

Towards efficient human - computer interaction

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Computer vision provides nowadays powerful tools for the interaction between man and computer. Low cost video image processing systems make it possible for a human to use head, hands, fingers as digital input devices, without touching a keyboard, a mouse or other commonly used peripheral devices.

In such an augmented reality, information is acquired by observing the way subject behaves. A simple example of an augmented reality is provided by the presented system which recognizes "yes" or "no" through the movement of a subject's head. In this abstract an experimental setup enabling a simple communication between the human and computer system is presented.

Vision of the face is an important aspect of human-to-human communication. We have been experimenting with the use of computer vision to "*watch the face*". In this contribution we propose a robust technique for detecting, tracking and recognizing images of face movements. When combined with real time image processing and active control of camera parameters, these technique can greatly improve the communications between human and computer in special applications, in which the interaction using hands, fingers or voice is not desired or impossible.

The system is depicted in Figs. 1 and 2, in which the face detection and object tracking modules is shown. The system is very fast, robust and can work efficiently in many special applications, in which the communication between the computer and human cannot be established in the traditional way.

Fig. 1 Face detection and tracking module.

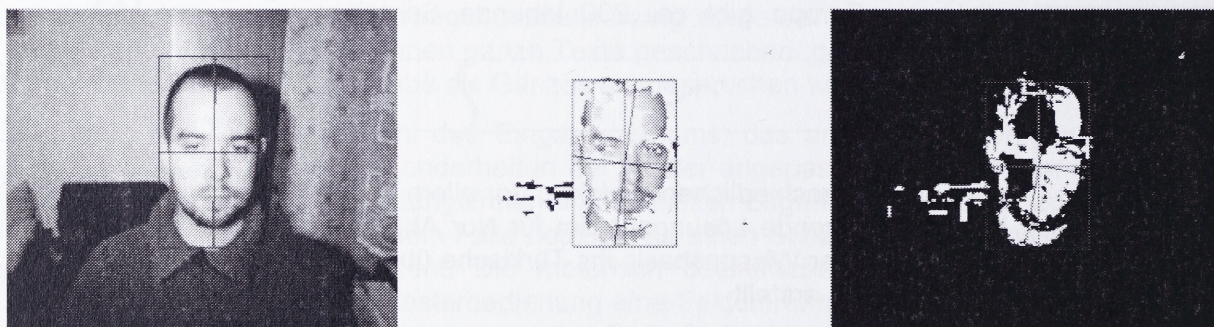
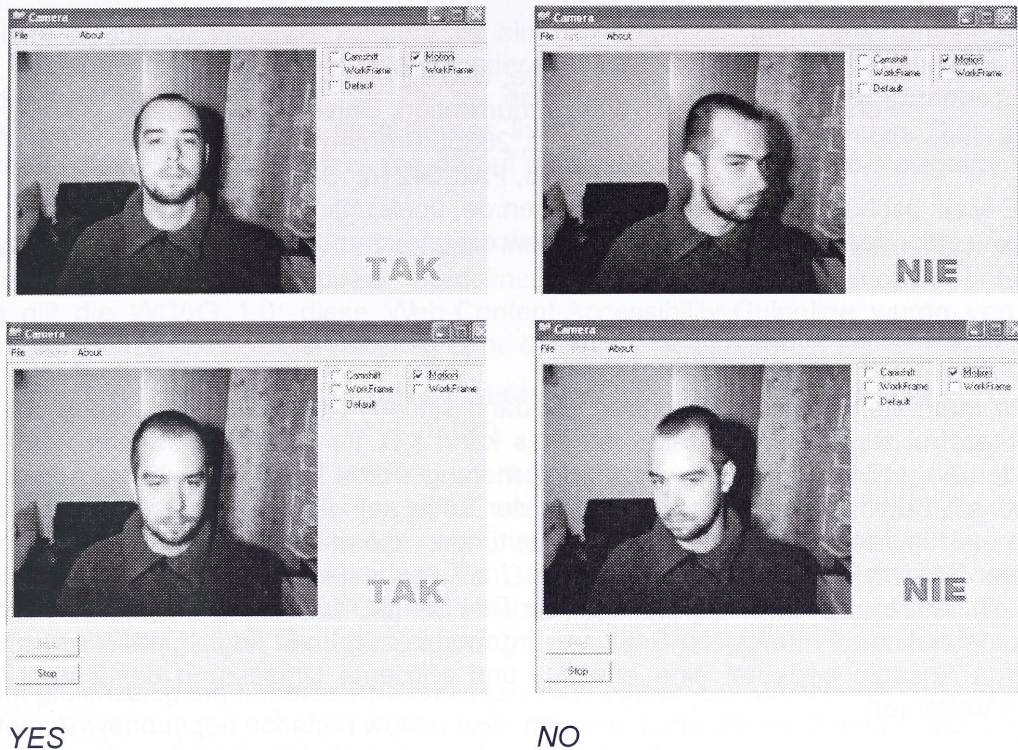


Fig. 2 Example of a human-computer interaction: the input *yes* or *no* is obtained through the tracking of the head movements.



REFERENCES

- T. Baudel and M. Beaudouin-Lafin. Charade: Remote Control of Objects Using Free-Hand Gestures. *Communication of the ACM*, 36(7):28--35, July 1993.
- J. Crowley and H. Christensen. *Vision as Process*. Springer Verlag Basic Research Series, Heidelberg, 1994.
- P. Wellner, W. Mackay, and R. Gold. Computer-augmented environments. *Special Issue of Communications of the ACM*, 36(7), July 1993.
- M. Abdel-Mottaleb and A. Elgammal, "Face Detection in complex environments from color images," *IEEE ICIP*, pp. 622-626, Oct. 1999.
- J.C. Terrillon, M. N. Shirazi, H. Fukamachi, and S. Akamatsu, "Comparative performance of different skin chrominance models and chrominance spaces for the automatic detection of human faces in color images," *Proc. IEEE Int'l Conf. on Face and Gesture Recognition*, pp. 54-61, 2000.
- R.-L. Hsu, M. Abdel-Mottaleb, and A. K. Jain, "Face detection in color images," *IEEE Trans. Pattern Analysis and Machine Intelligence*, vol. 24, no. 5, pp. 696-706, May 2002.