

Characterising Gestures According to Their Function in Collaborative Design

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Gestures have been analysed from different perspectives, dependent on researchers' aims. These have gone from semiotic, pragmatic, (psycho-)linguistic analysis to development of HCI systems, gesture recognition and generation in interactive dialogue systems, and collaborative task-completion tools.

Working in the domain of cognitive design research [1], we are interested by the functions of gesture in design collaboration. Besides an epistemic socio-cognitive psychology objective—to understand the use of various interaction modalities in professional collaboration—a long-term cognitive-ergonomics aim is to contribute to the specification of remote collaborative-design environments, especially to facilitate the use of multi-modal interaction (using different semiotic modalities) by designers working on remote locations.

We have analysed two face-to-face working meetings between three architectural designers. Until now, we have restricted our analysis to (a) gesticulations, that is, spontaneous, speech-accompanying gestures, and (b) emblems, that is, quasi-linguistic, lexicalised gestures that have conventional forms and meanings, and which are not necessarily speech accompanying.

This paper concerns the relevant levels and units of analysis. If we wish to characterise the function of these gestures in design collaboration, which of their characteristics of gesture do we need to identify? Are these, for example, physical and rather low-level features, such as hand position and shape? As our long-term aim (specification of collaborative-design environments) was rather open-ended, we adopted a "middle-level" characterisation in terms of form, using McNeill's [2] subcategories for gesticulation: deictics, iconics, metaphoric, beats, and cohesive gestures.

Our identification of gesture's functions for design, interaction, and collaboration was guided by our model of design as the construction of representations [1]. This analysis of function that was independent of gestures' form, led to five main families: (1) representational (designating or specifying design entities), (2) organisational

(managing discourse, interaction, or functional design actions), (3) focalising, (4) discourse and interaction modulating, and (5) disambiguating gestures.

According to our model, representational gestures are typical for design—and, among them, specification gestures *the* distinctive design gestures. Design specification is indeed particular. All interaction involves specification, that is, people specify meaning for other people in order to establish common ground. Yet in design specification aims not only one's interlocutors' understanding, but also their agreement: design partners should take decisions together. Designation occurs as well in all interaction, and also has a specific function in design (a point we developed in [3]). Organisational gestures, as we view them—comprising both the organisation of one's own discourse and actions, and the management of interaction and of other people's actions—should occur in each collaborative activity. Focalisation, modulation, and disambiguation gestures may be found in any interaction; they are specific neither to design, nor to other professional collaborative activities.

Concerning the characterisation of gestures according to their function, especially the question examined in this paper to know if gestures with a particular function are characterised by particular forms, we wish to highlight several outcomes.

It was impossible to attribute particular forms to particular functions—and *v.v.* A gesture with a particular function could take various forms, and a particular gestural movement as regards form could fulfil different functions. Most gestural movements (deictics, beats, iconics) could serve discourse modulation, for example. There were nevertheless tendencies. Designation, for example, was mostly performed through deictics, whereas specifying mainly through iconic and metaphoric gesticulations and emblems. However, deictics had other uses as well and specification could also be expressed differently.

Another example of this multifaceted nature of gestures was that neither functional nor form categories were exclusive. One particular gesture could have different functions in a meeting. A gesture could, for example, both specify and disambiguate, both designate and serve discourse organisation. Alternatively, a gesture could be both metaphoric and deictic.

We thus continue our quest for characteristics that allow differentiating gestures according to their function in a design meeting. Given our results, we think that these will be context-dependent, semantic characteristics of gestures, rather than formal features.

References

- 1 Visser, W.: *The Cognitive Artifacts of Designing*. Lawrence Erlbaum Associates, Mahwah, NJ (2006)
- 2 McNeill, D.: *Hand and Mind. What Gestures Reveal about Thought*. Cambridge University Press, Cambridge (1992)
- 3 Visser, W.: *The Function of Gesture in an Architectural Design Meeting*. Paper presented at the International workshop on Design Meeting Protocols (DTRS7, the 7th Design Thinking Research Symposium), London (2007)