6th Report, Innovative Interfaces

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1 Context

The theme for this week's papers are human emotions, and how (and if) they are relevant to computers. From an HCI perspective the topic is known as *affective computing* (in some sources *emotion and HCI*), we can broadly consider the following.

- *Interpretation* Measuring affect involves collecting and analysing physiological state, a common method is visual interpretation of facial and body expressions.
- *Processing* Given a computer has the ability to detect affect; processing emotions sets out to answer how applications can best adapt and respond.
- *Synthesis* Emotional expression in computers are possible in various forms, for instance providing encouraging textual feedback. Expression may be more realisticaly achieved as embodied agents, for example 2D-avatars or even physical robots.

To achieve the above we also need to *understand* emotion, which is a topic of psychology. A simplified view of the neurological structure of emotion is one possible basis for affective computing [1]. Ekman's work on facial expressions [2], independent of computer science, investigates how facial expressions are linked to emotions, and the universality of these (cross-culturally and individually).

Emotional interfaces, as a modern branch of computer science, originated from the MIT Media Lab. The second paper [4] is an early publication from the Affective Computing Research Group, it is a broad survey considering potential uses and applications.

The last paper [5] investigates emotional expression, and shows that these can be independent from interpretation. Based on a simple experiment it demonstrates that emotion in embodied agents can have a psychological effect on the user. Since computers can effect our experience and behaviour in this way, it draws attention towards what beneficial applications there may be.

2 Summaries

2.1 Facial Expression and Emotion

Ekman has been the leading figure and contributor on facial expressions since 1965. Before then it wasn't considered to have much interest (was considered mostly a source of inaccurate and culture-specific information),

Ekman developed the first comprehensive system for measuring movements in the face, the Facial Action Coding System [3]. The system specifies configuration of facial features, such as position of brows, eyes, nose and mouth, related to a set of basic emotions (fear, sadness, joy, anger, etc.). He investigated what emotion and languages people use to classify facial expressions.

Based on his studies he was able to infer several observations not just about facial expressions but but also about emotions. Among the findings is that facial expressions is one of the principle ways humans show emotions, and measuring facial expressions may be one of the most direct methods of observing emotion. Another important finding was the universality of emotions across cultures, similar patterns were observed ranging between various modern societies and isolated tribes. Ekman also considers different classification of emotions, how directly they relate to facial expressions, possible exceptions, and possible individual differences.

In terms of emotions in HCI, measuring facial expressions defines a basis for us to observe emotions. Since there is a set of emotions that are shared by all humans, some techniques may be universally applied. And whatever model we chose for measuring physiology and emotions, it has important implications for interaction design.

2.2 Affective Computing

This paper surveys affective computing, its objective is to define the field and establish its usefulness and potential applications. Before the paper was written (1995) there hadn't been to date significant research on emotion in HCI. The most important question addressed is whether affective computing is important or useful. Emotions and computers, or emotions and science in general, had traditionally been seen as two distinct entities. Picard shows that emotions may have many benefits. In general emotions are an integral part of a human's thought process, and effect our decisions profoundly. Since computers are built to help decision making, the underlying reasoning is that the may do a better job if they are enabled to act on emotions. Several potentially useful applications are described. In *teaching*, it may be beneficial to observe if the student is appropriately challenged, by showing interest, enjoying the material or being frustrated. The level of difficulty may be adjusted accordingly. In *testing computer interfaces*, by observing emotional responses, it may be easier to determine which parts of

a product are good, and which need improvement. In general in any type of *experiment*, compared to user-feedback, measuring emotions may be a more direct and reliable way of collecting data.

It is noted there is an important distinction between interpreting and expressing emotion, as opposed to *being* emotional, this type of interpretation may carry a stigma on social impact. One challenge is that emotionally enabled computer may introduces *unpredictability*. This may not be considered a good thing, and may have difficult and unexpected design requirements.

2.3 Computers that care: investigating the effects of orientation of emotion exhibited by an embodied computer agent

The paper's object is to see determine if expressing emotions has any effect on the user and, if there is any difference between self-oriented emotion and emphatic emotion. The experiment orients around a game of chance where emotion is expressed in an embodied agent (without any types of measurement of emotion). User feedback was collected on a range of interpretations of the agent.

The experiment presented in the paper is very simple, the findings produced are aligned with what would be expected. The paper claims that emotional expression produces a psychological effect in the user, this is measured against user-collected data, for example a scale on likeability A higher score on likeability was expressed on emotionally emphatic agents, but I don't think it's certain that it can be related to actual user experience. Users may be biased to report on likeability without feeling any positive emotions during the tests. In general it is hard to see what the practical relevance of any of the data collected in this experiment. Most of the data collected seem connected to the images and textual comments themselves, rather than any of the dynamics of the application.

In general though, the paper is pointing in the direction that user experiences may be effected by expressing emotions. My feeling though is that expressing emotions may be of limited use, compared to adapting to emotion. The latter would require measuring emotions.

3 Evaluation

According to Rosalind Picard, the most important observation is that emotions play an essential role in decision making, perception and learning, and if we want to have better natural interaction with computers, we must give enable them with this ability. It has since become apparent that the potential usefulness of the applications, the ones mentioned in Picard's paper, more recently an important medical reason is for people with autism who have difficulty noticing emotion in others.

Facial expressions is probably the most direct and unobtrusive way of measuring emotions, so Ekman's work was significant, and it's interesting to note that emotion in HCI is cross-disciplinary between computer science and psychology.

Considering the field in general, there are several important and unexplored area for research in emotion and HCI [**?**], most importantly, which emotions should we most concered about, and how should interfaces attempt to address user's emotions. Areas of importance are related to attention (for safety), memory, performance and assessment.

References

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[4] Picard R.W. *Affective Computing*. MIT Press, 1997.

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