Position Paper:
CHI'97 Workshop on Human Needs and Social Responsibility

Support for Human Emotional Needs in Human-Computer Interaction

Jonathan Klein, Rosalind W. Picard and Jocelyn Riseberg*
Affective Computing Group
MIT Media Laboratory
*Since space is limited, only first author will attend
if paper is accepted

"Most men lead lives of quiet desperation." --Henry David Thoreau

It is perhaps a fundamental truth to every psychologist and therapist in the United States and elsewhere that the fulfillment of emotional needs is basic and necessary to human well-being. Leading a rich, fulfilling life is intimately tied to being aware of ones emotional needs, and being able to meet them [i.e. 1, 2]. Conversely, a life with routinely unmet emotional needs is often filled with pain, manifesting itself as anxiety, depression, or violence. Indeed, many of the most virulent problems that plague human society, from drug and alcohol abuse to violent crime, may be traced to a widespread inability to meet such basic emotional needs.

Two main factors seem to be at play here: The first may be called "emotional skill needs", an awareness of emotions and the ability to manage them, both ones' own and those of others [3]. The second factor may be termed "experiential emotional needs", which tend to follow Webster's definition of a need: "A physiological or psychological requirement for the well-being of an organism." When one or more of these needs go unmet, the individual may suffer pain; chronic failure to meet these needs can result in severe effects. Developmental psychology studies, for example, show that babies raised in orphanages who don't receive enough attention either die or have developmental disorders [4].

We believe that technology has advanced to the point that we can begin to develop tools that can help people meet their emotional needs, and that such work is important to the development of human-computer interaction. While we strongly believe that technology should never replace interpersonal interaction, humans often suffer from the lack of such contact. We see technology's role as a tool to educate, empower and perhaps help "fill in gaps" for meeting experiential emotional needs when other humans are unable to fulfill such roles.

What's involved

Below are provisional lists of the two aforementioned divisions of basic emotional needs: Emotional skill needs, and experiential needs. Emotional skill needs [2, 3] are the need for basic skills and abilities for handling emotions:

- Emotional self-awareness: a need to learn to appraise and express what one is feeling;

- Managing emotions: the need to handle and regulate feelings so that they are appropriate;
- Self-motivation: a need to learn to harness one's emotions in the service of a goal, for example by delaying gratification.
- Affect perception: a need to accurately appraise what others are feeling as they are feeling and expressing it;
- Empathy: a need to learn to appreciate what others are feeling (closely linked in the literature to emotional self-awareness [3]);
- Handling relationships, primarily via managing the emotions of others. This skill is a necessary component of friendship, intimacy, popularity, and leadership.

Experiential emotional needs [i.e. 5, 6] are mostly inherently social needs, and are therefore usually only met with the assistance or presence of others. These include a need

- ...for attention -- strong and constant in children, fading to varying degrees in adulthood [10]
- ...to feel that one's current emotional state is understood by others (particularly during strong emotional response);
- ...to love and feel reciprocity of love;
- ...to express affection, and feel reciprocated affection expressed;
- ...for reciprocity of sharing personal disclosure information;
- ...to feel connected to others;
- ...to belong to a larger group;
- ...for intimacy;
- ...to feel that one's emotional responses are acceptable by others;
- ...to feel accepted by others;
- ...to feel that emotional experience and responses are "normal";
- ...for touch, to be touched;
- ...for security;

How computational media can help

Computers offer great potential for supporting human emotional needs, because many properties of modern computational media are natural affordances for supporting emotional needs. In particular, interactive media:

- Are increasingly portable, smaller, cheaper. Therefore they are increasingly able to be with their users at all times.
- Show signs of soon being able to sense emotion via a variety of traditional means such as facial expression [12], tone of voice [11], and gesture [13].
- May be able to sense emotion via non-traditional means [8].
- Are able to be eternally attentive. Event- and interrupt-driven computational paradigms provide a constant, focused ability to pay attention to a person; particularly valuable for applications with young children.
- Tend to be treated as real people by humans [14].

The promise that interactive media hold for supporting both types of emotional needs is as significant as the promise such media holds for supporting educational needs, or for enabling social interaction. We evaluate these opportunities below.

Supporting emotional skill needs

Educational technology has proven to be an effective and creative means for enabling learners to acquire academic skills and knowledge. It is neither a leap of imagination nor faith to imagine such tools designed to address emotional skill needs. Software tutors could be built today for students of any age to learn about emotions; other tools could help build emotional awareness and management skills.

Some of the latter skill-builders could also be constructed today, via similar means. Even an emotional awareness-builder might be built today, by prompting the user to record emotions (perhaps selecting from a list of pre-defined emotions, to start with) at random moments of the day. Work on such a tool is in the preliminary stages of investigation by the authors at the MIT Media Laboratory.

Research in the development of real-time emotion sensing and recognition is also underway as part of the Affective Computing project at the Media Lab. The realization of this technology may represent a fundamental advancement in human-computer interaction. For example, it may enable the development of an emotion-sensitive "Active Listener." Active listening is a simple but powerful skill used extensively by experienced therapists, and involves providing non-judgmental feedback, often about a speaker's emotional expression during conversation. While such a tool would probably rely on still-primitive speech processing capabilities, the potential benefit for such a tool is enormous. Elliot's "Affective Reasoner" [11], based on the Ortony, et al cognitive model of emotions [5], is an existing tool that could be incorporated into a system that tries to understand how events, acts, and objects are interpreted with respect to an individual's goals, standards, and preferences.

Recent work by the first author involves preliminary work toward such emotion-content conversational capabilities between user and machine. Specifically, the author has created a prototype for a software interface agent that uses machine-learning strategies to learn aspects of conversational style, to increase the subjective quality of user experience in dyadic speech interaction with computational media. This agent is designed to modify a computer's speech output to adapt to the way users prefer their conversational partners to interact.

Another possible application lies in supporting the needs of those with mild autism. There are as many as 460,000 people with autism in the US alone. Such people are often unable to experience any emotional awareness whatsoever. Instead, they try to memorize "normal" emotional responses by others. These people would benefit from an "affect tutor" that is able to interactively teach its users emotional reactions to a wide variety of situations.

Supporting experiential needs

While one may assume that experiential needs can only be met by other humans, this perception is false. Many people routinely meet many of these needs via other means, such as pet dogs or cats. In fact, people are able to establish relationships with a wide variety of organisms, with varying degrees of interactivity, and from whom they derive

substantial pleasure and satisfaction. Computational, "emotionally supportive" systems would theoretically springboard off of this natural propensity for inter-organism bonding, and provide the user with an outlet for emotional expression. The popularity of recent products that feature computational simulations of pets* demonstrate that interactive media can stimulate pet-like emotional bonding, for children and adults alike. Again, this conceptualization does not suggest that machines would substitute for interpersonal or even inter-organism contact, but offers a dramatic expansion in the availability and interactivity of non-human companions.

Bleeding-edge speech recognition and understanding still fails to offer us the ability to support full linguistic communication, and such capability would only augment the ability of machines to meet human emotional needs. This field is advancing rapidly, yet it is clear that humans can and do meet many of their experiential emotional needs on a daily basis without requiring linguistic communication. Computational media has much to offer today and in the future to assist in their provision, but such products require research and development.

Finally, imagine a computationally-realized "imaginary friend" for a shy child, who could teach the child about emotions and how to make new friends, while providing (temporarily) the warmth of companionship he is missing.

Conclusions

Research in computational support for human emotions represents an expansion of the scope of HCI research, yet such efforts are critical for the advancement of the field of human-computer interaction. It is our position that machines can augment the ability of humans to meet most (if not all) of these needs, and we will enumerate these ideas at the workshop.

Nearly all people have emotional needs, and if they go unmet, the consequences can be great. Therefore, it seems clear that any steps that can be taken to enable a person at risk to meet his own emotional needs can have profound effects, not only on the individual but also on those in his environment. We argue that computational media offers a great deal of promise for providing such support. We have enumerated a number of such avenues for future research, as well as our own efforts in this area. We are just beginning to address these challenges, yet the importance of this work merits a much larger effort. Fruits of these endeavors hold the promise of meaningful, beneficial effects on individuals and the society as a whole.

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Footnotes

* Note, for example, the phenomenon surrounding Dogz and Catz, in which adult Macintosh users adopt and play with software simulations of these animals on computer terminals. Beyond exhibiting behaviors associated with real pets, Dogz and Catz have prompted their "owners" to display

anecdotal evidence of emotional attachment, including posting affectionate screenshots of their pets on web pages. Similarly, a device on which is displayed a virtual pet bird called a "Tamagocchi" has achieved enormous popularity in Japan [15]. The Tamagocchi emulates emotional needs of its own: If its user doesn't feed it and show it affection (via pushing buttons), the image of the bird "dies". Like Dogz and Catz, both adults and children have adopted the Tamagocchi. These examples suggest that humans have a propensity for relating emotionally to computational media.

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Jonathan Klein*, Rosalind Picard** and Jocelyn Riseberg***
The Media Laboratory
Massachusetts Institute of Technology
20 Ames Street
Cambridge MA 02139-4307 U.S.A.

* 1 (617) 253-9401 Room E15-468C phaedra@media.mit.edu
** 1 (617) 253-0369 Room E15-383 picard@media.mit.edu
*** 1 (617) 253-0384 Room E15-394 rise@media.mit.edu

Background of the authors

Jonathan Klein

Jonathan Klein is a graduate student at the MIT Media Laboratory, working on the Affective Computing project, a multi-disciplinary research effort led by Professor Rosalind Picard. Affective Computing aims to enable computational media to recognize, model, synthesize and respond to human emotions. Others in the research group seek to sense and recognize emotional states by means of monitoring physiological response patterns that accompany emotional response. Jonathan is working to develop human-computer interaction paradigms that account for, and support, the emotional experience of users.

Jonathan received his B.S. with highest honors in Human-Computer Interaction and Computer Graphics from the University of Michigan in Ann Arbor. There, he worked with Elliot Soloway to develop interaction design solutions for a number of major research efforts in educational technology. These include serving as chief interface designer for a K-12 student learning environment for the University of Michigan Digital Library (UMDL). He was also project manager and chief interaction designer for the Investigators' Workshop, a virtual-world, integrated, on-line, collaborative learning environment for K-12 science projects. Jonathan served as interaction design consultant for the Upper Atmosphere Research Collaboratory (UARC) project, the Model-It project, and Danube, a graphical, on-line, multi-player fantasy game built in Java, among other efforts. He has also worked as an art director, graphic designer and illustrator for magazine and newspaper publishing firms.

His main interests include the design and evaluation of visual and

conversational speech interfaces; extending HCI to include support for a broad range of human needs; affective understanding, which involves building systems that can construct and dynamically maintain a model the user's emotional life, including discrete emotional states, moods, and temperament; application design for affective computing, as well as privacy and security issues that arise with the advent of emotion-savvy machines.

Rosalind W. Picard

Rosalind W. Picard is NEC Development Professor of Computers and Communications at the MIT Media Laboratory in Cambridge, Massachusetts. She holds Sc.D and S.M. degrees in both Electrical Engineering and Computer Science from MIT and a Bachelors degree in Electrical Engineering from Georgia Tech.

Prior to pursuing her doctorate, Picard was a Member of the Technical Staff at AT&T Bell Laboratories where she designed computer architectures and algorithms for digital signal processing. She has also worked closely with or consulted for a number of companies, including British Telecom, Hewlett-Packard Research Labs, IBM, Interval Research, Kodak, and NEC.

Picard is the author or co-author of over fifty peer-reviewed scientific publications, and is one of the pioneers of content-based retrieval for digital image and video. She has a forthcoming book on "Affective Computing," addressing computers which can recognize, express, and in some cases, "have" emotions. A present focus is on building affective wearable computers in smart clothing and jewelry, to sense the affective state of the wearer.

Jocelyn Riseberg

Jocelyn Riseberg is currently working as a Visiting Research Assistant for the Affective Computing Group at the MIT Media Laboratory. She holds a Master's degree in Social/Developmental Psychology from Brandeis University as well as Bachelor's Degrees in both Psychology and English Literature from Tufts University. Her role at the Media Lab includes designing and implementing experimental paradigms in the domain of emotion elicitation, as well as providing perspective from the psychology community on affective intelligence. Previous to her Master's program, Ms. Riseberg spent several years designing and conducting experiments in neuroendocrine pathology at Tufts Medical School/New England Medical Center.

Ms. Riseberg's past research protocols have examined verbal and nonverbal expression; particularly how these phenomena are manifested in computer and videomediated communication. At present, she is pursuing research into the design of systems possessing social/emotional intelligence, drawing from a social-scientific perspective on computational media.

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In recognition of the potentially sensitive nature of
the issues in this workshop, We affirm that we will treat
any personal information revealed in the workshop
as private and confidential.

--Jonathan Klein
--Rosalind W. Picard
--Jocelyn Riseberg

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