Landscaping Personification Technologies: From interactions to relationships

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Introduction

The Companions project is a 4 year, EU funded Framework Programme 6 project involving a consortium of 16 partners across 8 countries. The Companions vision is that of a personalised conversational, multimodal interface, that knows its owner and is implemented across a range of media and modalities [12], [7]. Companions draw upon speech recognition, multimodal interfaces, embodied conversational agents, knowledge representation and inference and human language technology — all presented in an intuitive, natural interaction. Companions are one example of a type of new computational technology that will become dominant from the mid 2010s onwards. These technologies (which include robots, on-screen avatars, virtual pets

and other autonomous systems) will demonstrate intelligence and affect, they will know their 'users' personally and people will form relationships with them. We refer to these technologies as 'personification technologies'.

The reason that these personification technologies will emerge is because during next few years a number of underlying technologies will mature that, taken together, will have a huge impact on how we view human-computer interaction (HCI). Speech technologies particularly as an output are finally reaching a level of effectiveness that they can be used in everyday interfaces. Human Language Technology (HLT) is similarly poised to achieve significant advances with the move away from rule-based representations of knowledge and inference to statistical and decision networks. Knowledge Representation formalisms are changing beyond 'slot filling' and are embracing the more successful inference mechanisms based on Bayesian statistical models [12]. Software architectures are becoming more flexible with respect to utilising multiple modalities and HCI is beginning to involve affect and emotion. We also expect significant advances to be made in the look and behaviour of on-screen characters, rendering them much more realistic [1].

Personification technologies enable intelligent interaction with people in terms of speech and language, gesture and other forms of touch, and non-speech audio. They are believable, intuitive, and convivial conversational partners. They are autonomous and personality rich. They will be sensitive to emotion in speech and will be capable of demonstrating emotional/affective behaviour through speech, behaviours and visual appearance.

To realise this vision is a real challenge for software engineering and computer science. New software architectures will be needed along with new functions that lie in between the operating system and the user interfaces (so-called 'middleware'). New approaches to knowledge representation and new methods of inference are required that go beyond simple rule-based systems. New forms of interaction are needed to enable people to have personalised, emotional and socially relevant on-going relationships with the technologies.

Characteristics of personification technologies

Personification technologies include many devices and objects that have engaged the population. The Tamogotchi is perhaps the best known of a group that requires people to care for their device, to feed it and entertain it. If left unattended it will die [11]. The Sony AIBO and more recently Honda's robots behave in engaging ways. They wiggle their ears, make cute noises and have other behaviours designed to make people attribute emotions to them. Chatterbots [5] and other such systems [3] try to engage people in conversations even though they are simply repeating back what is already known. Avatars adorn web sites to persuade people that they are dealing with a trustworthy organization. Voice output on satellite navigation systems now utilize attractive, even sexy voices.

There are clearly many challenges for personification technology that are illustrated in the descriptions and investigations reported above. The technology is a development of agents. Agents appear in the literature as software agents, interface agents or embodied

conversational agents (ECA). ECAs have typically been more concerned with behaviours [9]. Interface agents have focused on dealing with some specific aspects of HCI. Some early thoughts on interacting with interface agents did highlight speech as a key element [8]. In software the traditional model of agents is that they have beliefs, desires and intentions, sometimes referred to as BDI agents. Personification technologies draw upon all of these, and on spoken natural language technologies. It is this combination which we believe will shift interactions into relationships.

Bickmore and Picard [2] argue that maintaining relationships involves managing expectations, attitudes and intentions. They emphasise that relationships are long-term built up over time through many interactions. Relationships are fundamentally social and emotional, persistent and personalised. Citing Kelley they say that relationships demonstrate interdependence between two parties – a change in one results in a change to the other. Relationships demonstrate unique patterns of interaction for a particular dyad, a sense of 'reliable alliance'.

It is these characteristics of relationships as rich and extended forms of affective and social interaction that we are trying to tease apart so that we can understand personification technologies. Digesting all our experience to date we describe the technology in terms of utility, form, personality, emotion, social aspects and trust.

Utility

The issue of the utility is a good place to start as there is a spectrum of usefulness for personification technologies. At one end is non-specific purpose whilst at the other is specific purpose. A cat has no specific function other than to be a cat, while a care assistant undertakes specific tasks such as distributing medication, monitoring health and supervising exercise; but both may be considered personification technologies.

Utility is also concerned with the allocation of function between the two participants in a relationship. Relationships should also provide 'instrumental support' [2]. An important issue concerning utility and function is the issue of pro-activity. Personification technologies take the initiative and are pro-active in starting some new activity.

Form

The form that a personification technology takes refers to all the issues of interaction such as dialogues, gestures, behviours and the other operational aspects of the interaction. It also refers to the representational aspects such as whether it is 2D, graphical 3D or true 3D, whether it has a humanoid, abstract or animal form, and the modalities that is uses. The many aesthetic issues are also considered under this heading. The form and the behaviours of the personification technology are likely to vary widely between different implementations, but in empirical studies we have observed that although the detailed behaviours of a device such as AIBO were noted by people, they were not fore-grounded. Utility was the big issue and the details were secondary.

Certainly the attention that Sony paid to the behaviours of AIBO lead to a stronger emotional attachment. In a number of informal evaluations of AIBO, people would regularly comment on 'him' being upset, enjoying

something, being grumpy and so on. The attribution of beliefs, desires and intentions to an essentially inanimate object is an important aspect designing for relationships. For example people say that AIBO likes having his ears stroked, when there are no sensors in his ears. The careful construction of a mixture of interface characteristics — sound, ear movement and lights on the head in this case – result in people enjoying the interaction and attributing intelligence and emotion to the product.

Emotion

Designing for pleasure and design for affect are key issues for personification technologies. Norman discusses the three types of pleasure that need to be considered; visceral, behavioural and reflective. Attractive things make people feel good which makes them more creative and more able [8]. Relationships provide emotional support. Emotional integration and stability are key aspects of relationships [2]. There should be opportunities for each partner to talk about themselves to help self-disclose and to help with self-expression. Relationships provide reassurance of worth and value and emotional interchange will help increasing familiarity. Interactions should establish common ground and overall be polite. Politeness is a key attribute of the media equation described by Reeves and Nass [10].

Emotional aspects of the interaction also come through meta relational communication, such as checking that everything is all right, use of humour and talking about the past and future. Another key aspect of an interaction if it is to become a relationship is empathy; empathy leads to emotional support and provides foundations for relationship-enhancing behaviours. These aspects emphasize the personalised nature of relationships – as only in highly personalised interactions can empathy occur.

Personality and Trust

Personality is treated as a key aspect of the media equation [10]. Reeves and Nass [10] undertook a number of studies that showed how assertive people prefer to interact with an assertive computer and submissive people prefer interacting with submissive devices. As soon as interaction moves from the utilitarian to the complexity of a relationship, people will want to interact with personalities that they like.

Trust is "A positive belief about the perceived reliability of, dependability of, and confidence in a person, object or process" [4] Trust is a key relationship that develops over time through small talk, getting acquainted talk and through acceptable 'continuity' behaviours. Routine behaviours and interactions contribute to developing a relationship where they are emphasizing commonalities and shared values.

Social attitudes

Bickmore and Picard [2] emphasise appraisal support as a key aspect of relationship building and the importance of other social ties such as group belonging, opportunities to nurture, autonomy support and social network support. None of our investigations have involved opportunities to nurture, but of course the Tamagotchi demonstrates this clearly. Overcoming loneliness and acting as a social lubricant are two important principles that have come through in our investigations. Reeves and Nass identify specialists and team mates as different social roles that make media equal real life [10].

Relationships also play a key role in persuasion. The rather controversial idea of 'persuasive technologies' [4] is based on getting people to do things they would not otherwise do. In the context of personification technologies, though, this is exactly what you would hope a companion would do — providing it was ultimately for the good. A Health and Fitness companion, for example, should try to persuade its owner to run harder, or train more energetically. It is for their own good after all.

Designing For Relationships

The art of HCI will need to change if designers are to create experiences that allow people to build relationships with their personification technologies. We do not accept that it is possible to design relationships per se, but it is possible to design artifacts that will enable people to develop relationships with them. We summarise our approach as a 'star model' of designing for relationships (Figure 1).

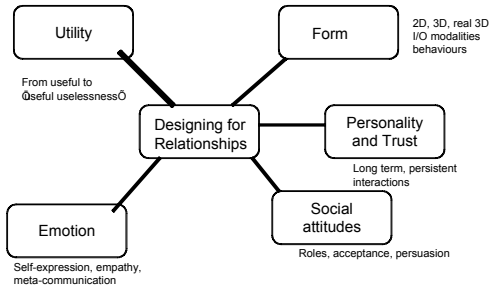

Figure 1 The star model of designing for relationships

Conclusions

Personification technologies will need to go further than simple key-word tags on objects. We want to associate objects from a domain of application with whole conversations in natural language that have happened between a person and the technology. These conversations will be highly domain specific, at least to start with, but will grow over time. Already we have effective spoken natural language interactions in domains characterised by structured tasks such as buying cinema tickets and train tickets. What we do not have is ways of joining up these natural language interactions, learning about individuals or engaging in less structured activities. The Companions project is directly addressing this aspect of personification technologies, focusing on conversation and rich natural language dialogues [12].

Interaction design will need to understand and develop a new set of techniques that will enable people to work at this level. And interaction design must do this as the inter-networked world becomes increasingly complex. New methodologies and new attitudes to design will be needed. Designing for relationships is very different than designing for function. Interaction design has always embraced the importance of form and as well as function and now it is taking on board emotional design too [8]. Now we demand a further step to deal with the characteristics described above to design for relationships.

The social impact of changing interactions into relationships is significant. We know that the 'persona effect' [6] can have significant impact on interactions and how significant the 'media equation' ('media equal real life') is for people [10]. There are important social

and ethical issues involved if we draw people into having relationships with devices, or with a computationally enabled ambient environment. There are issues concerned with exactly what these relationships might be like and what happens if they go wrong.

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