



Universiteit Leiden

# HCI

## World-Wide-Wii



### Evaluation report

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## Summary

This document describes the results of the first evaluation session which was used to evaluate the design and implementation of our prototype, as also the revisions that are needed.

For our first user evaluation we focused on the 4 main aspects of usability according to Shackle's Usability Model.

1. Learnability (aka Memorability); the user was instructed to follow basic navigation exercises to evaluate the basic tasks of our system and to see if the basic navigation skills were acquired in a short amount of time.
2. Throughput (aka Efficiency); after doing some basic training exercises the user was instructed to complete 10 advanced objectives within a total of 10 minutes. We counted the user error rate (user got stuck on object / in room).
3. Flexibility; we recorded user comments both on paper and digital camera about the suitability of intended actions.
4. Attitude (aka Satisfaction); afterwards we provided the user a system usability scale questionnaire to assess the users global satisfaction with our system.

We used the following evaluation methods:

### **Cooperative evaluation (observational technique)**

During the evaluation sessions users were asked in a form to think aloud, describing his actions, what he is trying to do. Using a simple paper and pencil we recorded user comments. During the evaluation process the user was asked questions about his behavior, as also the user could ask for clarification if a problem arose. Using this approach we could clarify some points of confusion which are dealt with in this evaluation report.

### *Protocol analysis*

We used paper and pencil together with video for recording user actions; Using a digital camera we recorded user movements on tape for further analysis. This has the advantage that we can see what the participant is doing.

### **Questionnaire (query technique)**

Next to the observational evaluation technique we also used a specific query technique called the "System Usability Scale questionnaire" to have a global understanding of the users satisfaction with our system.

In the following paragraphs the instructions of the evaluations are in "*Italic style*" whereas in the last paragraph the applied revisions are stated.

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## 1. Introduction

*Most of today's applications use standard input devices like for example the mouse and keyboard to control interaction. With the use of alternative input devices we would like to give the user the ability to maneuver like they would in daily life. Besides the use of alternative input devices we would also like to transform the way of displaying 2 dimensional data and representing it in a 3 dimensional "more natural" environment.*

*Thus this HCI project consists of building an interactive 3D environment. The user walks through a 3 dimensional world by use of the balance board. Using the Wii-mote the user can control the view in all dimensions. The 3D environment can for example consist of hotels and buildings with electronic walls containing dynamic web page information. A gatekeeper can for example be used as authentication. An elevator for the sitemap. We basically like to transform the 'going online' experience to more day-to-day activities, like going to a mall or walking on the street. We will try to make the controls as natural as possible and use gestures to simulate natural actions, like sorting e-mail.*

*As it is yet impossible to fully convert all 2D applications to the virtual world, we will try to find a hybrid solution, by the means of projecting the screen on some object and allowing a person to interact with the object in a more 'traditional way'. As a practical example, an (office)desk might contain a typewriter with some documents lying on the table which could be inserted into the type writer instead of using windows to manage the documents.*

*The World-Wide-Wii HCI project will be build upon Project Wonderland. Project wonderland is a 100% Java and open source toolkit for creating collaborative 3D virtual worlds. Within those worlds, users can communicate with high-fidelity, immersive audio, share live desktop applications and documents and conduct real business. Wonderland is completely extensible; developers and graphic artists can extend its functionality to create entire new worlds and new features in existing worlds. Using this framework we will create a new world with new features. We will implement the Nintendo Wii-mote and balance board as input devices for navigating through the virtual world. The final prototype will be used for demonstration purposes.*

*World-Wide-Wii uses the following functional specifications:*

- Viewport control using the Wii-mote*
- Navigating the 3 dimensional world using the balance board*
- Viewing dynamic web information on 3D models*
- Controls for operating the 3D world*

## 2. Test case

***The user evaluations are aimed at evaluating the current interface. We want to evaluate if the users understand the basics concerning 3 dimensional navigation with the mentioned input devices Wii-mote and balance board and investigate if the basic interface we provide is sufficient or needs further adjustments.***

***For the evaluation sessions we will use an existing virtual environment named MPK20 demo. This is a standard environment included in the Wonderland 0.4 package.***

## 3. Objectives

***The user has to complete the following objectives within the virtual environment using the mentioned input devices. Beginning with the basic navigation training, the user can score points for standard movements using the input devices. This can be considered basic training exercises before the user is allowed to complete the advanced objectives. The main goal of this basic navigation training for the user is to understand the product without manual or additional information. For each of the advanced navigation objectives completed successfully, they will get 1 point. Thus a maximum of 10 points can be achieved. The number of points scored will be used as KPI (Key Performance Indicator) for our system.***

### *Basic navigation (training)*

1. ***Turn left (Move Wii-mote in left direction)***
2. ***Turn right (Move Wii-mote in right direction)***
3. ***View up (Move Wii-mote to top)***
4. ***View down (Move Wii-mote to bottom)***
5. ***Walk forward (Stand on balance board and make balanced steps)***

### *Advanced navigation (10 objectives)*

1. *Find location (objective 1) (1 minute(s))*
2. *Find location (objective 2) (1 minute(s))*
3. *Find location (objective 3) (1 minute(s))*
4. *Find location (objective 4) (1 minute(s))*
5. *Find location (objective 5) (1 minute(s))*
6. *Find location (objective 6) (1 minute(s))*
7. *Find location (objective 7) (1 minute(s))*
8. *Find location (objective 8) (1 minute(s))*
9. *Find location (objective 9) (1 minute(s))*
10. *Find location (objective 10) (1 minute(s))*

## *4. Usability specifications*

### *Time*

- *User has to complete all advanced navigation objectives within 10 minutes.*

### *Error*

- *User is allowed a maximum of 5 navigational error's, e.g., navigating to wrong places within the virtual environment.*

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## 5. Revisions

During the 1<sup>st</sup> user evaluation the basic navigation instructions were not clear as also the time to complete advanced objectives was somewhat short. The following revisions are necessary:

### Instructions

#### Basic navigation (training)



1. Turn left (around Z-axis) (Rotate Wii-mote in left direction)
2. Turn right (around Z-axis) (Rotate Wii-mote in right direction)



3. View up (Move Wii-mote to top)
4. View down (Move Wii-mote to bottom)

5. Walk forward (Stand on balance board and lean forward)
6. Walk backward (Stand on balance board and lean backward)

## **Advanced navigation (10 objectives)**

1. Find location (objective 1) (2 minute(s))
2. Find location (objective 2) (2 minute(s))
3. Find location (objective 3) (2 minute(s))
4. Find location (objective 4) (2 minute(s))
5. Find location (objective 5) (2 minute(s))
6. Find location (objective 6) (2 minute(s))
7. Find location (objective 7) (2 minute(s))
8. Find location (objective 8) (2 minute(s))
9. Find location (objective 9) (2 minute(s))
10. Find location (objective 10) (2 minute(s))

## **Usability specifications**

### **Time**

- User has to complete all advanced navigation objectives within 20 minutes.

### **Error**

- User is allowed a maximum of 5 navigational error's, e.g., navigating to wrong places within the virtual environment.



## Prototype

### Observations

- Sometimes a user is stuck on a wall and because of the camera angle he can't really move anymore.
- Without instructions, basic navigation like walking forward is not clear.
- Without instructions, basic navigation like turning left or right is not clear.
- When user first stood on the balance board, he was going backwards.
- Users are applying more pressure in order to try to move faster.
- When asked to express emotions the user tend be more 'verbose' with the wii-mote and do not think about pressing the buttons.
- Emotion gesture 'wave' is executed by the user by waving it's hands.
- Emotion gesture 'approve' is executed by the user by moving the wii-mote up and down.
- Emotion gesture 'disapprove' is executed by the user by moving the wii-mote from left to right.
- User expect the avatar and camera position to return to it's original position, when placing the wii-mote back into 'neutral' position.
- User found advanced objectives are hard to find.

### Comments

We received the following comments from users evaluating our prototype:

- Illustrations with basic navigation instructions could be helpful.
- Person expects movement going faster when leaning more forward.
- Advanced objective screenshots are a bit difficult to recognize when printed in grayscale.
- Pointer does not work, not allowing to interact with the objects.

### Analysis

- Occasionally the user is stuck somewhere next to a wall and can't move around anymore. This happens because of the 3<sup>rd</sup> person view that is used when controlling the avatar. The home button can possibly solve this problem when used for leveling the view to a default.
- Including a direction map with some kind of route to allow more easy finding of objects.

## 6. Appendix A

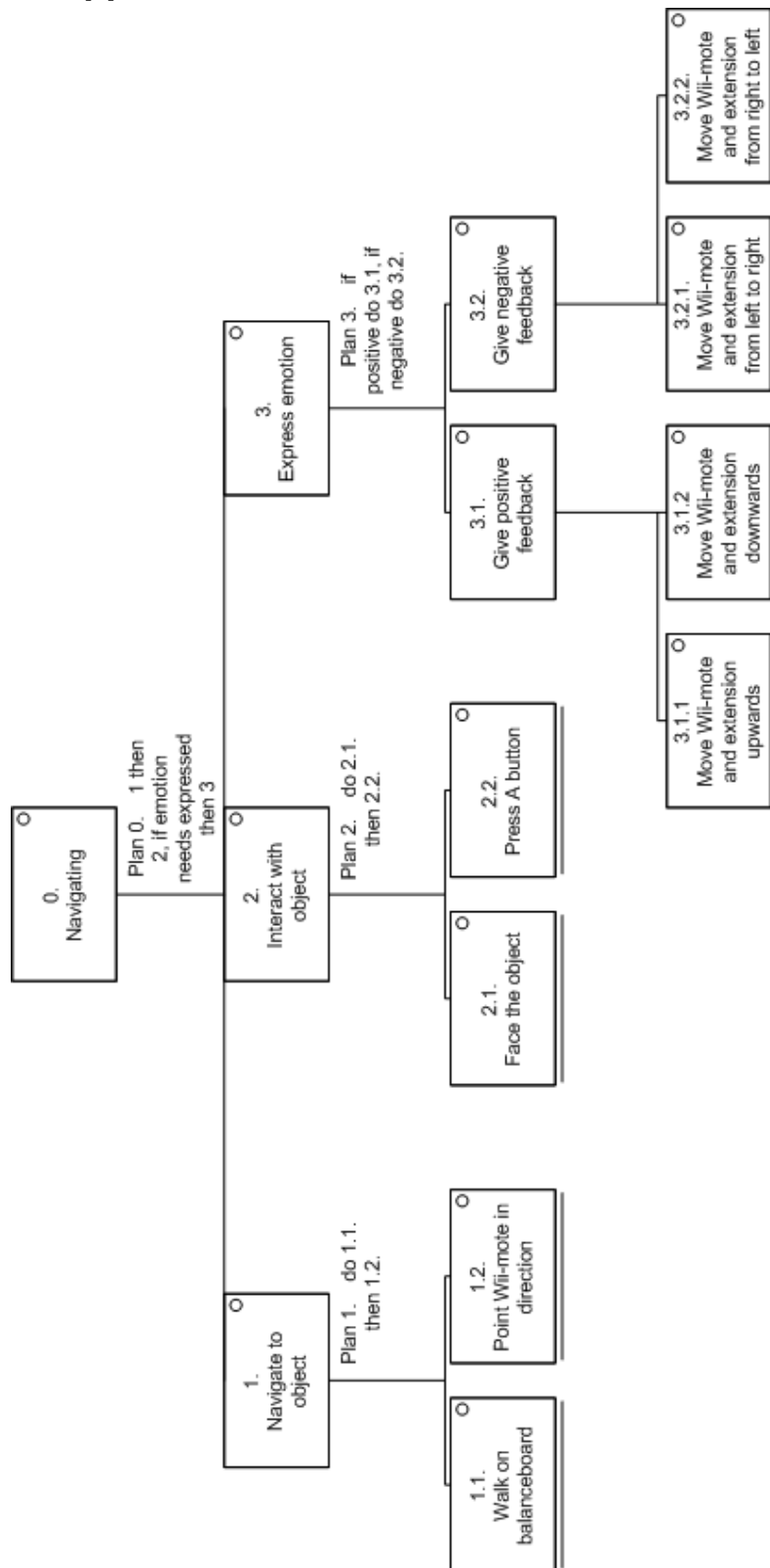


Figure 1: Detailed task analysis: Navigation

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## 7. Document management

### Version history

Version	Date	Author	Comments
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### Document distribution

Name / Lecturer / Assistant	Datum	Versie
Dr. Ir. Fons J. Verbeek	01 december 2008	1.0
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