Towards mood-oriented interfaces for synchronous interaction

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ABSTRACT
This paper presents an approach to representing emotions in synchronous text-based communication which facilitates setting, conveying and perceiving an intended mood in a continuing fashion. We posit that, while chatting, users typically remain in a continual mood for relatively extended periods of time, as compared to the instantaneous representation provided by mechanisms such as smiley faces and *emoticons*. In order to explore our hypothesis, we built a prototypical instant messaging environment that provides a persistent representation of mood. This representation is based upon a bi-dimensional valence-arousal model of emotions. We report on initial results that indicate that synchronous text-based communication benefits from this approach.

Keywords
Affective computing, instant messaging, emotion models, emoticons, valence-arousal model.

INTRODUCTION

Synchronous text-based communication (or "instant messaging") has become immensely popular in practically all settings, from highly informal conversations among children and teenagers to live updates among travelers to formal virtual meetings in office and research environments. Because of its widespread use, instant messaging (IM) poses interesting challenges for interaction designers to ensure that users are able to communicate effectively even when they cannot rely on richer channels such as audio and video.

One common problem observed in regular use of IM environments is the difficulty users find to accurately convey their emotions during text-based conversations. The nature of IM imposes a somewhat hasty style of interaction. Frequently, gaps in communication occur because text-based expressions that are typed with only minimal reflection do not carry sufficient information on the participants' predominant state of mind.

Thus, for example, statements intended to be humorous are taken seriously, or vice versa. Subtler mood variations, both positive and negative (e.g. happiness, joy, enthusiasm, sadness, sleepiness or depression), are even more difficult to convey or to detect in IM conversations.

It is common for IM users to resort to so-called "smileys" that provide clues on the intended meaning of what they type. Also, popular IM programs such as those made available by Microsoft and Yahoo! provide a variety of icons, referred to as "emoticons", from which users can pick the ones that may represent their emotions and can be interspersed along with the text to assist in its appropriate interpretation.

As discussed by Brave and Nass [1], it is useful to categorize affective responses as emotions, moods, and sentiments. Emotions are reactions to events, are typically short-lived, and are directed to objects (a person becomes *angry* at something, or *excited* about an event). Moods last longer and act as filters through which events are appraised (a person may be generally depressed without reference to an event or object). Finally, sentiments are persistent, almost permanent attitudes of individuals towards classes of objects (a person may develop a stereotype and generally like or dislike certain kinds of movies).

We contend that current aids for representing affect in IM environments, such as smileys and emoticons, represent a feeling at one instant during a discussion, or a reaction to a given issue that occurred during a conversation, but are insufficient to convey moods or sentiments. As a conversation progresses, the emotional state of IM participants may change or remain the same but, unless emoticons are continuously added to each line, there is not an explicit indication of such states. Emoticons enhance or underline the meaning of certain text elements, but as text scrolls upwards and disappears from view, they are rendered insufficient to represent longer-lasting affective states such as moods and sentiments.

In this paper we report on the design and initial use of Affective IM, an extended IM interface in which affective states may be selected from a palette of graphical representations and are sent to other participants to set a desired mood. This representation remains visible and

unchanged for as long as the user's mood is maintained. The palette of affective states we designed is a computer representation of a bi-dimensional model for emotions which is based on the notions of valence and arousal.

The paper is organized as follows: The next section provides pointers to salient work in the area of emotion modeling. Then we discuss the main decisions we made in the design of our IM interface. This is followed by a discussion of our observations of the use of the resulting IM environment. Finally, we provide an overview of ongoing and future work as well as the conclusions drawn from our initial experience with our affective IM environment.

RELATED WORK

There is a considerable body of work in the area of affective computing that is focused on the detection and communication of emotions. Of particular relevance is the research conducted by the Affective Computing Group of the MIT Media Lab, which has explored a wide range of avenues, including the use of external sensors to monitor physiological responses such as blood volume or heart rate to detect affective states [2], or the combination of facial expressions and typing speed as cues for the tone of email messages [3]. In our initial design we considered the use of external devices or video cameras but we ruled out these options due to cost and added complexity for our IM setting.

Persistent affective relationships are explored by [4], only they focus on user-technology or user-software agent relationships, rather than persistent affect when computers mediate human-human communication.

Central to our interface design is the work on models for emotions. Among others, we considered those proposed by Ortony et al. [5], Russell [6; 12], Roseman et al. [7], and Lang [8]. As discussed below, in the end we opted for a bi-dimensional representation that follows what is promoted by Russell and Lang, mainly due to its simplicity, ease of representation and positive feedback obtained from preliminary usability tests.

The representation of emotions in computer-mediated communication has also been explored by Imood [9] and Tecuanhuehue [10]. Our work is different in its emphasis on synchronous communication and the model of emotions on which it relies.

DESIGN OF A MOOD-ORIENTED IM INTERFACE

Figure 1 illustrates the model for emotions we selected as our basis to augment an Instant Messaging environment with means to express a user's mood during a conversation. The model is based on the valence-arousal dimensions suggested by researchers such as Russell [6] and Lang [8] to characterize affect. The horizontal axis in this representation refers to *valence*, which can be defined as a subjective measure of pleasantness or unpleasantness, whereas the vertical axis refers to *arousal*, which can be defined as a subjective state of feeling activated or deactivated [10].

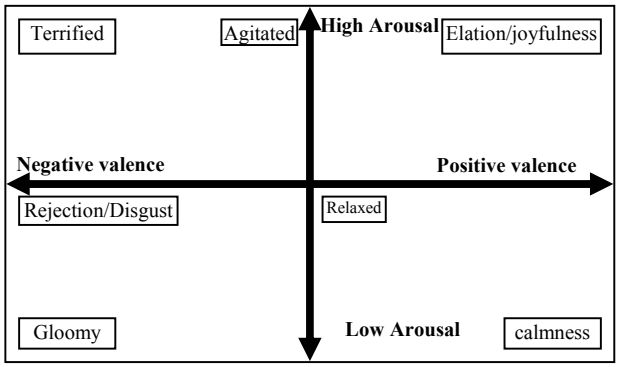
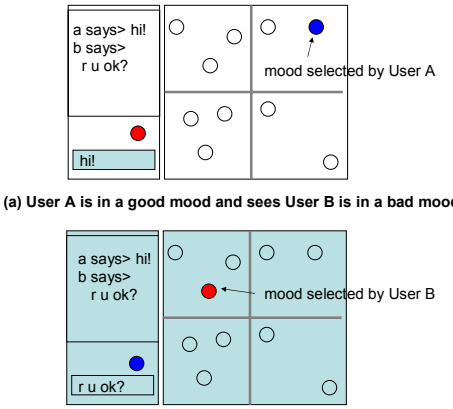


Figure 1. Graphical representation of a valence-arousal model of emotions.

Figure 1 also shows a few affective states that may as well correspond to some valence-arousal combinations. Thus, for example, "terror" could be mapped to a state entailing a very unpleasant and highly activated state of mind, whereas gloominess may also be unpleasant, but a gloomy person tends to be passive and can be said to be deactivated. Similarly, joyfulness and elation can be mapped to highly activated, positive emotions, whereas calmness and bliss may be very positive, but entail relatively low arousal. Experimental work reported by Russell [6] and Russell et al. [11] goes further to suggest precise locations of a variety of discrete emotions in a bi-dimensional representation of the model. Furthermore, their work shows that placement of specific emotions in the grid determined by the valence-arousal dimensions seems to be language- and culture-independent.

These properties of the model, plus its potentially direct mapping to a bi-dimensional display representation in which discrete emotional states can be positioned, prompted us to use it as the basis for an augmented IM interface. Figure 2 illustrates our approach: The user is presented with a familiar IM interface in which a graphical representation shows the current interlocutor's mood along with an "emotive panel" associated to the user's own mood.

The emotive panel should include a graphical depiction of a wide range of possible moods distributed throughout the x-y grid according to their valence-arousal attributes. The emotive panel could be updated automatically according to the tone of the conversation or manually by the user explicitly deciding to set a mood. Graphical representations for each mood may vary from emoticons or smileys to user photographs.



(a) User A is in a good mood and sees User B is in a bad mood

(b) User B is in a bad mood and sees User A is in a good mood

Figure 2. Initial design for a mood-oriented IM interface.

As discussed below, our initial implementation relies on manual selection of emoticons. Additionally, we introduce the use of specific text attributes such as font face, size and color associated to each mood. The selected emoticon would be sent to the other party, along with the text message using a corresponding size, font and color. Mood is displayed graphically in a conspicuous place and messages are rendered using the same text features for as long as the user remains in same emotional state.

Table 1. Sample mapping of emotions to diverse fonts, letter sizes and RGB colors.

Affective State	Font	Size (points)	Color (RGB)
Sad	Arial	12	139 ,137, 137
Happy	Times New Roman	15	255 ,204, 0
Very Angry	Brush Script	35	119 ,0, 0
Angry	Bookman	30	142, 35, 107
Tired	Arial Narrow	20	0 ,112, 112
Amazed	Lucida Console	35	255 , 0 , 0
Inspired	Tahoma	15	0 , 0 , 255
Ashamed	Courier	12	150, 200, 162

Modeling emotions with fonts, colors and text size

Different colors may cause different reactions in human beings. They can influence states of relaxation or pleasure, tension or irritability, peace or passion [12]. At least in western societies, colors in the range of blue, green and purple are typically considered peaceful and have a relaxing effect, while warm colors like yellow, pink, orange and light green can create an agreeable, exciting and sociable environment. Red is usually a color that irritates and causes impatience or a state of alarm.

Additionally, the type of the lettering used to display each message may convey different feelings. Larger letters capture attention better, whereas soft lines or cursive writing look friendlier that straight or bold letters. During the design of our IM interface, we experimented with various features to be used with messages to convey affect. Table 1 shows a sample of the mappings between emotions and font faces, sizes and colors, which are used in our current implementation of our affective IM interface.

Table 2. Summary of emoticons

	Angry		happy		confident
	Afraid		Bored		fortunate
	Nervous		em-barrassed		mocking
	Surprised		Doubtful		relaxed
	un-comfortable		Amazed		inspired
	Sad		in-love		tired
			rebellious		

Emoticons

Emotional icons or "emoticons" are stylized images with specific features intended to represent emotions. They typically do not refer to gender or race and use solid colors and clear expressions, as their only task is to communicate an emotional state.

We also experimented with diverse emoticons proposed by a graphic designer in our group. Table 2 shows 19 emoticons that have been included in our affective IM interface.

IMPLEMENTATION OF THE AFFECTIVE IM INTERFACE

During the initial phase of the development, a rough prototype for our IM interface was presented to potential users to test the idea's feasibility. This prototype included only a subset of functions and possible emotions.

A test of the prototype was designed with the participation of a group of ten users. In the first part of the test, all of the subjects were asked to select the emoticon from the panel that best represented their current mood, according to scenarios they were given. Figure 3 shows the setting we used for each side of the test and the initial layout of our augmented IM interface. In this first prototype the "emotive panel" was always displayed along with the main chat interface and only a small number of affective states were mapped to the grid.

Figure 3. Setting for tests of an Affective IM prototype.

The second part of the test consisted of a questionnaire to evaluate their experiences. Table 3 presents a summary of opinions expressed through the questionnaire.

Table 3. Summary of responses to initial questionnaire.

Consider the emotive panel useful?	100% YES
Agree with how emotions are represented?	57%
Suggested additional / other emotions:	43%
The use of different colors, fonts and sizes represented emotions accurately?	58% YES 42% NO
This type of chat improves communication?	100% YES
Is the classification of emotions adequate?	71% YES 29% NO
Is it easy to use?	82% YES, 18 % NO

This test provided helpful information on the usefulness of the proposed interface to represent affective states and the user's acceptance of a tool of this kind. Based on these results, adjustments were made mainly to the proposed emoticons and a new version of the prototype was constructed.

Figure 4 illustrates the appearance of the Affective IM's emotive panel. As can be observed, this panel is a direct representation of the valence-arousal model of emotions, in which the two axes determine four quadrants. Emoticons are distributed on these quadrants according to the emotion they represent. Positioning the cursor over any of the emoticons also provides a textual description of the corresponding mood. Emoticons also act as buttons that, upon selection, set the corresponding mood and trigger changes in color, font face and size of the text displayed on the screen.

The emotive panel appears as a separate window which the user can decide to minimize or move as desired. This is in contrast with our initial prototype, in which the emotive panel could not be detached from the main chat window. We opted for this separation to support the idea that moods may last for extended periods and the user may prefer to bring this functionality to the forefront occasionally during a conversation.

Actions performed on the emotive panel (i.e. clicking on a specific emoticon), have a direct effect on the main chat window. Figures 5 and 6 illustrate a conversation using the Affective IM. An enlarged version of the selected emoticon is displayed on the other party's screen as soon as a mood is set. Also, users noted that they needed some means to check their own current mood without resorting to the emotive panel (where the corresponding emoticon was highlighted). We thus decided to include a smaller emoticon in the main chat window to reflect the user's current mood.

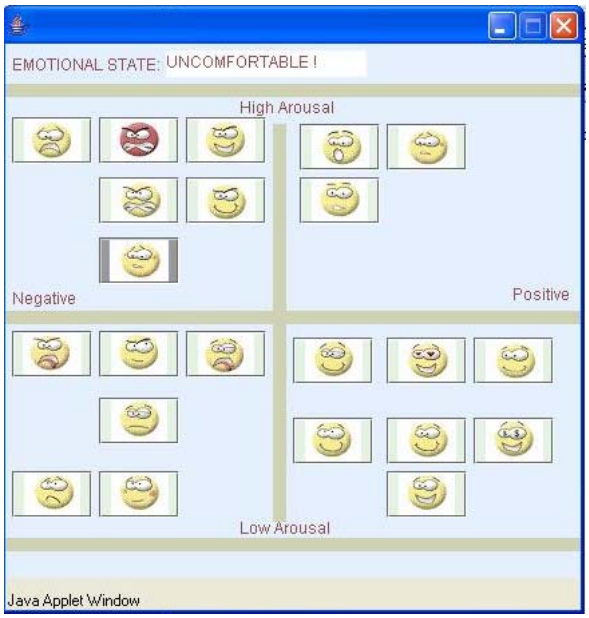


Figure 4. The Affective IM's emotive panel

Also shown in Figure 4, the names of the users currently online are displayed on the upper right corner. On the left side, a large text area displays the current dialogue. The different colors and typefaces provide clues on the mood and mood changes as the conversation has progressed.

A smaller text area allows participants to enter their messages. As in other IM interfaces, the user types the text to be sent and then presses the button to the right ("Send"). Figures 5 and 6 also illustrate the views from both sides of a conversation. Whereas user "ingrid" is in an "uncomfortable" mood (smaller, yellowish text), user "alfredo" has just changed from a "relaxed" mood (medium-sized, greenish text) to an "angry" mood (larger, bold, reddish text). The figures also show that emoticons are displayed on both chat windows, only the other party's emoticon appears in a larger size.

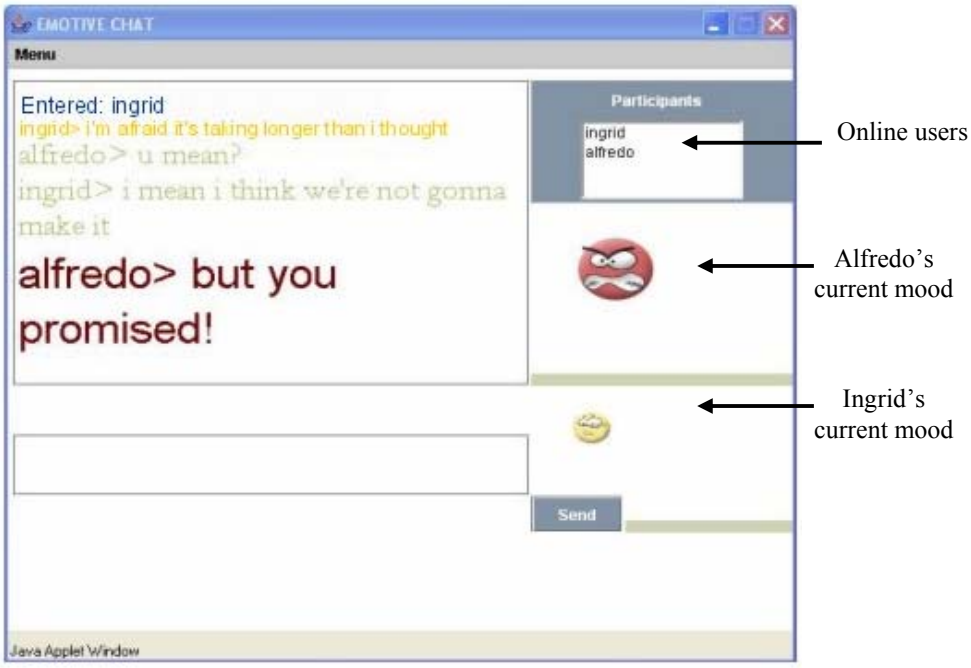


Figure 5. Example of a conversation between two users (Window for user "ingrid").

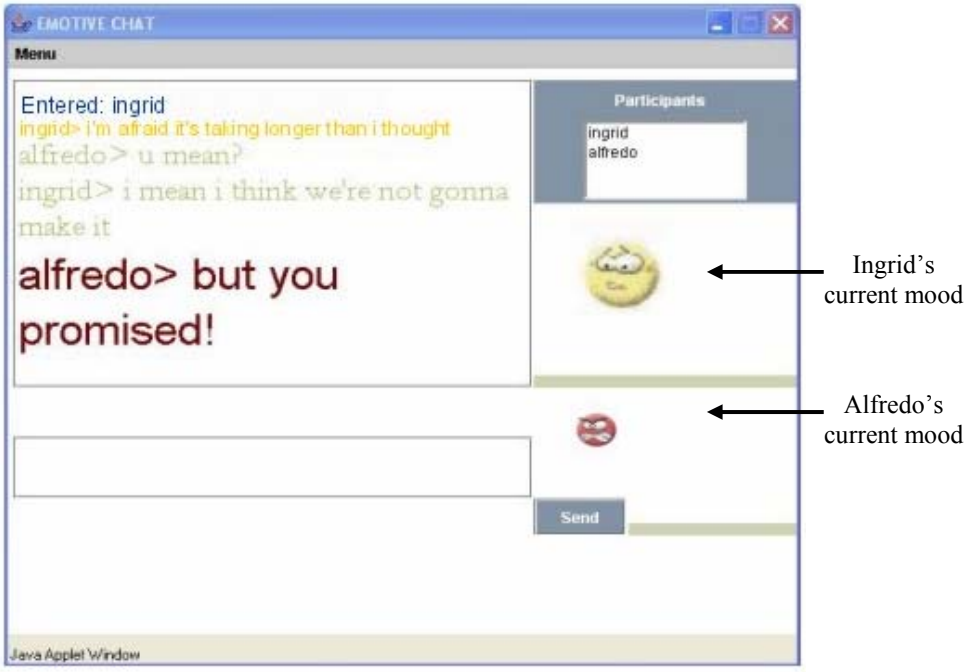


Figure 6. Example of a conversation between two users (Window for user "alfredo").

EVALUATION

We initially tested our Affective IM environment mainly among members of our group. We also designed a more formal study in order to assess how it may support our early premises on the mood-orientedness of instant messaging. In our study, ten subjects working in pairs were presented with the Affective IM interface. After a short briefing on the nature of the interface they were asked to communicate with each other and to use the emotive panel freely so they became familiar with the way our IM interface works. Next, they were given scenarios that entailed different affective states. For example, they were asked to tell their interlocutor about a failed exam, an upcoming job interview and a lost wallet (the complete kit for this experiment is detailed in [13]). Sessions were videotaped and semi-structured interviews were applied to participants.

Our observations confirmed that users stay in a selected mood (typically not the same on both sides) for extended periods of time, essentially while a conversation focuses on a given topic. It was interesting to note that during those periods, smiley faces were still used to indicate a momentary emotion but the general mood was unchanged. This way, users were able to attend to the emotive panel only when a significant change in their affective states occurred.

We observed that users did not have difficulty to find a mood they wanted to convey using the emotive panel. During the interview, all users mentioned that the organization of emoticons into a grid according to pleasantness and activity levels appeared natural to them and made it relatively easy to find an appropriate emoticon for a given mood. Although we have not conducted tests involving formal comparisons with other IM interfaces, in their comments our users have compared the emotive panel positively with respect to linear organizations of emoticons.

Table 4. Summary of responses to post-test questionnaire.

Consider the emotive panel useful	100% Yes
Affective IM helps in conveying moods/emotions	67% moderately 33% significantly
Affective IM improves communication	100% Yes
Improvement with respect to other IM programs	100% Moderate
Affective IM is easy to use	67% Very easy 33% Easy

Table 4 provides a summary of some of the issues addressed by post-test questionnaires. In general, we observed a good level of user satisfaction and acceptability of the interface. Still, most users noted in the interview that the emotive panel has ample room for representing other affective states and, in some cases, users referred to subtler moods that they wished they had available on the panel. We think of the emotive panel as a continuum to which discrete affective states of arbitrary granularity are mapped. It would be possible to include dozens or even hundreds of affective states and to make them available for selection. There is, however, a compromise that we need to explore between richness of affective expression, screen space and interface complexity. Thus far we have opted for simplicity at the expense of granularity in order to obtain initial feedback that informs future versions of the Affective IM.

For the time being, Affective IM has focused on conversations between pairs of users. Supporting chat rooms with three or more users would make it necessary to redesign the main chat interface to keep the user aware of every participant's mood. Although text attributes such as color and font size would maintain a record of current and past moods, one potential conflict arises as these features are commonly used in other IM interfaces to facilitate the identification of specific users.

CONCLUSIONS

Computer networks are increasing its importance as mediators of human communication in all kinds of scenarios. Instant Messaging (IM) has become a popular mechanism to support informal and formal communication. Thus, it is important to study the potential and limitations of IM and to explore ways in which its mediation role can be accomplished more effectively. One key shortcoming of text-based IM is its limited means to convey affective states, which often hinders communication.

We have described Affective IM, an IM facility that has been augmented with functionality to support the representation and awareness of moods. The emotive components of Affective IM are based on the graphical representation of a bi-dimensional, valence-arousal model of emotions. Initial experience with Affective IM supports the notion of moods that last for extended time periods during a conversation, and indicates that representing mood in addition to emotion has a positive impact on improving communication.

We are interested in continuing this work in various directions. The granularity of represented affective states versus the size and complexity of the interfaces is a tradeoff that we would like to investigate through experimentation. We also plan to explore mechanisms to automatically propose mood updates for participants in terms of the content of the conversation. The problems of mood representation and awareness for more than two participants, as mentioned earlier, is one more of the areas we plan to address in future versions of Affective IM. Finally, we plan to include Affective IM as a component for digital library environments such as virtual reference and annotation facilities. We believe observation in an

actual work setting will provide insight on the impact of an affective interface and will inform future developments.

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