

# The Laser Aura: a prosthesis for emotional expression

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## 1 Introduction

We propose a wearable device capable of translating bio-sensed data into cartoon-like graphics projected in the physical surrounding. Such 'expressive Laser Aura' (LA) may serve for biofeedback purposes; but more interestingly, as the display extends past the wearer's personal space it could complement non-verbal social communication by giving others an instant cue about a person's real inner state. In this preliminary work, we explore a proof-of-principle scenario: the possibility of enhancing empathic behavior at the working place, where people have little or no time to explicitly communicate a need for help, or on the contrary a need for isolation. The subject is sitting at the office desk; the LA (presently non-wearable) is projected on a nearby wall or on the floor. It takes the shape of an halo that changes its behavior as a function of the subject stress level. (The LA is also capable of displaying icons and text messages in an autonomous way, or as prompted by the user.) To measure stress, we first tried the commercial 'Mind Flex' head-worn device (combining simple EEG and EMG data). This proved to be too much dependent on test subjects, so we opted for a simpler strategy consisting on measuring *physical restlessness* by fitting the chair with an accelerometer. The custom laser projector unit measures about 20x20x10cm. The LA graphic output is inspired from cartoon conventions, paranormal folklore and synesthetic considerations. When the subject is relaxed, the halo is nearly circular, uniform and smooth; restlessness disturbs the aura by introducing dynamic spikes. This mapping seems very intuitive - in our preliminary experiment, casual observers never failed to recognize the intended meaning at first glance. When projected on the floor (either from the back of the chair or, in the future, using a laser projection belt [Wilde et al. 2010]), the LA may represent the limits of the personal space. By enlarging it, the subject can claim personal space and signify a need for isolation; on the contrary, while shrinking (or fading or changing its color) the aura may indicate the user readiness to engage in closer social interaction.

## 2 Technologically mediated Self

This research extends previous works in our lab on the *technologically mediated self*, such as the Haptic Radar [Cassinelli et al. 2006] or the Light Arrays [Wilde et al. 2010]. Externalizing subtle psycho-physiological states using simple visual cues may enhance human-human interaction in situations where natural communication channels are temporarily recruited in other tasks, or defective. For instance, a LA could inform others, at a glance, about

a person's 'availability status' - as currently done in online social software (teaser image, right). Also, by detecting, amplifying and possibly pre-processing *autonomic function* data (heart rate, stress level, etc) before projection, the device could help pathologically introverted people to engage in social interaction, or perhaps facilitate understanding of people on the autism spectrum. In a sense, the LA works as the reverse of the emotional prosthetic system described in [El Kaliouby et al. 2006], in which a wearable device with a tiny camera reports to its user about *other's people* emotional states (such as boredom). The LA is in fact a *semi-autonomous extension of the body and mind*, and as such can serve a variety of purposes - including attracting social attention by enlarging or retracting the aura as a peafowl tail, or even sending signals of distress. Of course, prosthetics for emotional expression can be implemented without laser display technology: visual, auditive, tactile, thermal or even olfactory cues could be generated by embedded devices on clothing (or by changing the shape or color of the clothing themselves). Psycho-physiological information could even be broadcast wirelessly and activate nearby cell-phones vibrators, or be uploaded on a blog or twit - effectively extending the emotional aura *online*. However, by recruiting the immediate surrounding for display, the LA has expressive power spanning intimate, personal, social and public spaces. Also, laser vector graphics offer a form of display that is naturally *minimalistic* in comparison to conventional projectors (too much information could clutter human-human communication instead of enhancing it). In the short term, we plan to develop the current prototype by replacing the accelerometer by a skin conductance sensor to measure arousal levels. In the future we plan to make the device wearable, as well as give it the ability to represent more complex states such as emotions by using affective computing methods and techniques (including cameras for face tracking and software to analyze the user interaction with the GUI).

## References

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