

Embodied Communication

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Introduction

Cognition arose in living organisms, in nature it is inseparable from a body, and only makes sense in a body. Likewise, natural communication and human language developed in intimate connection with body. When a person speaks, not only symbols are transmitted, but the whole body is in continuous motion. While speaking we can indicate the size and shape of an object by a few handstrokes, direct attention to a referenced object by pointing or gaze, and modify what we communicate by emotional facial expression. The meanings we transmit this way are multimodally encoded and strongly situated in the present context.

Embodied communication is the term meant to refer to such, often spontaneous, behavioral phenomena. Over and above symbolic communication they may convey meanings in a form which is not part of a conventionalized code but nevertheless understandable. An iconic gesture, like the one illustrated in Fig. 1, can serve to represent and communicate a mental image in an embodied form (McNeill, 1992). Such a gestural sign obtains meaning by iconicity, i.e. a pictorial similarity between itself and its imagined referent. An emotional expression communicates an emotional state which in its subtlety can hardly be conveyed by symbols but enhances the representational power of symbolizations.

Communication models that emphasize symbolic information transfer neglect the decisive role of non-symbolic qualities which are especially present in face-to-face communication. The cognitive modeling challenge is to devise theoretically grounded and empirically guided operational models that specify how mental processes and embodiment work together in communication.

Artificial Humanoid Agents

A growing body of work in AI and agent research – in areas like facial expression robots or embodied conversational agents – takes up questions that can be related to embodied communication in a technical way. With the artificial humanoid agent MAX under development at the University of Bielefeld we explore to what extent embodied communication can be realized by an artificial agent embodied in virtual reality. Clearly such an agent does not have a body in the physical sense, but it can be equipped with verbal conversational abilities, and employ its virtual body to express non-linguistic communication qualities such as gesture (Kopp & Wachsmuth, 2002). Equipped with a synthetic voice and an articulated body and face, Max is able to speak and gesture, and to mimic emotions. By means of microphones and tracker systems, Max can also “hear” and “see” and is able to process spoken instructions and gestures.



Figure 1 (from Sowa & Wachsmuth, 2002)

One of our current research challenges pertains to the question of how far Max can imitate iconic gestures demonstrated by a human communication partner. Iconic gestural movements are assumed to derive from imagistic representations in working memory, which are transformed into patterns of control signals executed by motor systems (e.g., de Ruiter, 2000). Could an artificial agent construct a “mental image” of shape from an observed iconic gesture and reexpress – *reembody* – it by way of iconic gestures? Another research challenge is emotion. Could an artificial agent express emotions related to internal parameters that are themselves influenced by external and internal events?

Conclusion

We have used examples to support the research importance of embodiment in communication. A fuller investigation would certainly involve many further aspects, e.g., rhythmic entrainment between communication partners, and so forth. Our research is led by the expectation that the construction and test of an “artificial communicator” will help to reach a more profound understanding of embodied communication. Finally, as embodiment plays such an important part in human communication, embodied communication should also have great impact in human interface research.

References

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