Augmenting Collaboration with Invisible Data

Brain-Computer Interface for Emotional Awareness

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1. Introduction

Emotions play a crucial role in human collaboration. Almost every task can become emotional when one transits from individual to group work. Emotions can affect our beliefs and judgments and have the potential to disrupt activity, which in turn has important consequences for group performance.

This poster describes a concept of an emotion awareness tool for remote collaboration which aims to measure and represent emotional information in an unobtrusive way.

2. Emotion awareness tools

The lack of non-verbal cues is a commonly recognized challenge of computer-mediated communication [2]. There is a line of research suggesting that people can collaborate better when they are aware of their own state and this of other people. But what are natural and effective ways to convey (and, first of all, to measure) emotions in CSCW?

Measurement of emotions

One can derive three main approaches to emotions measurement:

- self-report measures (either verbal or pictorial),
- behavioral methods (e.g., facial observation)
- and physiological measures (e.g., electrodermal measures).

Our concept: a BCI to discreetly obtain emotional information

Representation of emotions

The traditional ways of emotions representation have their limitations. Verbal labels, e.g., are conjugated with certain difficulties of identification and describing emotions.

Our concept: use of color [1] and shape [3] to convey valence and intensity of emotions to users

3. Current concept

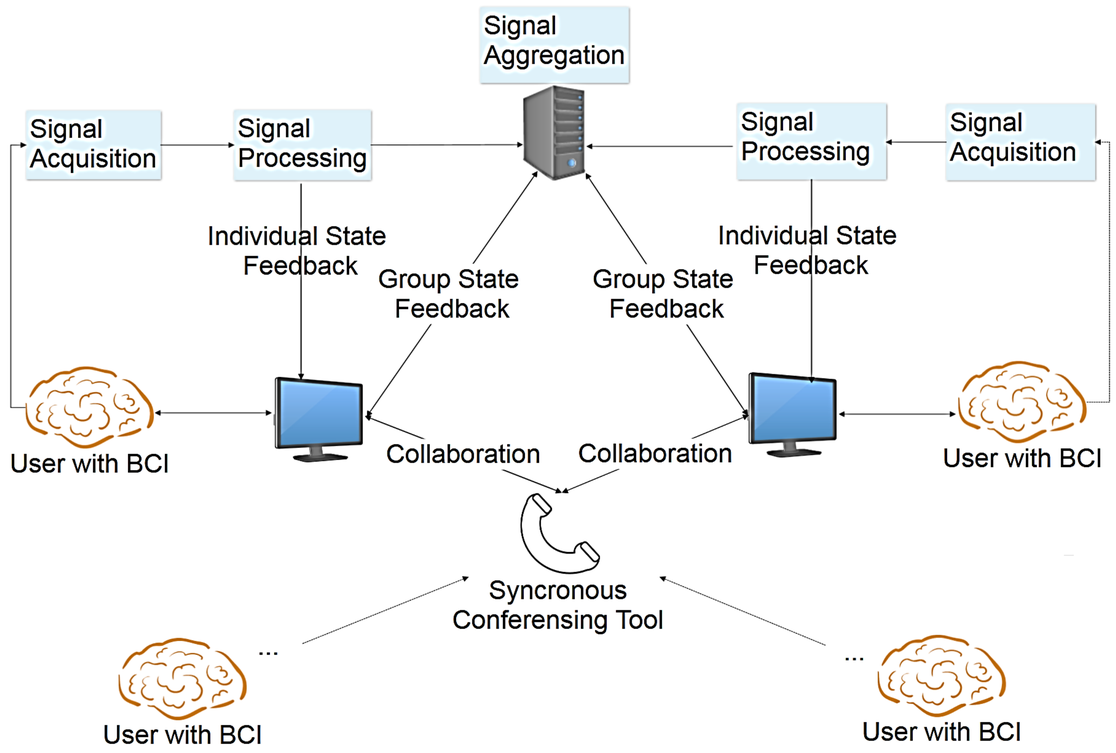
Design considerations

- Ambient capture of affective information
- Discreet feedback of the captured emotional information
- Avoiding fear of disclosure (e.g., aggregated view)

Concept of prototype

The future prototype thus is an extension to either a text or audio conferencing tool which would be able to provide real-time affective information mapped to color and shape.

The capture of affective information will happen with help of Emotiv Epoc, a wireless portable BCI which is able to measure not only raw EEG, but also to derive predefined metrics (e.g., Excitement, Engagement, Interest, Stress, Focus) and facial expressions.



Representation of affective feedback

The feedback of affective data will be represented in the form of a "magic aura" around the avatar in the chat window, or, in case of non-personal disclosure (averaged group representation), a fractal-like background in the group chat. In a textual chat, that can also be visualized more subtle, as a changing background of the top panel of the text chat window.

Rough sketch of UI
You are rather less aroused and calmer and a bit sad (blue shades and almost round form). The aggregated group information is shown on the background, meaning more excited and positive emotions (warm colors and spikes)

4. Limitations and future work

- The mapping of emotions to color and deconstruction of meaning from color to emotion can be seen arbitrary and individual, not to mention culture implications and (color)blindness → Possibility to adjust the system based on their individual perception.
- Association of color and emotions does not seem to be unidirectional. There could be a threat of a certain vicious circle: e.g., visualization of anger can, in turn, arouse the users and lead to secondary activation of anger.

Some of the future directions:

- Identify emotions and states crucial to collaboration, e.g., socio-emotional-cognitive constellations as "I cannot understand" and "I need your help".
- Test whether this type of emotions measurement and representation is valid and recognizable by users and if there is a need in further symbolic visualization.

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