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Designing Touchless Gesture-Based Interfaces for Human Computer Interaction: Insights from co-verbal gestures

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ABSTRACT

Gesture-based interfaces are seen as effective means of enabling intuitive and natural means of interaction with technology. However, these interfaces can be effective and intuitive only if anchored in a deep understanding of how humans use gestures to communicate. Over the past three decades, anthropologists, psychologist, linguists and semioticians have proposed various approaches to the empirical study of human gestures. We present here our preliminary ideas to identify and gather the common characteristics of "naturalness" and "intuitiveness" in touchless gesture production through empirical studies of interpersonal communication.

RESEARCH QUESTIONS

Gesture research in face-to-face communication has shown that everyday gestures are largely motivated by mental imagery or routinized manual actions involving some kind of object based on similarity relations between the gestures and the actions or objects they represent. For example in gesturing how to brush one's teeth, one could pantomime the brushing action with an imaginary toothbrush in hand (Fig 1) or use a finger to represent the toothbrush (Fig 2). This distinction is referred to as external and internal metonymy, respectively, in semiotic theory (Mittelberg and Waugh, 2009). External metonymy is exhibited when one holds an imaginary tool in hand (Fig1) and internal metonymy occurs when the body part represents the tool itself (Fig2).

Figure 1

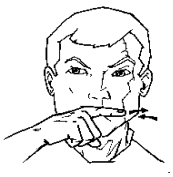

Figure 2

To identify meaningful, intuitive and natural gestures for HCI, we are interested in the following research question: *What is natural and intuitive in gestures involving object manipulation – do people manipulate an imagined tool (external metonymy) or use the hand itself to represent the tool while gesturing (internal metonymy).*

PROPOSED STUDY

Adopting a user-centric approach (Saffer, 2008), participants will be shown two pictures (before and after) that suggest that an action needs to be performed to make the before-picture look like the after-picture. They will be asked to think aloud and perform a gesture to "explain and show" what needs to be done in order to go from the before-picture to the after-picture. The scenarios used in the pictures will reflect simple computer tasks (e.g. cut), but camouflaged as everyday non-computer scenarios (e.g. Fig 3 of a cut apple) to minimize conceptual models of how one performs these tasks on a computer. All gestures will be captured on 4 high-speed video cameras and analyzed with respect to the preferred use of metonymy type and recurrent structures.

Figure 3

APPLICATIONS AND CONCLUSION

The proposed work aims to provide insights for appropriate selection and adoption of gesture vocabulary for meaningful interaction with technology. Insights for technology design in areas such as sterile/clean room environments, collocated shared technology and robotics.

ACKNOWLEDGMENTS

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