

Designing and Comparing Two-Handed Gestures to Confirm Links between User controlled Objects

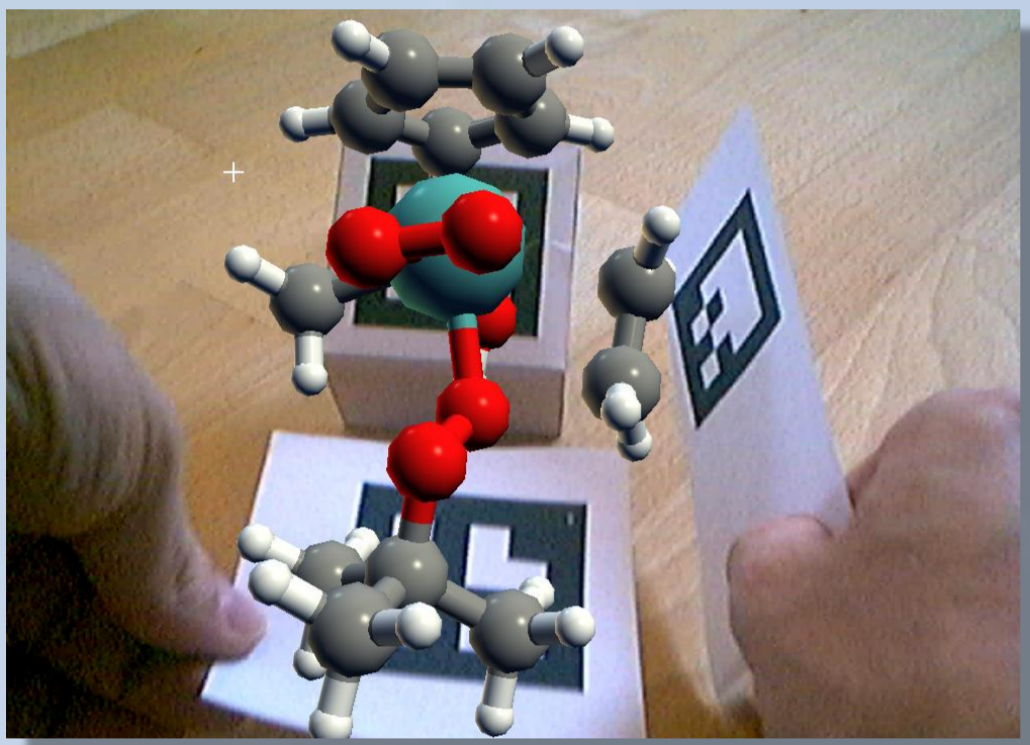
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Abstract: Systems using two-handed spatial manipulation techniques require strategies to enable system control tasks. These strategies make it possible to interact with the system comfortably while controlling two hand-held objects simultaneously. We developed and investigated two separate

methods to confirm a selected bond between two user controlled objects (molecule models) when both hands are already executing a two-handed symmetric interaction task. The first method is a waiting gesture and the second method is a back&forth motion gesture.

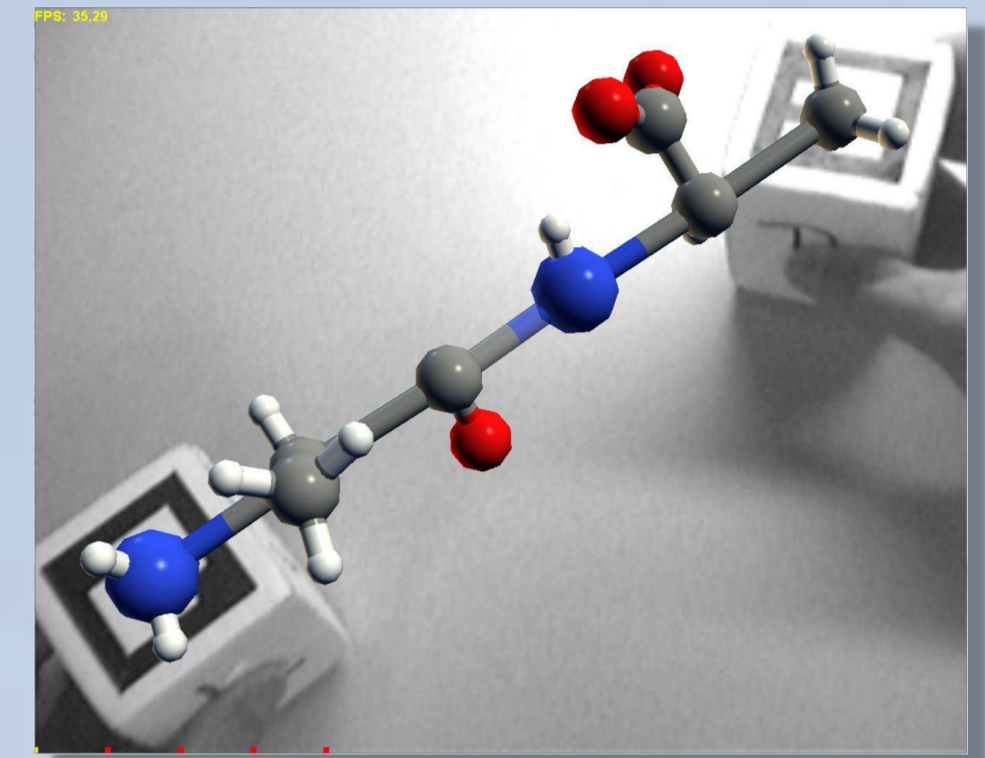


Problem:

- Hands already busy moving and rotating the markers
- How to perform system control?

Solution:

- Using gestures
- We developed two methods: a waiting and a back & forth method

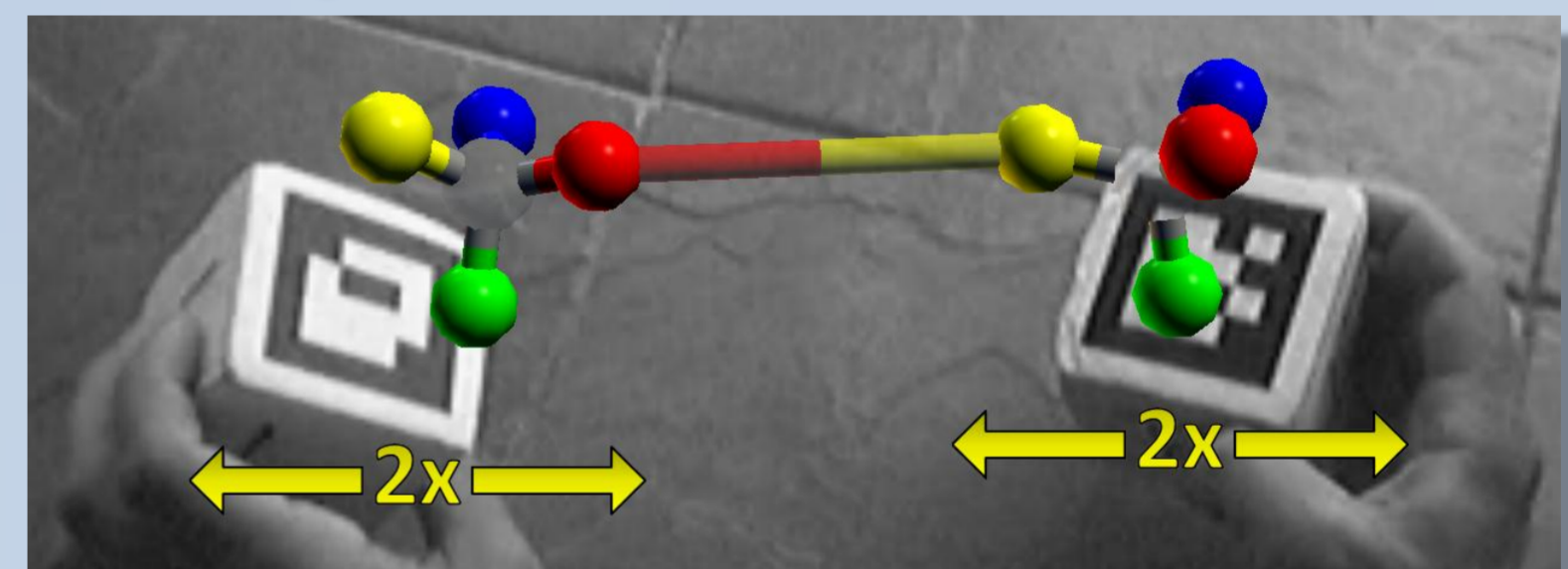


Waiting Method:

- Passive gesture
- Gluing metaphor
- User has to hold the markers still for a certain amount of time (0.5 sec)
- Algorithm inspects the minimal and maximal length of the connection in the last 0.5 seconds
- Confirmation of the connection, when the difference between min and max is smaller than 0.3 cm
- Filters out jitter that is smaller than 0.3 cm

Back&Forth Method:

- Shortening and expansion of the connection
- Gesture is a dual swinging movement
- Executed by two times contraction and expansion
- Minimal change in distance for each movement: 1.5 cm



User Study:

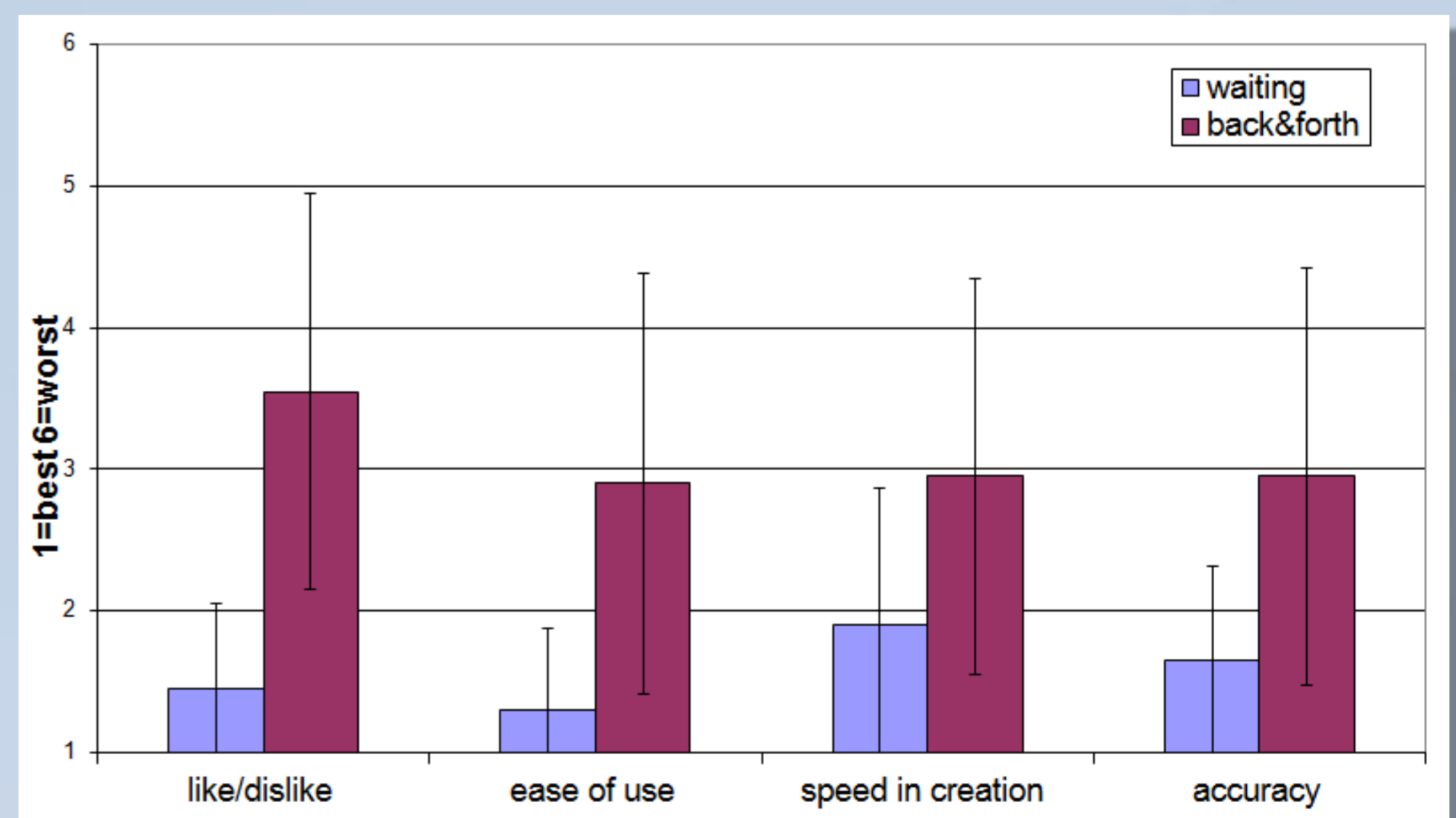
User study collecting objective and subjective measures

Structure:

- Within-subject, repeated measures, single-session design
- 20 participants (8 female, 12 male)
- Ages between 17 and 64 (mean age 36, std. dev. 13)

Task:

- Select a specified bond between the two molecules
- Confirm the selection by performing the waiting and the back&forth method
- 24 confirmations with waiting method
- 24 confirmations with back&forth method
- Completion of a questionnaire after each method



Results:

The method of waiting and not moving the markers is the preferred gesture for confirming a selection.

Future Work:

- Automatic adaption of the parameters to improve detecting a waiting method
- Undo a confirmation
- Gesture for breaking up a connection