
Facial Expression in Social Interactions: Automatic Evaluation of Human-Robot Interaction.

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Abstract

We present a pilot study to evaluate the automatic facial expression classification system (AFEC) developed at the Machine Perception Laboratory, as a tool for automatically measuring the quality of human-robot social interaction (Movellan 2003).

The AFEC system automatically detects frontal faces in the video stream, using a cascade of weighted integral image features (Fasel 2002) and codes them with respect to 7 dimensions in real time: neutral, anger, disgust, fear, joy, sadness and surprise. The expression classification combines Adaboost feature selection and SVM's. The generalization performance to new subjects for a 7-way forced choice was over 90% correct on two publicly available datasets. (Littlewort 2003) The output codes change smoothly as a function of time, providing a potentially valuable representation to code facial expression dynamics in a fully automatic and unobtrusive manner.

The AFEC system was deployed for measuring spontaneous facial expressions in the continuous video stream during unconstrained interaction with a social robot. Subjects interacted with RoboVie, a communication robot developed at ATR and the University of Osaka. Facial expression measurement of joy obtained by the automated system was compared to human judgments of joy obtained by turning a dial. The system predicted human judgments of joy in test sequences. Equipping robots or computer animated agents with the perceptual primitives necessary to use and learn from sub-second nonverbal communications opens a new realm of possible applications for machine intelligence, from entertainment robots to perceptive teaching software.