

Reading mind from body

~Body movements and physiological responses reveal emotions~

Abstract

Recent studies in cognitive science have repeatedly shown that human behavior, decision making, and emotions depend heavily on the “implicit mind”, that is, automatic, involuntary mental processes even the person herself/himself is not aware of. We have started to develop diverse methods to decode the implicit mind from involuntary body movements and physiological responses, including pupil dilation, eye movements, heart rate variability, and hormone secretion. Here, we introduce some examples of our mind-reading technology. If the technology can be made viable with cameras and wearable sensors, it would offer a wide range of usage possibilities in ICT, such as smartphones that can understand the user’s implicit intention, quantitative evaluation of user experience in a multimedia environment, and a sports-training system that takes account into the trainee’s mental state.

Eye movements tell who you are

- We found that eye movements during free conversation show a characteristic pattern unique to each talker, regardless of the contents or visual environments.
- In reviewing CG movies of measured eye-movement patterns (see figure below), observers can identify who the person is accurately.



Eyes reveal your impressions to sound

- We found that the dynamic characteristics of micro-saccades change in response to rare and hence salient sounds embedded in a sequence of common sounds.
 - Preference for music at each moment of listening can be estimated through the dynamic characteristics of microsaccades and pupil diameter changes.



Saliva and heart rate indicate relaxation by sound

- We developed a method to measure the level of oxytocin (OT), a hormone important for communication, with improved accuracy (with Prof. Kawato, the Univ. of Tokyo).
- We demonstrated that listening to slow-tempo music facilitates the secretion of OT and activates parasympathetic nerves, resulting in relaxation.
- The perceived reality of sound in a tele-communications system can be evaluated by salivary OT levels and autonomic nerve activity. (with Prof. Ueno, Meiji Univ.)



Footstep synchronization enhances interpersonal impressions

- We demonstrated phase synchronization of footsteps between paired walkers by analyzing the acceleration patterns of their ankles using a physical model.
- The longer the phase synchronization is, the more positive the interpersonal impression becomes.



Related work

- [1] A. Shirama, A. Koizumi, N. Kitagawa, “Your eye movements tell who you are,” *Perception* Vol. 42 ECVF Abstract Supplement, p.38, 2013.
- [2] Y. Oishi, H. Mukai, K. Watanabe, S. Kawato, M. Kashino, “The effect of the tempo of music on the secretion of steroid and peptide hormones into human saliva,” in *Proc. The 35th Annual Meeting of the Japan Neuroscience Society*, 2012.
- [3] M. Yoneya, H.-I. Liao, S. Kidani, S. Furukawa, M. Kashino, “Sounds in sequence modulate dynamic characteristics of microsaccades,” in *Proc. The 37th ARO (Association for Research in Otolaryngology) MidWinter Meeting*, 2014..

Contact

Makio Kashino Human Information Science Laboratory
E-mail : kashino.makio[at]lab.ntt.co.jp (Please replace {at} with @)