are more often visited by their users. This is particularly the case in AUT Flirtboat and CRO Flirtboat.

As we do not have reliable data about user demographics, we cannot make assumptions about the relation between user age or gender and avatar age or gender. As regards gender, we only have slight evidence for a correspondence between true user gender and avatar gender from a correlation between the distribution of male and female avatars in AUT Flirtboat and the distribution of male and female internet users in Austria. Thus personal properties must always be understood as avatar properties and not as user properties.

Keeping this in mind, we have further learned from the data, that female avatars outnumber male ones in UK Flirtboat, CRO Flirtboat and AUT Flirtboat, whereas the distribution is inverse for male avatars. These findings hold for avatars visited more often than once. Considering all avatars ever created, there is a higher dropout of male avatars from the game than of female ones. The distribution of (avatar) gender over (avatar) age groups is comparable for the Flirtboat applications in the UK, Austria and Croatia. In all three launches female avatars clearly outnumbered the male ones in the age group < 19. For all other age groups in all launches the tendency is reversed, i.e., male avatars outnumber female ones.

Considering the looks of the avatars (data are only available for UK and AUT), there is basic agreement on the two most and least frequently chosen appearances for male and female avatars. The most obvious factor is skin colour, i.e., all least frequently chosen characters have pale skin, whereas all most frequently chosen characters show a darker complexion. Another uniform characteristic of the most frequently chosen characters is the type of dress, i.e., all characters wear sporty clothes. Dress code is not this uniform for the least frequently chosen characters.

Outlook:

An aspect we would like to mention here is derived from a survey of user satisfaction. The data were collected after AUT Flirtboat 1 had gone offline. Even though the data stem from a very small set of users, representing 0.9% of the active users[12], the following feedback we find important with regard to the design of future applications with animated characters.

Asked what they wished for a new release, 39% (by far the largest portion) wished they had more information about the other avatars (users) in the environment, but only 11% requested more animation.[13] What we have found here is a clear interest in social engagement, the wish to get to know the co-inhabitants in the environment they or their avatars are part of. A reason why the requirement for more animation was quite low might be that character animation in general is very rudimentary in the current Flirtboat. The visual representation of the avatar functions much more as

[12] Users were considered inactive if 35 days elapsed without a login.

[13] The second largest portion was 12% of the respondents wished the incorporation of a calendar from which the past events could be accessed.

a mask behind which users can conceal/reveal themselves, than as an active means of communication. The communication aspect in the current Flirtboat is covered by the actions that can be instigated by the user, free text input, e-mail and chat facilities.

Nevertheless we assume that the judgment about the importance of animation will change in applications when the characters become more animated and thus more expressive. This assumption is investigated in the research project NECA (http://www.ai.univie.ac.at/NECA, [Krenn et al., 2002]). In the NECA project, a system is developed on the basis of sysis NetLife which enables affective face-to-face life-like interaction between agents, i.e., the agents communicate with each other using speech, facial expression, gesture and posture. The users are presented with movies of agents interacting and performing a clearly defined task (currently two of them discussing an encounter one of them previously had with a third avatar).

User reactions to these clips are collected by allowing the users to rate the appropriateness of the agent's performance in the clip at various levels. Presenting the user with example scenes and dedicated (online) questions, we are able to accesses users' feelings about the appropriateness of their avatars behaviour which the user might not be aware of. For example, users are doubtless aware that a scowl and a friendly smile are not equally appropriate actions when making friends or rejecting an advance. They might, however, have difficulties in pinpointing, or even verbalising, how the type of intonation or voice quality used plays a role in signalling the avatars intentions.

Another aspect which is already available in sysis NetLife is that the users can tutor their avatars. In the NECA context this means: after watching the movie, users can tell their avatars (the system) what they did right and where they went wrong, ideally with hints on how to perform better the next time a similar situation arises. Such feedback provides the developers with information as to what users believe to be socially acceptable behaviour in a given situation. Even if the technology used in the application is not advanced enough to simulate this behaviour, it provides a goal for future research.

Once the target behaviour is established across a group of users in a given situation, the same method can be used for more diagnostic testing of the effectiveness of different aspects (facial expression, gesture, posture, intonation, voice quality) of avatar communication across a range of different cultures and subcultures.

Literature

[Allbeck;Badler:2001] Jan Allbeck, Norman Badler: Consistent communication with control. In Autonomous Agents 2001 Workshop on Non-Verbal and Verbal Communicative Acts to Achieve Contextual Embodied Agents. 2001.

[Badler et al., 2002]. Norman Badler, Jan Allbeck, Liwei Zhao, Meeran Byun: Representing and Parameterizing Agent Behaviours. In Proceedings of Computer Animation, IEEE Computer Society June 2002, Geneva, Switzerland.

[Cassell et al. 2000] Justine Cassell et al. (eds.). Embodied Conversational Agents. MIT Press, Cambridge, MA., 2000.

[Cassell:2000] Justine Cassell. Nudge Nudge Wink Wink. Elements of Face-to-Face Conversation for Embodied Comversational Agents. In Justine Cassell et al. (ed.), Embodied Comversational Agents, Cambridge, MA. MIT Press, 2000.

[Cassell et al. 2001] Justine Cassell, Yukiko I. Nakano, Timothy W. Bickmore, Candace L. Sidner and Charles Rich. Non-verbal cues for discourse structure. In *Proceedings of the ACL-2001 Conference*, Toulouse, France, July 2001.

[Cassell;Bickmore:2002] Justine Cassell and Timothy W. Bickmore. Negotiated Collusion: Modeling Social Language and its Relationship Effects in Intelligent Agents. In *User Modeling and Adaptive Interfaces*, 2002.

[Colburn et al., 2002] Colburn, A., Cohen, M. F., and Drucker, S., The Role of Eye Gaze in Avatar Mediated Conversational Interfaces, MSR-TR-2000-81. Microsoft Research, 2000.

[Cowie et al., 1999] Cowie, R., Douglas-Cowie, E., Appolloni, B., Taylor, J., Romano, A., Fellenz, W. (1999). In Mastorakis, N. (ed.). Computational Intelligence and Applications. World Scientific & Engineering Society Press.

[De Carolis et al:2001] B. De Carolis, F. de Rosis, V. Carofiglio, C. Pelachaud, I. Poggi: Interactive Information Presentation by an Embodied Animated Agent. International Workshop on Information Presentation and Natural Multimodal Dialogue. Verona, Italy, December 2001. online proceedings http://i3p-class.itc.it/ipnmd-proceedings.html

[Ekman:1972] Paul Ekman. (1972). Universals and cultural differences in facial expressions of emotion. In J. Cole (Ed.), Nebraska Symposium on Motivation 1971, (Vol. 19, pp. 207-283). Lincoln, NE: University of Nebraska Press.

[Ekman 1979] Paul Eckman. About brows: emotional and conversational signals. In M. von Cranach, K. Foppa,. W. Lepenies, D. Ploog (eds). Human ethology: claims and limits of a new discipline: contributions to the Colloquium. Cambridge University Press. Cambridge, England, New York, 1979.

[Ekman:1999] Paul Ekman.Facial Expressions. In T.~Dalgleish and M.~Power (eds.), Handbook of Cognition and Emotion, New York. John Wiley & Sons Ltd., 1999.

[Ekman,Friesen:1978] Ekman P., Friesen W.: Facial Action Coding System, Consulting Psychologist Press, Palo Alto, CA, 1978.

[Elliott:1992] C.D. Elliott: The Affective Reasoner: A process model of emotions in a multi-agent system. Ph.D. Thesis, Northwestern University, Institute for Learning Sciences, Technical Report, 1992.

[Gibbon:1998] Dafydd Gibbon. German intonation. In Daniel Hirst and Albert di Cristo (eds.), Intonation Systems, Cambridge, MA, pages 78--95. Cambridge University Press, 1998.

[Heaton, 2001] Lorna Heaton. Presentation at the Workshop on Agent Culture: Designing Virtual characters for a Multi-cultural World. Vienna, Austria, August 2001.

[Höök et al.: 2000] Kristina Höök, Per Persson, Marie Sjölinder. Evaluating Users' Experience of a Character-Enhanced Information Space. In *Journal of AI Communications*. Vol 13, No 3, 2000.

[Isbister:2001] Katherine Isbister. Building bridges through the unspoken: Embodied agents to facilitate cross-cultural communication. In Workshop on Agent Culture: Designing Virtual Characters for a Multi-Cultural World. Vienna, Austria, August 2001.

[Isbister;Hayes-Roth:98] Katherine Isbister; Barbara Hayes-Roth: Social Implications of Using Synthetic Characters: An Examination of a Role-Specific Intelligent Agent. Technical Report KSL 98-01, Knowledge Systems Laboratory, Stanford, CA. 1998.).

[Järvenpää and Immonen, 2002] Elia Järvenpää and Stina Immonen. Challenges of cross-cultural management: case studies in Finnish companies. In Proceedings of the Project Management Global Conference. Hong Kong, March, 2002.

[Keirsey; Bates:1984] David Keirsey, Marilyn Bates. Please Understand Me: Character and

Temperament Types. Prometheus Nemesis Book Co; 5th Edition. 1984.

[Krenn et al., 2002] Krenn B., Grice M., Piwek P., Schröder M., Klesen M., Baumann S., Pirker H., van Deemter K., Gstrein E.: Generation of Multi-modal Dialogue for Net Environment, In Proceedings of KONVENS-02, 30 September - 2 October 2002, pp.91-98, Saarbrücken, Germany.

[Moon;Nass:1996] Moon, Y. & Nass, C. I. (1996). Adaptive agents and personality change: Complementarity versus similarity as forms of adaptation. In R. Bilger, S. Guest M. J. Tauber (Hrsg.), Human factors in computing systems: Chi'96 electronic conference proceedings.

[Nass et al.:2000] Clifford Nass , Katherine . Isbister , Eun-Ju Lee, Truth is beauty: researching embodied conversational agents, Embodied conversational agents, MIT Press, Cambridge, MA, 2000

[Nass et al., 1994] Clifford Nass, Jonathan Steuer and Ellen S. Tauber: Computers are Social Actors.

http://cyborganic.com/People/jonathan/Academia/Papers/Web/casa-chi-94.html

[Oberlander;Brew:2000] Jon Oberlander, Chris Brew. Stochastic text generation. Philosophical Transactions of the Royal Society of London, Series A, Vol. 358, p. 1373—1385.

[Ortony et al. 88] Andrew Ortony, Gerald Clore and Allan Collins: The Cognitive Structure of Emotions. Cambridge University Press, Cambridge, MA, 1988.

[Ortony:2003] Andrew Ortony. 2003. On Making Believable Emotional Agents Believable. In R. Trappl, P. Petta, S. Payr (eds). Emotions in Humans and Artefacts. MIT Press 2003.

[Ostermann et al. 1998] Jörn Ostermann, Mark Beutnagel, Ariel Fischer, Yao Wang. Integration of talking heads and text-to-speech synthesizers for visual TTS. In *Proceedings of ICSLP 98*. Sydney, Australia, December 1998.

[Pasquariello;Pelachaud :2001] S. Pasquariello, C. Pelachaud, Greta: A Simple Facial Animation Engine, 6th Online World Conference on Soft Computing. In Industrial Appications, Session on Soft Computing for Intelligent 3D Agents, Septembre 2001.

[Pelachaud et al. 96] Catherine Pelachaud, Norman Badler and Mark Steedman. Generating Facial Expressions for Speech. Cognitive Science, 20:1 -- 46, 1996.

[Pelachaud:2001] Catherine Pelachaud: Contextually Embodied Agents. In N. Magnenat-Thalmann and D. Thalmann, editors, Deformable Avatars, Kluwer Academic Publishers, 2001.

[Persson:1999] Per Persson. AGNETA & FRIDA: A Narrative Experience of the Web? AAAI Fall Symposium on Narrative Intelligence, North Falmouth, Massachusetts, 1999.

[Ruttkay et al., 2002] Zs. Ruttkay, C. Dormann, H. Noot: Evaluating ECAs – What and how? In: *Proceedings of the AAMAS'2002 Workshop on Embodied Conversational Agents – let's specify and compare them!* Bologna, Italy. 2002.

[Schroeder et al:2001] M. Schröder, R. Cowie, E. Douglas-Cowie, M. Westerdijk & S. Gielen (2001). Acoustic Correlates of Emotion Dimensions in View of Speech Synthesis. Proc. Eurospeech 2001, Aalborg, Vol. 1, pp. 87-90.

[Stronks:2002] J.J.S. Stronks: Friendship relations with embodied conversational agents: Integrating social psychology in ECA design. Master Thesis, Faculty of Computer Science, University of Twente, Enschede, The Netherlands. 2002.

[Weizenbaum 1966] Joseph Weizenbaum. ELIZA - A Computer Program for the Study of Natural Language Communication between Man and Machine. Communications of the Association for Computing Machinery 9 (1966): 36-45.

[Zong et al. 2000] Zong Y., Dohi H., Prendinger H., Ishizuka M.: Emotion Expression Function in Multimodal Presentation, Advances in Multimodal Interfaces – ICMI2000 (Proc. 3rd Int'l Conf. on

Multimodal Interfaces), Beijing, China, pp.57--64, 2000. [available online at http://www.miv.t.u-tokyo.ac.jp/papers/yzong-beijing-ICMI2000.pdf]