An Explorative Study on Requirements for Ambient Displays Presenting Mood Awareness

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Abstract

In face-to-face meetings important information about other team members' mood can be grasped from facial expressions. In distributed teams this information is missing. Media Spaces connect users in different rooms over distance via audio and video links. While studies on awareness have shown that mutual information—including the mood—improves social interaction, concerns with respect to users' privacy in the connected rooms are increasing. In this paper we report on a study exploring the design space of ambient displays as means of capturing and presenting mood awareness while preserving present users' privacy. Our survey (N=19) revealed interesting requirements for the design of ambient displays and shows that the actual mood has a strong influence on the willingness to share one's mood.

1   Introduction

Media Spaces have a long tradition in Computer-Supported Cooperative Work. Many systems and user studies have shown the strengths of connecting rooms via permanent audio and video links over distance to facilitate spontaneous formal and informal interaction (Gross & Beckmann 2009). In particular, colleagues' mood is an important fact. Mora et. al. (2011) showed that an ambient display that supports aggregated emotional awareness among team member lead to a better performance of teams in meetings. However, finding a balance between awareness and sharing versus privacy remains a challenge (Zhang & Xu 2016).

In this paper, we report on a survey to gather requirements and wishes for designing ambient displays capturing and presenting mood awareness among remote rooms and their inhabitants with respect to privacy concerns; actively communicating versus passively tracking mood information; as well as displaying mood information. We glance at related work of ambient mood displays and privacy concerns faced; and we describe the method of our study and present its results.

2   Related Work

Ishii's group at the MIT Media Lab were among the first to develop and publish ambient displays. Their ambientRoom had several sensors capturing information of users in rooms, and displays presenting the information subtly in the users' periphery of attention (Wisneski *et al.* 1998). For instance, their 'active wallpaper' is an infrared camera-based display projected on the room wall to show movement in a remote room. Users felt it was intrusive due to the literal mapping and lack of privacy, which lead the authors to find a more abstract display of data such as the fuzzy dots instead of displaying people's video images.

The MoodLight ambient display specifically aims at presenting mood information. It automatically tracks users' mood with biosensors and uses multicolour LED lamps to represent users' mood using warm colours for high arousal and cold colours to describe a more relaxed state. A study of the system demonstrated the privacy challenges with respect to unintentional disclosure of feelings (Snyder *et al.* 2015).

3   Methods

We conducted an explorative user study on design tensions between (1) mutual interest and empathy versus privacy concerns; and (2) manually controlling and influencing the process versus effort entailed. The participants that used our online survey were randomly selected. They were 11 females and 8 males; the age ranges were: 5 aged 18-24 years; 12 aged 25-34; 1 aged 45-54. Users were informed that their data would be handled anonymously and confidentially when taking the survey.

In the first part of the survey users were asked about demographics, and in the second part about their mood awareness and privacy. More specifically, the second part included their perception of how important mood communication is to them and being aware of others' mood. The point of departure were the three moods: Positive, Neutral, Negative that are prevailing in literature. They were asked about their mood representation preferences choosing between 3 representations (Colours from a Colour Spectrum, Picture of Imagery Scene, Physical Objects) per each mood. Users were shown examples of each of the representations. We asked about their privacy choices with respect to revealing their information and their identity (Private, Anonymous, Public). The privacy choices were explained as following: Public: Your mood is made available to the public, and your identity is associated with it; Anonymous: Your mood is made available to the public, but your identity is not associated with it; and Private: Your moods is only made available to you and no one else. And they were asked how they would prefer to have their mood captured (Automatically, Manually) for communicating their chosen representation per mood. Tracking choices were explain as following: Automatic: You allow the computer to automatically calculate and infer your mood; and Manual: You choose to select your own mood manually. Finally, the users were given open-ended question such as what other representations they would like to add to the previous demonstrated representations.

4   Results

In this section, we analyse the outcome of our survey focusing on the mood in comparison to their mood representation, mood tracking and privacy choices. Our preliminary results show a trend between different types of mood of users and their choice of privacy and representation. Users' preference of colours for mood representation is the highest for negative mood compared to neutral and positive mood. Nevertheless, imagery scenes are the most preferred overall, while physical objects are least preferred (cf. Figure 1). Looking more closely at the different image for the imagery scenes, users tend to prefer more abstract images of mood such as nature and silhouettes, as opposed to expressive human faces of mood. The choice of colours did not follow a consistent pattern of warm colours for positive moods and cold colours for negative mood. Some users preferred lighter colours for positive mood and darker colours for negative mood.
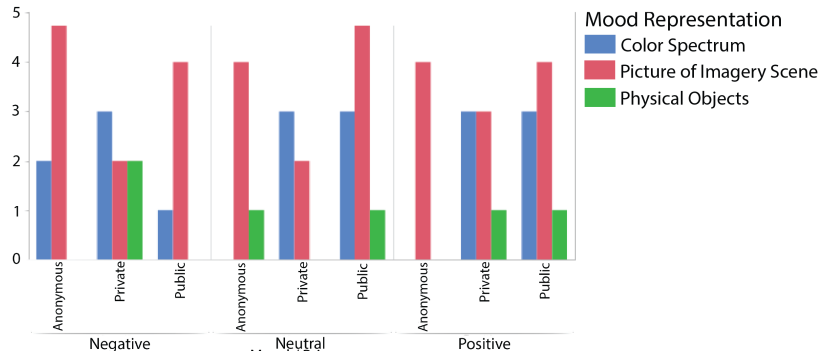

Fig 1: Number of Participants for Mood Representation per Mood and Privacy Choice.

Users preferences for capturing versus communicating their mood strongly depend on the respective mood. Public and automatic detection of mood was most preferred by users for positive and neutral moods, while for negative mood users preferred private or anonymous privacy setting for the presentation of their mood, and chose Manual communication of their moods (cf. Figure 2).
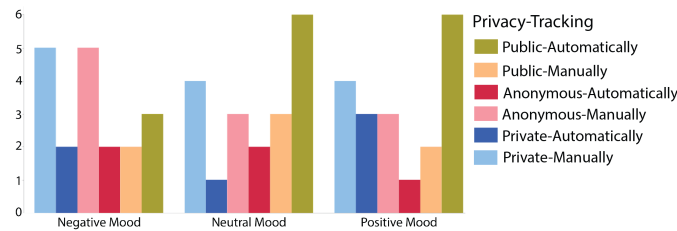

Fig 2: Number of Participants for Mood and User Privacy/Tracking Choices.

5 Conclusion

Our results concerning users awareness of their teammate mood aligned with previous studies (Church *et al.* 2010) which showed users interest in the mood information of their fellow peers, or the need for comparison of users to a public reference of mood. We showed that despite the abstract and subtle nature of colour representation for mood ambient displays such as Moodlight, it may be miss-interpreted at the receiving due to cultural and physiological difference, compared to the imagery scenes which would mediate the mood in a more detailed manner. Nevertheless, imagery scenes could have been more revealing, yet the investigation of applying visual filters could help to reduce this intrusive and increase abstractness for privacy. In the future more exploratory interviews and user studies could gather user needs for our mood ambient display design, focusing on the controllability and adaptability aspects of the display for privacy in tracking and representation.

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