

RADBOD UNIVERSITY, NIJMEGEN



ADVANCES IN HUMAN-COMPUTER INTERACTION

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## Building with the LEAP

The use of the LEAP-motion for building virtual block structures.

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## Abstract

abstract

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# 1 Introduction

## 1.1 LEAP-motion (Jasper)

Hier ook iets over de perceptive components van de LEAP

## 1.2 Interaction patterns (Janne)

Ik stel voor dat we in dit stukje ook het stukje over GOMS doen, dus meteen de interaction patterns ‘analyseren’ (eventueel in een subsubsection, maar dat mag de auteur zelf weten)

## 1.3 Research question (Annet)

This study aims to answer two research questions:

1. Can we make an interface with the LEAP-motion to build a particular virtual block structure out of separate blocks?
2. Does the LEAP-motion improve the task of building virtual block structures with respect to likeability, usability, acceptability, accuracy, and speed, in comparison to a mouse and keyboard interface?

In order to answer these questions two interfaces were build to build virtual block structures. First one with the LEAP-motion and then one with a mouse and keyboard. Then a usability study was done.

# 2 Methods

## 2.1 Description of the system (Annet)

The system build for the experiment consisted of three main parts. First, there was an environment in which the structures could be build (see Figure 1). The environment looked simple. There was a circle with a grid inside in which the structures had to be build. On the right side (or left side for people who were left-handed), there was an infinite stack of blocks. The users of the system could grab here new blocks if they needed them. In the right upper corner there was a representation of the structure that had to be build for the experiment.

Next to the environment there were two different interfaces with which you could build in the environment. First, there was a LEAP-motion interface, using hand movements to build the structures. Second, there was a interface which used a combination of the mouse and the keyboard.

In the next section there are more details about how the environment and the interfaces are implemented.

## 2.2 Implementation details (verschilde mensen per subsectie)

Hier ook duidelijke de design choices proberen te verklaren. Vergeet ook niet om als het nodig is onderscheid te maken tussen LEAP interactie en keyboard-muis interactie.

### 2.2.1 Environment (Sil)

### 2.2.2 Grab (Annet)

### 2.2.3 Rotate (Jasper)

### 2.2.4 Experimentor interface (Sil)

## 2.3 Experimental design (Janne)

### 2.3.1 Participants

Sixteen people, ??? males and ??? females, participated in the experiment (meag age = ????, SD = ???).

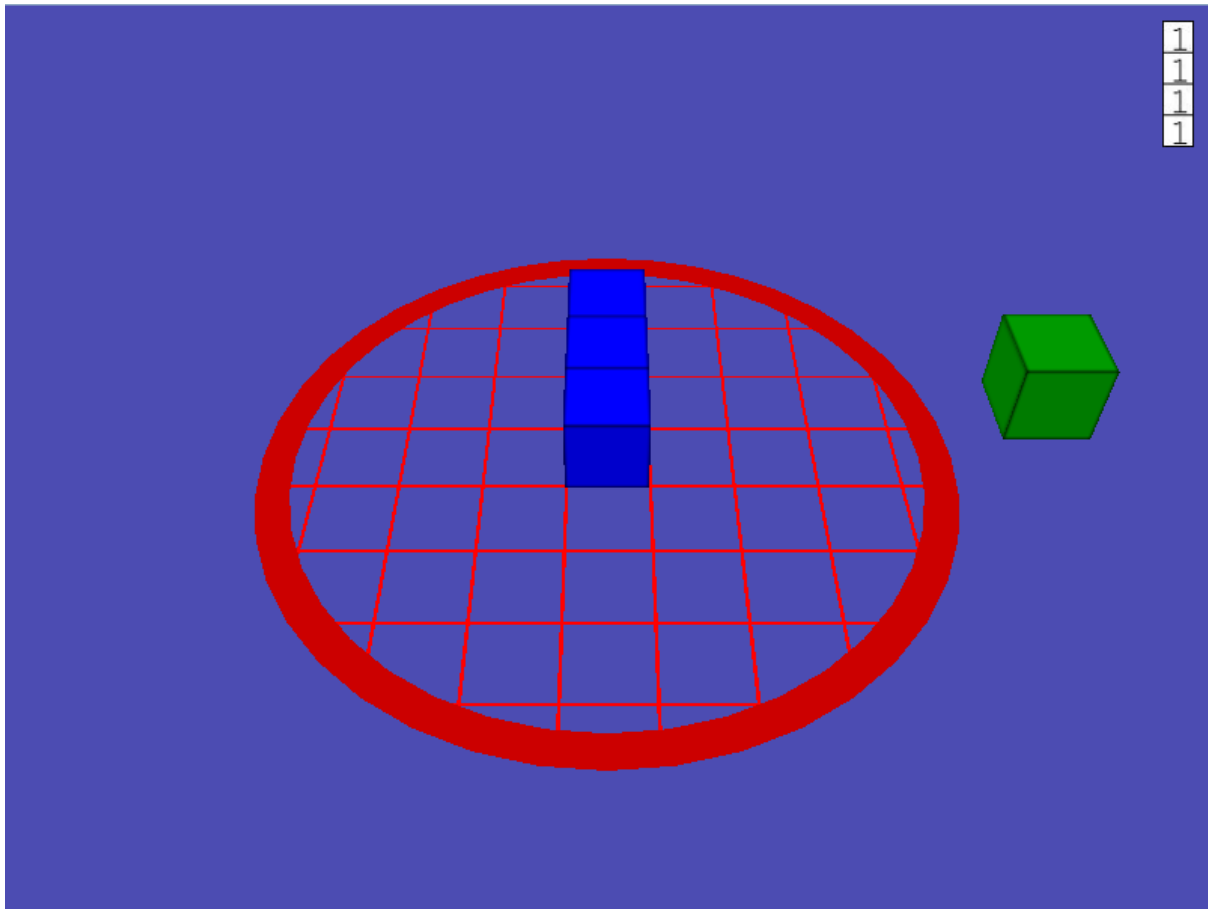


Figure 1: The environment in which the structures had to be build.

### 2.3.2 Task and procedure

The experiment consisted of two sessions: a LEAP-motion session (in which participants used the LEAP motion interface) and a keyboard & mouse sessions (in which participants used the keyboard & mouse interface). The order of the sessions was counterbalanced.

Before the experiment participants received instructions about the task they were going to perform. Before every session participants received instructions about how to use the interface: which actions are possible, how to perform the actions (possible gestures, which buttons to use). After these instructions participants got 3 minutes to explore the interface that they were going to use in the upcoming session.

Both sessions consisted of 3 trials. In each trial the participant had to replicate a target model (see figure ??). In the LEAP motion session participants had to replicate the target models using gestures, while in the keyboard & mouse session they had to do this by using the keyboard and the mouse.

After the session participants filled in a Post-Study System Usability Questionnaire about the interface they used in that session (see Appendix A). So that every participant after the experiment has filled in the usability questionnaire for each interface.

For possible follow-up analyses the participants were, after the two session, asked to fill in a questionnaire about their preferences, background and previous experience and/or expertise with the two interfaces (see Appendix B).

Uitleggen over tijdlimiet, printscreens van schermen en dan uitleggen hoe de trials precies gingen etc Moeten we ergens misschien een HCI cycle inbouwen?

## 2.4 Design and measurements

The experiment was done and analyzed using a within-subject design with as independent variable Interface (LEAP motion, keyboard & mouse) and dependent variables: usability, accuracy, efficiency and speed.

Usability was measured using the Post-Study System Usability Questionnaire (PSSUQ) questionnaire [1]. Items are displayed with seven-point graphic scales with on the end points the terms Strongly agree for 1 and Strongly disagree for 7, and a Not applicable (N/A) point next to the scale. The PSSUQ was adapted to better fit with our system. questions 9-15 (measuring Information Quality) were excluded considering that our interfaces did not differ with respect to information provided. Furthermore, help or error messaging was neither used or necessary in our system. The adapted PSSUQ is attached in Appendix A.

This questionnaire now measures three system qualities: Overall quality, System Usefulness and Interface quality. Different items on the questionnaire respond to different system qualities:

- Overall: Average the responses to Items 1 through 12.
- System Usefulness: Average the responses to Items 1 through 8.
- Interface Quality: Average the responses to Items 9 through 11.

## 3 Results (Mike)

## 4 Discussion (Mike)

## 5 Conclusion (Annet)

## A The Post-Study System Usability Questionnaire Items

1. Overall, I am satisfied with how easy it is to use this system.

STRONGLY AGREE

STRONGLY DISAGREE

1	2	3	4	5	6	7	8	N/A
---	---	---	---	---	---	---	---	-----

Comments:.....

2. It was simple to use this system.

STRONGLY AGREE

STRONGLY DISAGREE

1	2	3	4	5	6	7	8	N/A
---	---	---	---	---	---	---	---	-----

Comments:.....

3. I could effectively complete the tasks and scenarios using this system.

STRONGLY AGREE

STRONGLY DISAGREE

1	2	3	4	5	6	7	8	N/A
---	---	---	---	---	---	---	---	-----

Comments:.....

4. I was able to complete the tasks and scenarios quickly using this system.

STRONGLY AGREE

STRONGLY DISAGREE

1	2	3	4	5	6	7	8	N/A
---	---	---	---	---	---	---	---	-----

Comments:.....

5. I was able to efficiently complete the tasks and scenarios using this system.

STRONGLY AGREE

STRONGLY DISAGREE

1	2	3	4	5	6	7	8	N/A
---	---	---	---	---	---	---	---	-----

Comments:.....

6. I felt comfortable using this system.

STRONGLY AGREE

STRONGLY DISAGREE

1	2	3	4	5	6	7	8	N/A
---	---	---	---	---	---	---	---	-----

Comments:.....

7. It was easy to learn to use this system.

STRONGLY AGREE

STRONGLY DISAGREE

1	2	3	4	5	6	7	8	N/A
---	---	---	---	---	---	---	---	-----

Comments:.....

8. I believe I could become productive quickly using this system.

STRONGLY AGREE

STRONGLY DISAGREE

1 2 3 4 5 6 7 8 N/A

Comments:.....

Note: The interface includes those items that you use to interact with the system. For example, some components of the interface are the keyboard, the mouse, the microphone, and the screens (including their use of graphics and language).

9. The interface of this system was pleasant.

STRONGLY AGREE

STRONGLY DISAGREE

1 2 3 4 5 6 7 8 N/A

Comments:.....

10. I liked using the interface of this system.

STRONGLY AGREE

STRONGLY DISAGREE

1 2 3 4 5 6 7 8 N/A

Comments:.....

11. This system has all the functions and capabilities I expect it to have.

STRONGLY AGREE

STRONGLY DISAGREE

1 2 3 4 5 6 7 8 N/A

Comments:.....

12. Overall, I am satisfied with this system.

STRONGLY AGREE

STRONGLY DISAGREE

1 2 3 4 5 6 7 8 N/A

Comments:.....



## A Additional questionnaire

Age: .....

Gender: .....

Study: .....

1) How many hours per day do you use a keyboard & mouse controlled device?

.....

2) Did you use a LEAP motion before? (if so, for how many hours?)

.....

3) What did you think of the experiment?

.....

4) In which situation would you like to use the keyboard & mouse?

.....

5) In which situation would you NOT like to use the keyboard & mouse?

.....

6) In which situation would you like to use the LEAP motion?

.....

7) In which situation would you NOT like to use the LEAP motion?

.....