

BAUHAUS UNIVERSITY WEIMAR

MASTER THESIS

Comparison of Interactive and Non-Interactive advertisement in public display

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*A thesis submitted in fulfillment of the requirements
for the degree of M.Sc*

in the
HCI group
Human Computer Interaction, M.Sc

May 15, 2016

Declaration of Authorship

I, Hasibullah SAHIBZADA, declare that this thesis titled, "Comparison of Interactive and Non-Interactive advertisement in public display" and the work presented in it are my own. I confirm that:

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- Where I have consulted the published work of others, this is always clearly attributed.
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- I have acknowledged all main sources of help.
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Signed:

Date:

“Thanks to my solid academic training, today I can write hundreds of words on virtually any topic without possessing a shred of information, which is how I got a good job in journalism.”

Dave Barry

BAUHAUS UNIVERSITY WEIMAR

Abstract

Faculty of HCI
Human Computer Interaction, M.Sc

M.Sc

**Comparison of Interactive and Non-Interactive advertisement in
public display**

by Hasibullah SAHIBZADA

The Thesis Abstract is written here (and usually kept to just this page).
The page is kept centered vertically so can expand into the blank space above
the title too...

Acknowledgements

The acknowledgments and the people to thank go here, don't forget to include your project advisor...

Contents

Declaration of Authorship	i
Abstract	iii
Acknowledgements	iv
1 Introduction	1
1.1 Introduction	2
1.2 Thesis Goal	2
1.3 Research Questions	3
1.4 Methodology	3
1.4.1 Prototypes	3
1.4.2 Evaluations	4
1.4.3 Ethics	4
1.5 Research context	4
1.6 Thesis outline	4
2 Background	6
2.1 Advertisement	7
2.1.1 History of advertisement	7
2.1.2 Pervasive Advertising	7
2.1.3 K / L value	7
2.1.4 Metaphors	7
Mirrors	7
Windows	7
Overlay	7
Posters	7
2.2 Public displays	7
2.2.1 History of public displays	7
2.2.2 Auto-active displays	7
2.2.3 Engagement with displays	7
Attention	7
Motivation	7
Interaction	7
2.2.4 Interaction modalities	8

Body	8
Mobile	8
2.2.5 Interaction models	8
2.2.6 Evaluation	8
2.2.7 Approaches to Research	8
2.2.8 Methods and tools	8
3 Attraction attention	9
3.1 Introduction	10
3.2 Background and related works	10
3.3 Approaches	11
3.3.1 Prototypes	12
3.3.2 Hypothesis	12
3.4 Study design	13
3.4.1 Participants	13
3.4.2 Location	13
3.4.3 Procedures	13
3.4.4 Data gathering	13
Observation	13
Interviews	14
3.5 Findings	14
3.5.1 Observation findings	15
3.5.2 Interview Findings	16
Good Advertisement	16
Bad Advertisement	18
3.6 Conclusion	19
4 Advertisement decision	20
4.1 Introduction	21
4.2 Research Questions	22
4.3 Study design	22
4.3.1 Participants	23
4.3.2 Focus-Group Environment	23
4.3.3 First session	23
Questions	23
Procedures	24
4.3.4 Second Session	24
Procedures	25
Prototype and discussion pictures	25
4.3.5 Data Gathering	26
4.4 Findings	26
4.4.1 First Session Findings	26
Reason of Bauhaus-Walk and advertisement	26
Target group	27
Peak Tour times	28
Possible advertisement location	28
Content of advertisement	28
Interaction of advertisement	29
4.4.2 Second Session Findings	29
Prototype discussion	30
4.4.3 New ideas	30

4.5 Conclusion	31
5 Advertisement Low fidelity prototype	32
5.1 Introduction	33
5.2 Requirement gathering	34
5.2.1 Functional Requirements	34
5.2.2 Non-functional Requirements	34
5.2.3 Personas	34
5.2.4 Use case diagrams	36
5.3 Goal	36
5.3.1 Hypothesis	36
Body Interaction	36
Mobile Interaction	36
5.4 Design study	37
5.4.1 Subjects and location	37
5.4.2 Procedures	37
5.4.3 Data gathering	38
5.5 Findings	38
5.5.1 Usability issues	38
5.5.2 Body Interactions issues	38
5.5.3 Mobile usability	39
5.5.4 Hypothesis decisions	41
Body Interaction	41
Mobile Interaction	42
5.6 Conclusions	43
6 Advertisement application	44
6.1 Introduction	45
6.2 Attracting attention Application	45
6.2.1 Requirement gathering	45
Hardware requirement	45
Software requirement	46
6.2.2 Following eye application	46
6.2.3 Firework application	46
6.2.4 Silhouette application	46
6.3 Main advertisement application	47
6.3.1 Interfaces	48
6.3.2 Advertisement video	49
6.3.3 Hardware setup	50
6.3.4 Non-Interactive application	50
Flowchart Diagram	51
6.3.5 Body Interactive application	52
First interface	52
Transition to second interfaces	52
Second interface	53
Flowchart Diagram	53
Software Details	54
6.3.6 Mobile Interactive application	55
First screen interface	55
Transition to second interfaces	55
Second screen interface	56

Mobile interface	56
Hardware setup	57
Software setup	57
Flowchart Diagram	58
7 Advertisement High Fidelity prototype	60
7.1 Introduction	61
7.2 Research questions	61
7.2.1 Body and Mobile interactions	61
7.2.2 Video advertisement	62
7.3 Test Design	62
7.3.1 Participants	62
7.3.2 Task	62
call-to-action understandability	62
Task understandability	63
Task completion time	63
Content of Advertisement	63
Usability issues	63
Data Gathering	63
7.3.3 Performance data	63
7.3.4 Preference data	63
7.3.5 Think aloud quotes	64
7.3.6 Interview transcripts	64
7.3.7 Recordings	64
7.4 Findings	64
7.4.1 Mobile Interaction performance	64
7.4.2 Body Interaction performance	65
7.4.3 Body Vs. Mobile performance	65
7.4.4 Usability issues	67
Mobile Interaction	67
Body Interaction	68
Advertisement video	68
7.4.5 Advertisement goal	69
Did users understand about advertisement?	69
Word cloud (Wordle)	69
Key factors for advertisement understanding	70
7.4.6 Interview Findings	71
Mobile Categories	71
Body Categories	72
Advertisement	73
7.4.7 Application Performance	73
7.5 Conclusion	74
8 Interactive and non-Interactive Advertisement field study	75
8.1 Introduction	76
8.2 Interactive Advertisement	77
8.2.1 Body Interactive	77
8.2.2 Mobile Interactive	78
8.3 Non-Interactive Advertisement	79
8.4 Research questions	80
8.5 Design study	80

8.5.1	Location	80
8.5.2	Duration	80
8.5.3	Internal Validity	81
8.5.4	Participants	81
8.5.5	Data gathering	81
8.6	Data Analysing	84
8.6.1	Glance counts	84
8.6.2	Interviews	84
8.6.3	Display Engagement phases and time	84
8.6.4	Honeypot and landing effects	84
8.6.5	Other observations	84
8.7	Findings	85
8.7.1	Non-Interactive findings	85
8.7.2	Body Interactive findings	90
8.7.3	Mobile Interactive findings	99
8.7.4	Comparison of advertisements	103
	Number of passerby	103
	Attention Level Comparison	103
	Engaged and Non-engaged passers-by	104
	Landing effect	105
	Honeypot effect	106
8.8	Discussion	107
8.9	Conclusion	108
9	Advertisement enhancement	109
9.1	Introduction	110
9.2	Advertisement enhanced version	110
9.3	Research question	110
9.4	Design study	111
9.4.1	Location	111
9.4.2	Duration	111
9.4.3	Participants	111
9.4.4	Data gathering	111
9.5	Findings and results	113
9.5.1	Attention Level measurements	113
9.5.2	Engagement phases and duration spent	113
9.5.3	Passerby and engagement	114
9.5.4	Landing and Honeypot effects	115
9.5.5	Other observations	116
9.5.6	Comparison with Body interaction	117
9.6	Discussions	118
9.7	Conclusion	118
10	Conclusion	119
10.1	Introduction	120
10.2	Attention attraction study	120
10.3	Interaction	120
10.4	Motivation	120
10.5	Future work	120

A Appendix	125
A.1 Glance count sheet	126
A.2 Consent Form	127
A.3 Interview Questionnaire	128
A.4 Focus group skitches	129
A.5 Low fidelity	131
A.6 Coded Interviews	132
A.7 Onsite study	133
A.8 Interview Questionnaire	134
A.9 Non-Interactive glance count	135
A.10 Body Interactive glance count	136
A.11 Mobile Interactive glance count	137
A.12 Non-Interactive interview code	138
A.13 Body Interactive interview code	139
A.14 Mobile Interactive interview code	140
A.15 Non-Interactive observation notes	141
A.16 Body Interactive observation notes (1)	142
A.17 Body Interactive observation notes (2)	143
A.18 Mobile Interactive observation notes	144
A.19 New body interactive study	145
A.20 Enhanced Interactive advertisement Glance count	146
A.21 Enhanced Interactive observation notes	147
A.22 Hi-Fi	148

List of Figures

2.1 The Audience Funnel	8
3.1 Attraction attention methods	12
3.2 A: Kasseturm Advertising monitor, B: Mensa ground floor plan.	14
3.3	14
4.1	23
4.2	24
4.3	25
4.4 Explaining and discussions on prototypes	26
4.5 Target Group	27
5.1	37
5.2 (A) Body interaction: as can be seen on the left corner, the person is physically walking and in the screen the blue silhouette is changing. (B) Mobile interaction: In the left corner, the person is changing the cursor in the phone and the effect is shown on the screen.	38
6.1 Initial interface of advertisement: The picture shown is the <i>Gropius walter</i> room, and the Event name on the upper left side, and the Bauhaus University logo at the bottom right.	48
6.2 Second Interface: This is map of Weimar that has some interest regions shown on the top of the map. Those regions are blinking to signal the users.	48
6.3 Second interface: Before the image is shown on the map, first the picture is animated to become enlarged then the picture is resized to fit on the map.	48
6.4 Second interface: This shows a map with the picture elements, each picture contains a name	49
6.5 Third interface: In this interface the video is being played, this picture is a screenshot of one of the frames of the video . .	49
6.6 Third interface: This is the last frame of the video that shows information about how and where to join the Bauhaus Walk.	49

6.7	Hardware setup	50
6.8	Picture	50
6.9	Non-interactive Flowchart diagram	51
6.10	First Interface: When the person steps in the range of the Camera, his silhouette is projected on the screen with a different color; the application calls the person to come near in order to trigger the game.	52
6.11	As can be seen in picture A, the person is close to the screen and the loading animation is started, in picture B the person silhouette is being scaled down (in this example the silhouette color is green) and in picture C the instruction is shown.	53
6.12	Second Interface	53
6.13	Body Interactive advertisement Flowchart diagram	54
6.14	Mobile interactive interface:	55
6.15	In picture (A) a user has logged in and the screen is loading, in picture (B) the task description is shown.	56
6.16	Mobile interactive interface	56
6.17	Mobile controller interface: The left side is the cursor and the right side is the select button.	57
6.18	Hardware setup	57
6.19	System architecture	58
6.20	Mobile Interactive advertisement Flowchart diagram	59
7.1	64
7.2	Chart that shows each aspect with respect to duration.	65
7.3	Chart that shows each aspect with respect to duration	65
7.4	Comparison of body and mobile interaction performance	66
7.5	Comparison of the aspects of interaction among body and mobile	66
7.6	Number of words and drawings of the advertisement elements	69
7.7	Word cloud representation of the keywords	70
7.8	74
8.1	Two persons are standing far from the screen, and their colored silhouettes are shown, the girl is getting closer to the screen to start the interaction.	78
8.2	Both are in interaction phase, as you can see the girl has explored one location and a picture is shown	78
8.3	The person is connecting to the advertisement web controller using his phone.	79
8.4	The screen is automatically exploring locations on the map	79
8.5	Weimar Tourist Information Center Top-view picture, The locations are marked with yellow arrows.	80
8.6	Depth recording examples	83
8.7	Non-interactive attention level chart	85
8.8	Non-interactive Attention level percentage	85
8.9	Non-interaction Number of engaged and Non-engaged passers-by	86
8.10	Non-Interactive Percentage of engaged and passerby	86
8.11	Landing effect	87
8.12	Honeypot effect	87

8.13	The first two pictures show that the display is completely ignored and people are busy with themselves. Picture C shows two couples are reading the screen.	89
8.14	Body interactive attention level chart	90
8.15	Body interactive Attention level percentage	90
8.16	Average time for each phase	91
8.17	Body interactive Number of engaged passerby	92
8.18	body interactive percentage of engaged passerby	92
8.19	Landing effect	93
8.20	Honeypot Effect	93
8.21	96
8.22	Calling others	96
8.23	Playing with silhouette	97
8.24	Noticing interactivity	97
8.25	Raising hand	97
8.26	Mobile interactive attention level chart	99
8.27	Mobile interactive Attention level percentage	99
8.28	Mobile interactive Number of engaged passerby	100
8.29	Mobile interactive percentage of engaged passerby	100
8.30	Honeypot effect	101
8.31	Landing effect	101
9.1	Advertisement extended version using three Kinect cameras. .	110
9.2	Three Kinect images	112
9.3	Attention level chart	113
9.4	Attention level percentage	113
9.5	Average time for each phase	114
9.6	New body interaction Number of engaged passerby	114
9.7	Percentage of engaged and passers-by	115
9.8	Honeypot effect	115
A.1	First sketch	129
A.2	Second sketch	130
A.3	Third sketch	131
A.1	Pariticipant's body performance	148
A.2	Pariticipant's mobile performance	148

List of Tables

1.1	Summary of Research Questions	3
3.1	Cross tabulation of deployment and attention level	15
3.2	Cross tabulation of Following and traditional attention level	15
3.3	Cross tabulation of Firework and traditional attention level	15
3.4	Cross tabulation of Silhouette and traditional attention level	16
5.1	First persona	35
5.2	Second persona	35
6.1	UserMap and application color mapping	47
8.1	Week sequence	81
8.2	Landing and honeypot effects	87
8.3	Body Interactive Landing and honeypot effect	93
8.4	Mobile Interactive Landing and honeypot effect	101
8.5	Number of passerby in three weeks	103
8.6	Cross tabulation for each week attention level	104
8.7	Number of engaged passers-by in three weeks	104
8.8	Post-Hoc Tukey's HSD	105
8.9	Number of Landing effect in three weeks	105
8.10	Post-Hoc Tukey's HSD results	106
8.11	Number of Honeypot effect in three weeks	106
8.12	Post-Hoc Tukey's HSD results	106
9.1	Landing and honeypot effects	116
9.2	Number of people for three conditions	117
9.3	Cross tabulation for each condition attention level	117
9.4	Cross tabulation for each condition Landing effect	117
9.5	Cross tabulation for each condition Honeypot effect	118
9.6	Number of engaged passerby in three weeks	118

List of Abbreviations

LAH List Abbreviations Here

WSF What (it) Stands For

Physical Constants

Speed of Light $c_0 = 2.997\,924\,58 \times 10^8 \text{ m s}^{-1}$ (exact)

List of Symbols

a	distance	m
P	power	W (J s^{-1})
ω	angular frequency	rad

For/Dedicated to/To my...

1

Introduction

1.1 Introduction

From very old ages as from 13th century advertising has played an important role to promote customers attention and be able to compete with one another, The first paper advertisement was published at 1704 in an American newspaper called Boston News Letter, which was about houses and lands to be sold [16] and after that lots of business started to do their advertisements in newspapers, posters and banners. The first television ad was shown at 1941 on an American TV [15], this ad brought attention to a wide area of application and big business industries toward advertisement as a result the budgets raised much higher for advertisements and later advertisement entered the World Wide Web or so to say online advertising, which has evolved now to multi-billion dollar industry. Now because of the emerging new technologies and advancements, advertisements are in our smart phone applications, smart TV sets, tablet PCs and many other smart devices. And from past decades display screens are replacing print advertisements because of the easy reusability of the screen and convenient usage of them and providing dynamic contents.

Above all, still most of the advertisements are boring, time consuming, not clear for a lot of viewers, people tend to ignore advertisements because of many different reasons. Posters, banners and digital screens, which have static and dynamic contents respectively, are still done in a very bias way with considering the contexts, user's interests, locations and many other factors.

On the other hand, the use of technology with the advertisements could make the advertisement more attractive and interesting for viewers and open new ways and techniques to boost product purchases by customers, for example with the use of internet now more companies reserve spaces for their advertisement inside webpages by making flashy ads or playful interactive ads to attract users and redirect users to their webpages and so on. Even more interactive advertisements are now experienced in public spaces by allowing users to interact with their smartphone or do gestures or touch on large displays to perform easy tasks and get redirected to the shop or at least use them as a fun tool to remember about the product.

Additionally using body-sensing technologies, which are advancing day-by-day like Kinect Camera [17], could be used to allow passers-by to be engage without the use of other device, with which it would be easy for us to explore more possibilities of attraction methods, novel interactions and engagement techniques to provide to the users better experience and increase product purchase and interest.

1.2 Thesis Goal

The research is concentrated in one particular environment, which is the Tourist Information Center, and currently there are more dynamic and static displays compared to interactive displays, people are a lot familiar with non-interactive displays and most of the times expect series of pictures and videos from these screens and threat it as a mean of advertisement, but there is a missing link between passers-by and advertisement, if this missing link gets connected somehow then advertisement would be more fun and engaging for people.

First, this thesis researches on advertisement in general to find out what are the people interest and expectation from a public display and how could the existing be changed in a way that people would like it and pay attention.

Second, this thesis researches on attraction attention level in public to find out which of the defined methods attracts passers-by attention toward the screen.

Third, it focuses on the missing link, that how to effectively connect people with advertisement so that people get attracted, motivated and get engaged with the screen.

Fourth, it conducts users studies and focus groups to make an advertisement that suites to the theme and is meaningful, from which two are interactive and one is non-active advertisement. Two of interactive advertisements consist of body interaction and mobile interaction and the non-active advertisement is same but the different phases are triggered automatically.

Additionally, conduct a comparative study on advertisements that first it would compare the non-interactive advertisement with interactive advertisement and second would compare two different interactive advertisements (Smartphone Vs. body) with each other.

And finally it proposes new attraction attention, motivation and engagement techniques for public displays and compares it with the previous interactive advertisement techniques.

1.3 Research Questions

TABLE 1.1: Summary of Research Questions

No.	Research Questions	Chapter
R1	What are the characteristics of a good and a bad Advertisement?	Chapter 3
R2	Which method is better to attract passers-by's attention?	Chapter 3
R3	How to create a suitable interactive and non-interactive advertisement?	Chapter 4
R4	How to design and evaluate Low-fidelity prototypes for public display?	Chapter 5
R5	How to design and evaluate High-fidelity prototype for public display?	Chapter 7
R6	What are the differences between non-interactive and interactive ad?	Chapter 8

1.4 Methodology

Public displays are increasing day-by-day because the hardware prices are decreasing and people can afford to pay and install on at their shop, supermarket, tourist centers, libraries, museums and lot more places; therefore there is still not a single accepted guideline to design and evaluate public displays, This thesis is a qualitative research and used a user-centered design approach to carryout evaluation in different stages and most of the data gatherings were qualitative to take users feedbacks that led to the results and findings.

1.4.1 Prototypes

In this thesis prototypes were created in each stage like low-fidelity, high fidelity and the enhanced version of high fidelity prototypes, Each of the prototypes had their different versions and the latest versions were selected for the evaluation. There were lab prototypes and also on field prototypes,

excessive efforts have been done to assure to make prototypes to be similar in various stages like low-fi and high-fi prototypes, and at the same time these prototypes should be robust and comply with technologies.

1.4.2 Evaluations

Before even starting evaluations, many questions arise like where the location should be, what hardware shortcoming you have, and if you have other moderators to help you with the evaluation process and when they are free to assist you. During the thesis work different stages of evaluations have been completed like there were some evaluations that required only indoor in a controlled environment and some others required outdoor to get real data from public, The Low-fi and High-fi prototypes were evaluated in lab to do usability testing and do performance measuring, and the actual comparison of the advertisements (interactive and non-interactive) were done on field.

The lab evaluations were fairly easily managed, but for the onsite field evaluations we had to deal with the many level of responsible personal to fix a date and location.

During the evaluation process in public, privacy issues was an important factor that we had to be clear about and we tried to avoid taking pictures or video recordings unless by taking their permission and Kinect color silhouette recordings were used to hide identity of people.

Different methods of data gathering were used like interviewing people, taking onsite notes of the passers-by behavior, system logs and Kinect depth recording and some pictures.

1.4.3 Ethics

Is this important, if yes which ethics should i mention?

1.5 Research context

The research was carried out under Human Computer Interaction department in Bauhaus University Weimar over the course of one semester period the advertisement prototype was officially made for Bauhaus-Walk event and the main location that the comparison happened was in Weimar Tourist information center.

1.6 Thesis outline

- **Chapter 2:** This chapter discusses in-depth on various related issues like Advertisement, how it began, why is it influential, what is pervasive advertising, what are the common metaphors, in the second part of this chapter, it discusses on Public displays, the history of it, what are common technologies, what are they mostly used for, how engaging, attention and motivation methods are being used, what are the interaction techniques and how these displays could be evaluated.
- **Chapter 3:** This chapter focuses on advertisement to figure out what public really expect from advertisement in public displays and qualitatively summarizes good and bad advertisement, then this chapter

discusses on various methods of attention level in public displays and proposes three different methods and evaluates them to chose the best one, the decision of this method will be used in further studies.

- **Chapter 4:** This chapter goes through the process that how and why the advertisement for Bauhaus-Walk was selected.
- **Chapter 5:** This chapter is the paper prototype evaluation, this chapter discusses on how the paper prototype was created for interactive advertisement public display and what were the results and findings from the participants.
- **Chapter 6:** This chapter explains all the functionality and requirements of the applications, what technologies and hardware were being used and how to get the system running.
- **chapter 7:** This chapter conducts an advertisement high-fi evaluation and compares body interaction with mobile interaction techniques.
- **chapter 8:** This chapter makes the main goal of the thesis which is the comparison of non-interactive and interactive advertisement, the chapter explains about the study design along with data gathering techniques and how the data were evaluated and compared.
- **Chapter 9:** This chapter is an extension of the previous chapter and discusses the issues with the body interaction and how the body interaction could be enhanced to perform better in current existing public display setup, The chapter discusses on design study and how the experiment was conducted and how the results were compared with the older version of body interaction.
- **Chapter 10:** Conclusion

2

Background

2.1 Advertisement

2.1.1 History of advertisement

2.1.2 Pervasive Advertising

2.1.3 K / L value

2.1.4 Metaphors

Mirrors

Windows

Overlay

Posters

2.2 Public displays

2.2.1 History of public displays

2.2.2 Auto-active displays

2.2.3 Engagement with displays

Attention

Motivation

Interaction

There are many stages until users actually interact with the advertisement as shown above by Michells,D and Muller,J in the journal of HCI [2] Attention and motivation will eventually lead to interaction and these stages follow each other if the first step fail the rest would not happen. In this part of the study I want to focus more on the attraction attracting part of advertisement.

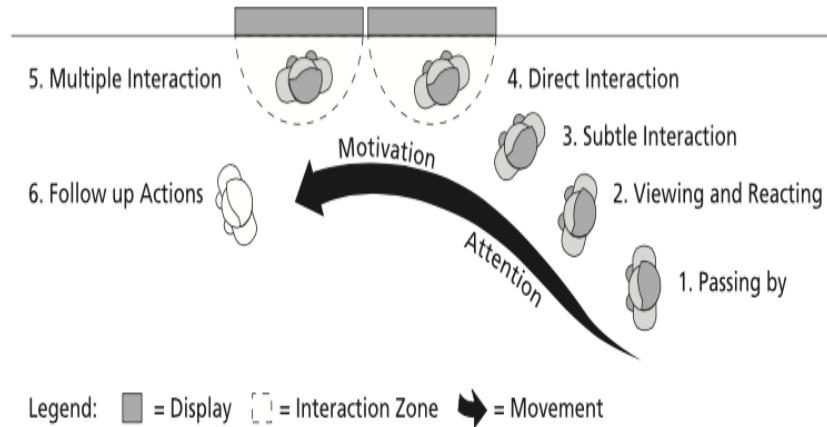


FIGURE 2.1: The Audience Funnel

2.2.4 Interaction modalities

Body

Mobile

2.2.5 Interaction models

2.2.6 Evaluation

2.2.7 Approaches to Research

2.2.8 Methods and tools

3

Attraction attention

3.1 Introduction

Increasingly displays are now being installed in most of the locations and most of these displays are full of advertisements and passers-by often try ignoring because they expect unrelated or uninteresting contents. Huang et al, also investigated and explained that most public displays are ignored and get little glances [20].

In other areas there is problem of “*information overload*” on people at some environmental setups, when they enter at place where too much information is delivered and needs to be processed by a single person, and when that is beyond the person capability then they simple ignore them, as Milgram [21] investigated on information overload stated in his paper that “*the concept of overload. This term, drawn from systems analysis, refers to a system's inability to process inputs from the environment because there are too many inputs for the system to cope with, or because successive inputs come so fast that input A cannot be processed when input B is presented*”, therefor there are priorities for each input and low priorities are disregarded.

A good example of disregarding of low priorities inputs is “*Banner Blindness*” in the web, Burke et al [22] showed with an experiment using eye-tracking that people tend to ignore banners mostly and have very few number of recalls of the banner contents, where at this points other researchers tried to investigate on “*Display Blindness*” if it resides in public displays, Jörg müller and his fellow investigated on the effect that people ignore displays because of uninteresting content, they conducted the experiment with two displays “*One, the iDisplay, which showed information for students, was looked at more often than the other (MobiDiC) which showed coupons for shops.*”[28]

We conducted a small field study to investigate the behavior of passers-by of an already situated screen in university and took interviews of 16 people to question them about their behavior toward these displays and try to categorize the negative feedbacks and positive feedbacks of advertisement in public displays. And at the same time it was a comparative study to investigate how the attention toward the screen could be achieved by evaluating three different techniques and the old traditional advertisement shown on the university Mensa screen, The purpose of doing this was to find out appropriate attention attracting stage for interactive advertisement which are discussed on the next chapters.

Should i mention results and findings in one paragraph briefly here?

3.2 Background and related works

At the early stages of digital advertisement, they were very interesting for people and people would stand for a while and have a look at the content, simply because it was something new with big screens, and now digital advertisements are increasing everyday and has become very common and it is same as Television ads without sound; therefor most people try to avoid seeing them because it is not interesting for them anymore or is not related to them, some how there is a missing link between people and advertisements. The rise of powerful computers and new technologies in the last decades, we have Interactive advertisements that integrate people involvement to make advertising more effective and usable.

Designers of Interactive advertisement have focused a lot on the Usability of the them which obviously should not be avoided but many other factors have not been studied deeply that is why it fails to accomplish their main purpose and are treated like simple posters and ignored. Interactive advertisement should be able to Attract and motivate users and finally allow users to interact in a better way. “*If they capture attention, many displays seem to fail to motivate passers-by to interact, who have other goals in mind. If, finally, the audience has noticed the display and is motivated to interact, interactive displays seem to fail to deal appropriately with the public nature of interaction, where people may avoid interaction in order to maintain their social role and e.g., not look silly*”[1]

Every moment we spend alone, with friends in the crowd, in the concert or party our attention keeps tracks of us and make us aware of the environment and we react differently for different stimuli, so “*Attention is the process that, at a given moment, enhances some information and inhibits other information. The enhancement enables us to select some information for further processing, and the inhibition enables us to set some information aside.*”[5]. Attention is influenced by two different processes (Top-Down & Bottom-Up). Top-Down process happens when the user has prior awareness (goal) about where to put his/her attention toward and Bottom-Up process happens when the user has no prior awareness and suddenly by an external stimuli move or change attention toward or to something. People walking on pathway or walking in a store or waiting in bus station does not have any knowledge or awareness about an Interactive advertisements located there, nor the researchers tend to speak about it for them, at this situation I believe that the attraction of attention should be a Bottom-Up process for the users to drag them to the screens.

The appearance of objects suddenly or moving objects on the screen or contrasting color can capture attention quicker. Yantis and Jonides (1984) demonstrated that the detection of a target in visual search was markedly enhanced when the target was presented as an abruptly[6]. And the type of contrast change on an object influence priority in visual search, “*Both the sudden appearance of an object and sudden changes in existing object features influence priority in visual search.*”[4]

Elaine M. Huang, Anna Koster, and Jan Borchers have researched and discussed on “*When Does the Public Really Look at Public Displays?*”[7], in this paper they argued that glancing and attention at large displays is complex and is dependent on many factors like Brevity of glances, Positioning of displays, Content format and dynamics, Catching the eye, Display size, this paper provided some recommendations for each of the mentioned factors.

3.3 Approaches

As discussed earlier the Interactive advertisement would need to first attract the passers-by, Therefor for the initial attraction attention study, three different types of eye-catching techniques are made to observe which suites best for further research and which side of them should be improved and use them for the interactive advertisement. In this study the of the interactivity or the advertisement itself are not the core study, this study is only to see how many passers-by change their attention and glance toward the screen.

The definition of glance and ignored toward a screen is briefly given by John Hardy and their colleague [19] in which they categorized the attention level to three levels as glanced, ignored and watched, glance happens when the passer-by turn his/her head and stares the screen for less than 3 seconds, and ignore is when the person completely does not look or turn his/her head.

3.3.1 Prototypes

In the following examples the screen background color is set to black and is in full screen mode but with different contents.

As you can see in this figure 3.1 these eyes suddenly pop-up when a person passes-by the screen and follows the person by moving its eyeball. The idea behind this is to check if people would react if something abruptly appear on the screen and starts to follow people, This example has very limited movement it is only constraint with limited eye space, but big object with high contrast.

Another example in figure 3.1, shows different colored and sized firework animation, The application will show a random firework for each person on the scene, there are three blocks of fireworks for three persons, the movement of the person changes the location of the firework. In this example there is more object movement and color changes with high contrast.

Jorg Müller [8] has investigated that how passers-by notice the interactivity of the public display by showing different representations of body like Mirrored (1) “*user silhouettes*”, (2) “*avatar-like*”representations and (3) “*real user Image*”. In that paper they concluded that mirroring user image is much more effective to attract users and understand the interactivity of the display, but because of privacy policy and because of social attitude like may be someone does not like to be shown on the screen, only Mirrored silhouettes,which is the augmented colored representation of people, will be shown and investigate how much is the attraction toward the screen. Figure ?? shows three person’s silhouette representation.

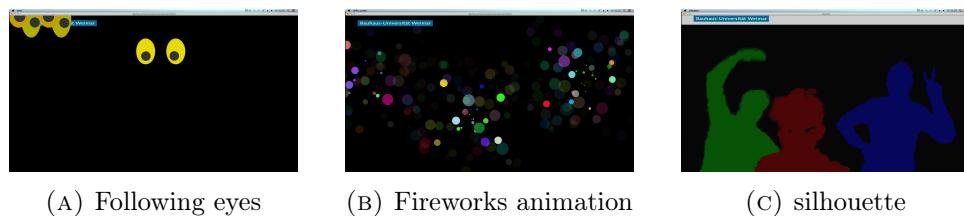


FIGURE 3.1: Attraction attention methods

3.3.2 Hypothesis

- **H1:** Silhouette representation method attracts more passer-bys than other two methods.
 1. Dependent Variable: Number of people glance per total passers-by.
 2. Independent Variable : Interactive / traditional Advertisement.

3.4 Study design

In the beginning the idea was to conduct a some experiment in the lab and investigate about the attention, like doing gaze tracking but it did not suited well for the real life displays, Therefor we came up to a decision to investigate the glance counts made for each individual methods and compare them among each other.

3.4.1 Participants

Participants were random from university students or employees, basically a broad target that mostly consisted of students and teachers, the participants were taken in consideration that passed in front of the display, The participants who passed from the backside of the screen were not taken in consideration. Non of the participants knew about the methods shown on the screen.

3.4.2 Location

The study was conducted in university Mensa, this location was an ideal location because many students, teachers and university employees go for having lunch and taking coffee breaks and the Mensa gets crowded. The Mensa 14 inch display was used for the study, which was installed near the stairs and already was used for advertisement purpose.

3.4.3 Procedures

The study was conducted for four continues days, and each day only one method was displayed on the screen for two hours at 14:00 oclock, The first day of the study was the passive mode of the screen, where traditional advertisement was displayed and the next three days the attraction attention methods were activated. One person was responsible for observing and noting the glances made by the passers-by and also noting interesting behaviour of people toward the screen. The other person was responsible to take interviews from the passers-by that glanced at the screen and get more feedbacks of the advertisement in general.

3.4.4 Data gathering

Three different attraction attention methods and one traditional advertisement of Kasseturm were evaluated each for two hour period from 14:00–16:00 in individual days in Bauhaus University Mensa. Two methods (Observation and Interviews) were used for data gathering during the four day long period.

Observation

Observation was used to count the number of glances the passers-by make at the screen while pass from the front of the screen. A small pilot study was conducted for the observer to find an appropriate location in the Mensa setup to be able to count people and glances without being noticed by passers-by.

The first day, which is a normal advertisement, does not require Kinect Camera, but in order to have same environment for all the days, The camera

was installed on top of the monitor to look similar as the other interactive feature.

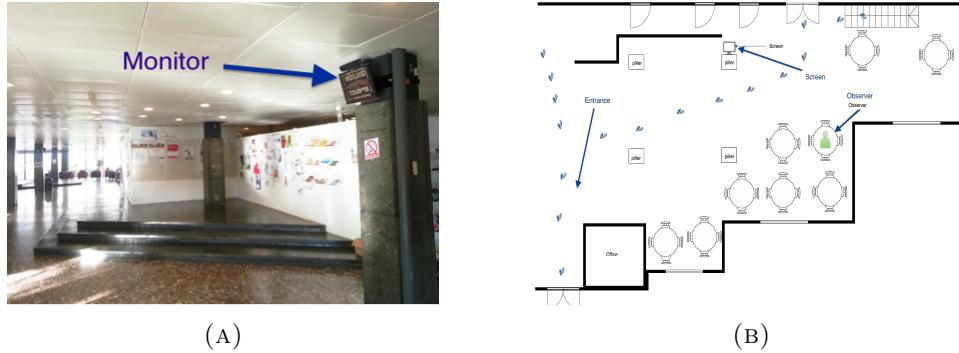


FIGURE 3.2: A: Kasseturm Advertising monitor, B: Mensa ground floor plan.

As sheet was provided to the observer to note each 5 min time stamp for two hours, specific letters were defined to detect Male, Female, Unknown gender and at the same time who were in a group and individual and who glanced to the screen. See A.1

As stated before that observer was given one small pilot study to detect a good location and be able to count and note in the sheet, beside that he was told to write notes if he observes something interesting during the period.

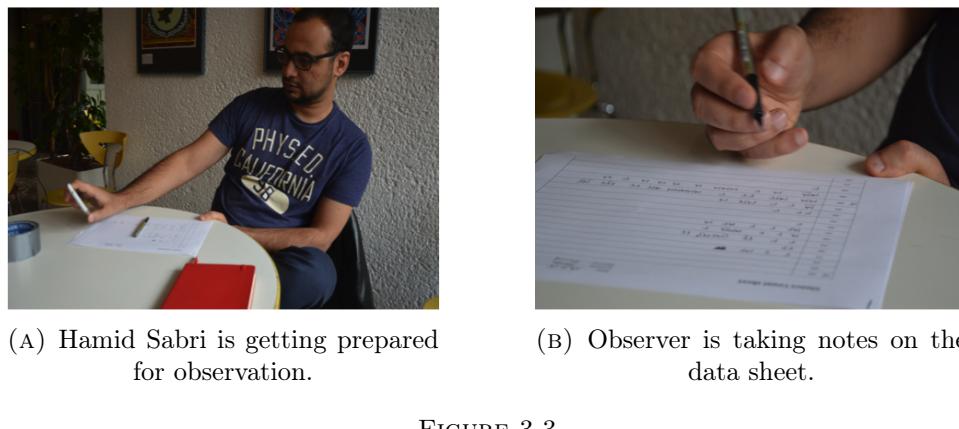


FIGURE 3.3

Interviews

During all four day of the observations, 16 interviews were taken from people inside Mensa to get general opinion about advertisement and people preferences what they like and what they avoid about advertisement. Responders were asked to sign the consent form because the interviews were tap recorded for later analyzing. Each interview took around 6 minute in average. All interviews were transcribed separately for further data analyzing. See A.2 for consent form and A.3 for the questionnaire.

3.5 Findings

To have accurate findings explanation, they are categorized as bellow.

3.5.1 Observation findings

Observational data for glance count and people passed by the screen were gathered and results to the bellow findings.

TABLE 3.1: Cross tabulation of deployment and attention level

Method	Glanced (%)	Ignored (%)	Total
Traditional	9 (%7.6)	109 (%92.3)	118
Silhouette	22 (%15.82)	117 (%84.7)	139
Following eye	10 (%12.98)	67 (%87)	77
Firework	6 (%10.1)	53 (%89)	59

As can be seen a lot of from the table above Silhouette attention attraction technique received the highest number of glances 21 out of 138 compared to other techniques, Following eye technique was the second most attracted technique probably because of its contrasting color and funny.

To find the statistical significant difference between traditional screen and these three methods Chi-squared test was applied as bellow.

TABLE 3.2: Cross tabulation of Following and traditional attention level

Method	Glanced (%)	Ignored (%)	Total
Traditional	9	109	118
Following eye	10	67	77
Total	19	176	195

Performing the ch-squared test, $\chi^2 (1, N=195)=1.522, p >.05 (p=.21)$ suggests that there is no significant difference to attract passers-by between following-eye method and traditional screen

TABLE 3.3: Cross tabulation of Firework and traditional attention level

Method	Glanced (%)	Ignored (%)	Total
Traditional	9	109	118
Firework	6	53	59
Total	15	162	177

After the ch-squared test, $\chi^2 (1, N=177)=0.328, p >.05 (p=.56)$ suggests that there is no significant difference to attract passers-by between Firework method and traditional screen.

TABLE 3.4: Cross tabulation of Silhouette and traditional attention level

Method	Glanced (%)	ignored (%)	Total
Traditional	9	109	118
Silhouette	22	117	139
Total	31	226	257

After the ch-squared test, $\chi^2(1, N=257)=4.046, p < .05 (p=.04)$ suggests that Silhouette representation attracts more passers-by than traditional screen. Based on above findins, We accept Hypothesis H0, that Silhouette representation method significantly attracts more passers-by than other two methods. The silhouette seems more promissing compared to rest of the methods, so the decision would be to use silhouette technique for further advertisement application.

3.5.2 Interview Findings

Interview transcripts were individually coded to generalize the responder's opinions on the advertisements. I created two main sections from the interviews that what makes a Good Advertisement, and what makes a Bad Advertisement and related all responses to these sections a lot of codes were analyzed and grouped together to make sub sections and sub-sub-sections.

Good Advertisement

A lot of categories have been found after coding the interviews the chart in Appendix A, show all the categories and sub categories with the correspondent code from the interviews and even some codes were directly also placed as a category instance. The bellow list describes some of the important categories retrieved from the diagram.

1. Content

Interactive advertisements attract more people than traditional advertisement. Responders like to have more Funny contents than any other restrict informational advertisement; “*just make it funny like make a joke or something but something in a very good one that is really difficult*”, “*it should be very not very serious?*”, “*Yeah mostly I like funny things that the main concept is shown in different way like in funny things*”, “*I like advertisement that are somehow have humor*”.

At the same time responders would like to see some useful, true, sensible facts and main idea of advertisement; “*an offer if it is clearly mentions that okay that you save this much or you get this or that, that is like a clear message?*”, “*You have to focus on the main things that will happen in the event which will attract people will come.*”

Furthermore contents of advertisement should be small and understandable; “*the advertisement should be clear too*”, “*when you have too many numbers and too much to read then it is confusing*” “*Add some*

pictures based on the advertisement what do you want to show.”, “Not many text in advertisement”, “Have a good design, not too crowded with information”, “Well defined subject, and shorter contents, because we don’t like reading long things usually no body likes to read”.

Another important thing was Context Based contents, the users liked to see things related to their surroundings; *“if I am standing near a shopping center it should tell me that what kind of shops are there and what I could buy from there.” “It should show movies of the actor I like”.*

2. Creativity

People like to see very new and creative things happening in advertisement; *“something that catches your attention in a way that you haven’t seen before”*, *“like seeing something out of ordinary”*. Introducing new ideas, artistic; *“as I am musician you know kind of creative person I like if it something special inside not it is just like for example if it is advertisement of milk”*, *“Which can be something un-expectable probably also”*, *“in general I would say yes as long it gets creative”*

3. Style

The style of advertisement plays key role in terms of color and size as stated by responders; *“may be should be more should be more colorful?”*, *“my eyes are attracted to so hard things unless there is something big enough things”*, *“Use the bright color.”*, *“You have to be clever in using colors okay because color mismatch does not attract the eyes”*, *“when it is really just like an art like you have a picture you some impression or illusion”*.

4. Location

Responders like to see advertisement while they are on the way, they don’t get annoyed if advertisements comes on their way and some probably take a look to them too, but heavily they do not like advertisement while they are at home or watching program in TV or Internet, *“I think the street is better?”*

5. Interactivity

Some liked to have some sort of interactivity to experience like playing games; *“it is good like if you have a game, it would better to have a preview of the game on the screen or just like something like even people could interact with it like get an experience of the game”*, *“if the screen will also be interactive so you can interact with the with the something you are advertising.”*

6. Mean

Different means were mentioned like larger screen, sound, banners for good influential advertisement.

7. Motivation

One of the responder pointed that the advertisement should motivate users in a natural way and should be from unbiased point of view; *“I prefer to buy in a natural way. The company should know who are using their product the power users who that have a lot of influence you know*

if you have good connections with the guitarists who have like actually like you know people listen to his opinion I think you have to reach out to the guitarist but once you know the guitarist is gaining something from that guitar maker then I don't trust that company, It should be like completely unbiased, I think that is the kind of advertisement I listen to. ”.

Others suggest that advertisement must motivate for healthy diet and sport; ?if it reminds me to do stuff like do more sport or eat healthier or anything that has a good purpose?

8. Other categories

Many other categories were also extracted for a good advertisement like Goal of advertisement, Audience, Purpose and motivation, for more detail look at appendix A.

Bad Advertisement

The bellow categories were derived from the interviews that make an advertisement feel or look bad, and we should not avoid using in advertisements.

1. Style

There exist different styles that advertisement makers follow but texts or photos are blinking; “*try not to use anything would be blinking okay because that is really annoying okay because even so if you are not looking at it is still effecting*”. Using of mismatched colors in advertisement is certainly a bad idea; “*color mismatch does not attract the eyes*”.

2. Annoyance

Most of the responders felt annoyed by almost all advertisements because they contain some sort of similar features like repetitions; “*it should not be like repeating itself over and over and over again*”, “*I like advertisement apart from watching it again and again*”, “*Hmm if I see the same advertisement again and again that is annoying.*”

Other feature is destruction, which does not allow a person on focusing on something; “*Not just like something popping up in front of your face*”, “*for example in middle of the serial or a movie that i am watching and an advertisement that is I don't like because it makes me destructed now I just can't focus on things for view minutes you have to leave what ever you were*”

3. Motivation

Advertisement in general motivate people in their own way to attract customers, which people make not like it, for example sudden appearance of something in the screen or what users do not like to see but they are forced to see; “*usually you are forced to see them because you are watching something or doing something and suddenly it comes and it disturbs you*”, “*it is trying to convince me of something only for to consume or buy and then I mean I don't want*”

4. Content

Some advertisements exaggerate on their products or even say lie; “*it is like magnificent thing and nice pen okay and then it is just a pen, okay*”,

“They are all lies. Showing inappropriate content are heavily disliked,” “whenever I go and access the Internet okay A lot of advertisement comes to my face and most of them are inappropriate. Stuffs like that I don’t like them at all for example some perfume ad which would the a woman in a very degrading position or for example mocking someone believe or something just to catch the attention that is probably to offend people that is what would annoy me a lot. The use of ugly and old people is also not welcomed.”

5. Duration

Long lasting advertisement are always boring and waste of time, most of the responders said that they would prefer short advertisements.

6. Other categories

Many other categories are also extracted from the interviews like location, Confusing advertisement, Controversial ads, amount of ads and types of ads that were not liked by responders. For more information see Appendix B

3.6 Conclusion

As a result this research takes all the considerations and concerns about the nature of traditional advertisement and what the passers-by think that could be good for the advertisement in terms of attractiveness, engaging, content and many other factors described in the chapter. A good advertisement from people points of view is an advertisement that provides most relevant content to the theme and environment, is more short and precise, should have creativity and some kind of interactivity. Many other negatives aspects should be avoided like having a bad style, being annoying and putting non-context contents.

Regarding the attracting attention, among other techniques the silhouette representation of statistically attract more passers-by because of a higher number of glances, these findings would be used on the making of the interactive advertisement for the next experiment and it will be integrated at the attracting attention phase of the application.

4

Advertisement decision

4.1 Introduction

At the time of industrialization, industries compete on product quality, and modern organizations focused more on delivering services, and now services and products is hardly able to be distinguished because of they provide various offers and consumers lose themselves in it, as Peter van Waart describes in his paper that “*In the last two decades however, economical developments resulted in the experience economy: a new era of marketing and branding, in which traditional advertising is becoming less effective and meaningful experience branding is key*”, [36], therefor economical developments have changed from time to time and is emerging from economical experience and factors like price-reduction for a brand is not so important, but experience factor has become the central part for the development. Any advertisement that explains a product features and why that matters fails to achieve people satisfaction, because people’s experience were not considered in it, as Joško Brakus [37] explains the measurement of brand experience and how it can effect on product loyalty.

Now at this era where the technology is highly advanced and most people especially youngsters are much familiar with them like using smartphones, Tablets and now even wearable computers like Apple watch, and also there are many developments in sensing technologies like body tracking, hand recognition, By using these technologies different interactions are possible and very attractive and funny interactive advertisement can be developed so that could engage more participants.

As a computer scientist, there had been no chance to create an advertisement but have always been interested in advertisements; Advertisements are always unique and attractive to watch, at least for the first time. Therefor there is a need to conduct a study with the people who have been working in advertisements for long time and have experience and professionalism in related domain. The people working for Bauhaus-Walk as tour guides understands much more about the topic than anyone else, because they run the program, know tourists, understand tourist’s Interests and many more.

Focus group methodology has been selected to have more insight on the deciding an Interactive Advertisement for the Bauhaus-Walk program. Focus group is a small group usually between six up to ten participants joint together in comfortable place usually a quite room, to discuss on a specific topic domain and share ideas. As described by Jenny Cameron “*Focus groups can be exhilarating and exciting, with people responding to the ideas and viewpoints expressed by others, and introducing you, the researcher, and other group members to new ways of thinking about an issue or topic*”[12]. As Florian Alt [25]talks about the process of how the focus group was conducted for a mobile contextual display systems.

Focus group was conducted to get more detailed information about Bauhaus-Walk program and its content. This was mainly meant to understand many aspects of Bauhaus-Walk and collect the required parameters for designing the interactive advertisement. Because of time limitation in each session two

sessions were arranged in two different dates to cover all topics and discussions. This chapter describes the main theme and goal for focus group and reports all the processes that were taken to establish the focus group, how participants were invited and what was being discussed and more focused on each session. How data was gathered and what techniques were used to analyze them. The document presents all the findings and outcomes in details and related discussions and conclusions.

This whole chapter is kind of requirement analysis

4.2 Research Questions

To design the interactive application advertisement it was required to collect the bellow information from the Bauhaus-Walk members. So that we develop a very relevant advertisement that could speak by itself for Bauhaus-walk program and at the same time it should be entertaining and funny for the passers-by that want to play with advertisement and remember the experience for long time and as a result be motivated to take the tour. Therefor we would need to understand many aspect of Bauhaus-walk as listed bellow in short.

1. Who is (are) the target Group?
2. What are the existing Bauhaus-Walk advertisement medium?
3. What are the peak times in the year for Bauhaus-walk tour?
4. Which are the tour routes?
5. Which famous Locations are included in the tour?
6. What are important aspects of Bauhaus-Walk from their point of view?
7. What could be a suitable interactive advertisement theme?
8. Which content should be in advertisement?
9. What engagement techniques should be integrated in advertisement?
10. What kind of advertisement would be suitable for both body and mobile techniques?

4.3 Study design

Focus group was designed in two sessions mainly because of the participants could not be present all at the same time or date, and by doing we also had enough time to analyze the first session and discuss the findings in the second session with new participants and get their point of view, the first session was more related to gathering general information about Bauhaus-Walk program and second session was more in depth discussions on the advertisement decisions.

4.3.1 Participants

The focus group in this study consists of six participants including the Moderator, which will be me (Hasibullah Sahibzada). They will be divided in sub groups based on their professionalism, position to be able to discuss among each other comfortably, if possible or will be considered as only one group for discussions. The participants were invited through doodle, where a varieties of date slots are available to select, and can see other participants joining time and date. A short introduction of the focus group was described in. The complete focus group session lasted about 90 minutes

4.3.2 Focus-Group Environment

The focus Group was held inside the DBL building ground floor, where we had enough space to make a group circle. Participants were offered coffee and biscuits at the beginning or end of the session.

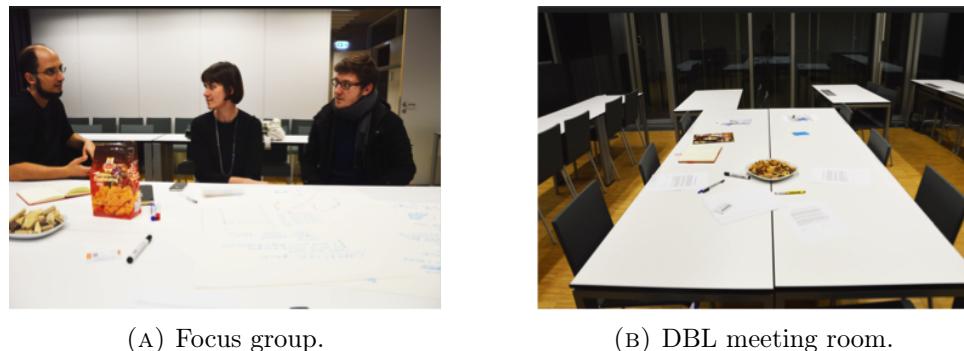


FIGURE 4.1

4.3.3 First session

This session was an exploratory session for Bauhaus-Walk program, and a good start for us to think different domains about interactive advertisements.

Questions

1. What kinds of advertisements for Bauhaus-Walk are there?
2. Who join the Bauhaus-Walk program in general?
3. What could be a suitable theme of Bauhaus-Walk for the Interactive advertisement?
4. What would be the content of the advertisement?
5. How to motivate passer-by to be engaged with the advertisement?
6. How to engage passers-by with the advertisement?
7. What kind of Gesture and Mobile Interactions should be used?
8. How to motivate passer-by to join the actual Bauhaus-Walk tour?
9. Is there anything else we need to discuss on Bauhaus-Walk Advertisement? Any new angle?

Procedures

Participants were warmly welcomed and asked to feel comfortable by having biscuits and coffee. I introduced myself and asked them to introduce themselves. This helped to understand each others professional background and interests.

1. Introduction

Brief introduction on advertisement and interactive advertisements were given to participants to understand the possibilities of existing technologies and the use of them in advertisement field. Some interactive advertisements were introduced with their relative interaction techniques. The agenda and goal of thesis was also described to have a wide picture of what is going to be done till the end of this semester.

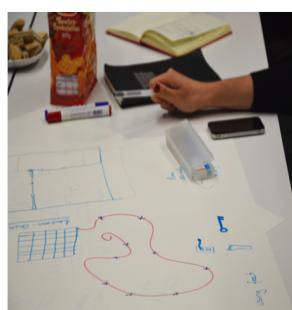
2. Discussion session

After introduction, discussion started on bellow mentioned questions. Because there was limited number of participants I could not divide them in to groups to discuss in detail and do comparative study among the groups. They were given sheet empty big papers to draw and write what come in their mind while discussing to be able to keep track of their thoughts and be easy to generalize the opinions. During the discussion Patrick Tobias Fischer was asked to write notes on the discussion.

3. Consent Form

Each participant was asked to sign the consent form to make sure they agree to participate and video recorded.

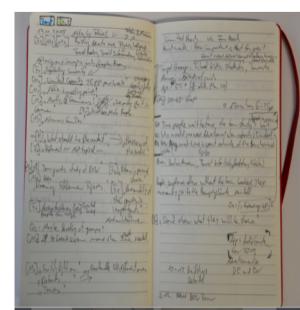
I was responsible to carry on the entire discussion and Patrick Tobias Fischer was doing the note taking during the discussion. He noted important information extracted from our discussions so that I could later look at them beside that the entire discussion was also video recorded for analyzing.



(A) Drawing sketches



(B) Group discussion.



(C) Observation notes

FIGURE 4.2

4.3.4 Second Session

Based on the first focus group's discussions and the participant's nice ideas, which are mentioned in finding section, two different paper prototypes of advertisement were made to dig more in detail. The participants were given the prototypes to play with them and explore their own way of designing the advertisement and interaction.

First prototype was Bauhaus-Chess, This prototype was chosen because of the historical background of this amazing chess game that was developed by Josef Hartwig [14] long time before. The shape of the chess piece defines the movement direction of itself on the chessboard. The goal was to show the chess on the advertisement screen and show one piece at a moment and let users to move the chess in the right direction by some sort of gesture.

Second prototype was to show map on the screen and possible interactive famous places, the interaction idea was to map physical movement of a person to the virtual movement inside the advertisement and let them to explore the target places by reaching their silhouettes on them. Maximum three places were to be explored by one person.

The basic ideas were designed to help the participants to think more and come up with some more ideas and at the same time should be in the context of Bauhaus-Walk program.

Procedures

1. Short introduction was given on Interactive Advertisement thesis.
2. Short motivational video of interactive advertisement was shown.
3. Two paper prototypes that are mentioned above (Bauhaus chess and Map) were introduced.
4. Possible interactions were shown to them.
5. Participants were asked to comment on prototypes and come up with new ideas and interactions.
6. They were asked to design their own prototype.
7. Integrate some fun ideas with prototypes.
8. What contents should be included in the prototypes.
9. How to gather and collect those contents.

Prototype and discussion pictures



(A) Map prototype



(B) Chess prototype

FIGURE 4.3

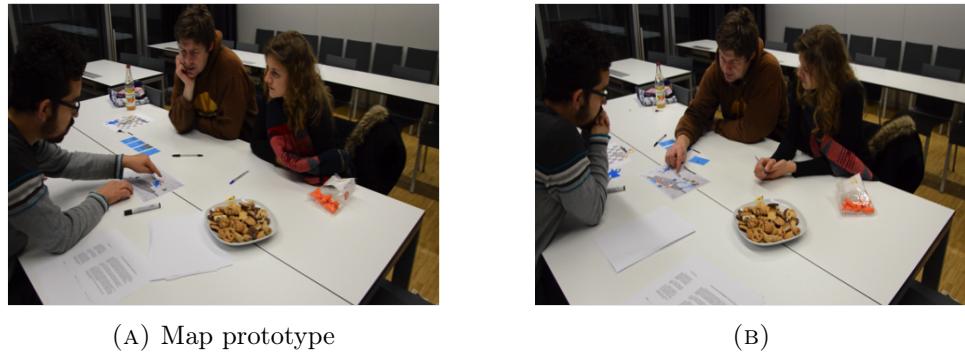


FIGURE 4.4: Explaining and discussions on prototypes

4.3.5 Data Gathering

The entire session was video recorded for analysing. Note taking technique was used to write down the major and important parts of the discussions. Beside the noted taking we encouraged the participants to discuss the issues on a piece of chart using drawings and texts, this helped the participants to focus on their ideas and build the ideas in a more better way and at the same time that helped us to have a summary of their opinions and thoughts. Photos were also taken from the participant while discussing ideas and from the sketches they drew. Check Appendix A.22

4.4 Findings

The design of this focus group was done in a way that could be very easy to be analyzed and generalized in very little amount of time.

- Participants were asked to draw sketches and write on the given big sheets of paper on the topics they were discussing.
- They could make summary of their discussion on the paper so that they and we fully understand the topics.
- Tobias Patrick was taking notes to cover up everything we discussed.
- All the sessions were video recorded for full detailed analyzing.

All of the above resources were analyzed by going through each of the sketches they drew and each notes that were written and all the videos were seen many times to check if some ideas were not clear in the sketches or notes and to have a final image of the discussions.

4.4.1 First Session Findings

The bellow sections are extracted from the long discussions, and analyzing video and drawn charts.

Reason of Bauhaus-Walk and advertisement

Bauhaus-Walk is a project that is run by university students to show more about Weimar and Bauhaus culture to the world by giving small tours to group of maximum 30 people. The tour shows studying conditions of the

university and students, living style of people and giving excursion to historical places.

Guides are from different backgrounds like architecture, urbanism and design and each of them could show various aspect of Bauhaus by their own stories and inter-relate the stories with the facts and then connect them to the places in Weimar. Most important for the guides are not just the buildings but also the small details inside the building that most people do not focus, guides want to be the voice of those unspoken stories for the tourists.

Current existing advertisements for Bauhaus Walk is through different mean as listed bellow.

1. Web Bauhaus Walk is advertised briefly in the Bauhaus University Weimar webpage [15] and in Weimar tourist information page [16]
2. Print Bauhaus Walk program are advertised in flyers and leaflets at different locations, like they could be found in tourist information center, Bauhaus Museum, calendar of Weimar and in travel leaflets.
3. Books Bauhaus Encyclopedia has mentioned this program too.
4. Oral Mostly the people who have already taken the program once publicize it and they let their friends, relatives and family know about it.

As stated above Bauhaus-Walk already has many ways of advertising and at the same time an the making of interactive advertisement was proposed by me there are many reasons that why Bauhaus-Walk would need advertisement as stated bellow.

- Extend the current situation.
- Create new audience.
- Get more people on regular basis.

Target group

Most of the people who join the tour are from elder people ranged between 45-65 years old and others are adults and children. Adults mostly learn about the program trough web and the elders learn from the tourist information centers and books. Most of the participants are German and do not understand English language.

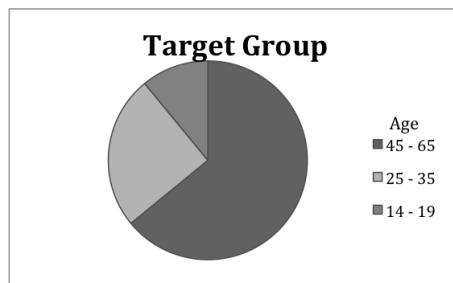


FIGURE 4.5: Target Group

Peak Tour times

In Average 5000 people take the tour each year. April, May, September and October are the peak months that people take the tour because of the weather condition to be good the amount of people per tour is about 25 people, but in winter there are very few people joining the tour and the amount of people per tour is up to five to six.

Possible advertisement location

1. Tourist Information.

This is a good place to put Bauhaus-Walk advertisement because

- Random visitors from different places and cities come here and want to know about Weimar in general.
- Heavy traffic of people.
- This is the only place to get Bauhaus-Walk tickets in advance.

2. Bauhaus Museum.

This could be another good place, but people have to pay to enter to this museum, so there will be limited people but who

- Are very interested in Bauhaus.
- Likely to go on tours.

3. University main building.

Main university building is a more open place for all visitors; there are many factors as stated bellow.

- People from different background.
- People from different age, more youngsters like students.
- Interested people in Bauhaus.
- It is close to starting point of Bauhaus-Walk tour.

Content of advertisement

Participants pointed on very important thing about the content of advertisement from which the advertisement got clearer and clearer and could be categorized in to many different aspects of Bauhaus-Walk.

1. Objects

There are objects that are introduced during the tour for the tourists; A good idea would be to show those objects on various locations on the map that they belong to.

2. Stories

Bauhaus Walk tour guides have many stories to tell about the walk and their own backgrounds as one of them said "*Probably our walk is to sum it up, consists of stories we are actually telling stories, not just talking about history, not just about facts but our own personal stories and stories that were told by former students, so we are kind of raping the history in to personal stories, and we want to say that*

hay, we are students from different faculties and we want to tell the stories by different ways, and that is not a bad thing, because based on historical fact that there has not been the same Bauhaus in Weimar, there has been so many different teachers and students and they all had a different idea that what Bauhaus could be and I think we still kind of incorporate that the fact that no Bauhaus tour would be the exactly the same like the others before.”

3. Histories, Facts, Places

Interaction of advertisement

Based on the examples that were shown at the introduction for the participants, they like hand gesture and some other and came to the bellow possible techniques.

1. Hand gesture Interaction.

The bellow two kinds of interactions were discussed each containing different contents.

- Hovering:

By showing the Bauhaus map on the screen with the most important elements on it, the users should be able to look at the items by moving their hands on top of it. The items could change its status when hovering for example if there is a light object shown by hovering it should turn on or something like that. There could be famous places shown on the map that Bauhaus-Walk tour focuses most, and by hovering the hand some more information like a picture or a related to that places should be shown.

- Performing a specific gesture:

There are many objects that have specific characteristics and those details are described in the tour, so the idea was to bring those objects in action and allow users to perform those actions, one idea was to show a 3D environment and the user should be able to perform a gesture like opening door handle, lighting up a lamp, opening a lock by a key or play with Bauhaus SCHACHSPIEL chessboard to navigate the correct movement of the chess piece on to the screen, or other different gestures for specific tasks.

2. Body Interaction

Bauhaus-Walk is known from its name that it is all about walking to different historical places therefore there was the idea of giving short virtual walk on the screen by moving the user's body in front of the screen and exploring some sights.

4.4.2 Second Session Findings

The second session was held after a week and half, with only two participants other participants could not come because they were busy with their studies.

Prototype discussion

Participants understood both prototypes along with their mobile interactions concept, and liked both prototypes in terms of interaction and idea. And commented as below. I categorized their comments in two positive and negative sections as below.

1. Chess-Game

- Positive points:

- The idea is very nice, because many of the visitors are above the age of 40 and they may be familiar with this game.
- Easily understandable by looking at the shape, because shape defines the movement.
- Suites best for Bauhaus Museum because, there is the original chess board of Bauhaus but people are not allowed to touch the game, by bringing this type of interaction, people will have a live experience with the chess board and play around with it and understand it.

- Negative points:

- Very difficult to understand by people who have not played chess before or have not seen this special type of chess.
- Players could make a lot of mistakes while moving the chess piece.
- The idea does not really fit to the Bauhaus-Walk program.
- It does not fit the places that are being shown in the tour.

2. Map-Game

- Positive points:

- Map game idea fits a lot to Bauhaus-Walk tour.
- Portraits the idea of walking by body interaction.
- Easy interaction just by moving body and navigate inside the screen.
- Understandable concept by moving on to different places and exploring them.

- Negative points

- Possible moving difficulties in a given space.

Based on the discussions, the Map-Game was accepted for further discussion and Chess-Game was exploded for further discussion because of the crucial negative points.

How the system could be designed, in terms of attraction, space,interaction

(read Interactive Public ambient displays with multiple-users)

4.4.3 New ideas

- Content of the game should be very clear and accurate and they should show the places where we provide tour. We do not have many places to show and there may be maximum three places.

- Integrating some fun factor to the game and interaction like by showing a famous character face on top of the silhouette head position. And giving a kind of funny movement.
- Giving opportunity for multiusers to play interactive game, like for example if there are two people standing in front of the screen, the tasks will be divided among them by locking one's silhouette or interaction and allowing the other to perform the task.
- Defining the task by the defined character or by color of the body or by random.
- Showing funny map, which was made many years back of Weimar city.
- Popping up interactive objects (houses) on the screen so the users understand that they are interactive.

4.5 Conclusion

The conduct of the two sessions of focus group was very helpful in a way that it was held very intensive that helped to understand in general the whole about Bauhaus-Walk program tour and especially about the tour guides that what they think about Bauhaus-Walk and what are the most important things that could be discussed and advertised for Bauhaus-Walk. All the relevant mentioned questions for the design and interaction of advertisement were answered and discussed. As a result of this focus group, one interactive advertisement prototype would be proposed, that should be able to cover all the aspects of advertisement and concept of Bauhaus-Walk that was discussed in this focus group and the findings from attraction attention and last from findings from people interviews.

5

Advertisement Low fidelity prototype

5.1 Introduction

After doing requirement analysis of Interactive advertisement, which was described in the previous chapter, now the stage shifts to formative studies that help the design process of advertisement and how to investigate problems with the various interactive prototypes, as Charles M. Reigeluth [38] says “*Formative evaluation (sometimes called field testing or usability testing) is a methodology for improving instructional resources and curricula*”, and using this we question that what is correct in prototype and what things do not make sense or make sense, what are the most usability issues.

Evaluating the paper prototype of a system can be an efficient [33] and can be very effective as Robert A [27] conducted usability testing using Low-and High-prototypes of the same system, where one group of subjects were confronted with a paper prototype and the other group of subjects with high-fidelity prototype (real functional system) and both groups were give the same set of tasks, and stated that “*In both experiments, substantially the same sets of usability problems were found in the low- and high-fidelity conditions. Individual problems were detected by a similar proportion of subjects in both the low- and high-fidelity conditions*”

There have been many researches on public display earlier prototypes like Scott Carter [24], where three different prototypes were created for Ubicomp systems and were evaluated at different stages inside office places, during the early phases the 16 paper prototype technique was used, the evaluator was simulating the computer’s reactions, and even he involved five of his friends and employees to play the part of network that could update content in the display and the analysis was mostly qualitative like by taking interviews.

Evaluation of computer and mobile application paper prototypes are very common and it is easy to be conducted because there is only one interface and the interaction happens on and with the interface, but as far as public non-touch displays are concerned, they seem to be slightly different because the interaction is happening outside maybe with a smartphone or without any input device like body interaction, at this point the moderator should be monitoring the interaction interface and simulate the effect in the display, most of this kind of testing is done with using think-aloud method as Robert .A [27] conducted the evaluation of electronic book player where the keyboard and the screen were simulated on paper and participants were told to call loud when pressing a key and the evaluator was doing the action on the screen.

During the last focus-group discussions and all gathered data from attraction attention study and interviews, the first paper prototype of interactive advertisement was decided to be created. This document describes the advertisement application requirements, lists all functionalities along with its use cases and defines the target group that this application is going to be made for. Paper prototype for Bauhaus-Walk [17] shows two different interactions (body and mobile) and tries to give an overall general picture of how the advertisement would look like after development and conducts the evaluation of them for all important system functionalities.

5.2 Requirement gathering

The bellow mentions a generalized form of Bauhaus-Walk advertisement's functional, non-functional requirements and system requirements. These requirements were the result of the focus-group and discussions.

5.2.1 Functional Requirements

1. Detect multi User.
2. Assign a character to the user.
3. Assign a task to the user.
4. Respond to each user interaction.
5. Show advertisement text.
6. End the interaction.

5.2.2 Non-functional Requirements

1. Performance

This is a very important requirement that should be wisely done. Response time should be very fast in both gesture and mobile interaction so the user could see the reaction quickly on the screen.

2. Scalability

The interaction is scalable for multi-users at the same time for body interaction and mobile interaction.

3. Availability

Kinect camera should be functional during the experiment for people detection, Access point should be running so that it could provide network access to users.

4. Usability

The advertisement interaction both mobile and body should meet all criteria of usability.

5.2.3 Personas

The bellow personas are made based on focus group findings that most of people taking tour are elder people, which builds up our primary type of persona and secondary type persona would be young age girl as described bellow.

TABLE 5.1: First persona

Type	Primary
Name	Andreas Müller
Background	History teacher
Demographics	Age:.....50 Height:.....1,6 m Martial status:.....Married Kids:.....Two Profession:.....School teacher Language:.....Deutsche Computer experience:.....None Smartphone experience:.....None
Goal and Task	Experience goals: 1.Likes to learn about places in Weimar 2.Likes to have fun. 3.Does not like to feel alone and likes his wife or friend to also join. End goals 1.Wants to see his body moving in the screen. 2.Wants to explore the character's location. 3.Want to learn about Bauhaus-Walk program.
Environment	He and his friends want to learn about some good places in Weimar and explore other famous culture events. He does not use technology.

TABLE 5.2: Second persona

Type	Secondary
Name	Anna Weber
Background	Media art student
Demographics	Age:.....25 Height:.....1,6 m Martial status:.....Single Kids:.....None Profession:.....Designer Language:.....Deutsche, English, Spanish Computer experience:.....Yes Smartphone experience:.....Yes
Goal and Task	Experience goals: 1.Avoid feeling stupid. 2.Likes to try and error. 3.Likes to have fun and laugh. End goals 1.To complete the task. 2.Learn about Bauhaus-Walk program
Environment	She is a student in Bauhaus University; she is very interested in art and design and wants to find out more about Weimar art. She loves using technologies like smartphone.

5.2.4 Use case diagrams

Should i make ?

5.3 Goal

The goal of this evaluation is to find possible issues as listed bellow with interactive advertisement.

1. Confusing and unclear events or interactions.
2. Misconception of a function.
3. Task confusion.
4. Understandability of advertisement goal and contents.

5.3.1 Hypothesis

Hypothesis are divided for each individual interactions like mobile and body.

Body Interaction

- H1: Users understand and react to the Call-to-Action approach.
- H2: Users recognizes the character assigned to them.
- H3: Users understands the tasks assigned to them.
- H4: Users can explore locations by moving their body in physical space.
- H5: Application raises alerts to specific user actions.
- H6: Application motivates participants to continue playing.

5.3.2 Mobile Interaction

- H1: Users understand the Access Information shown on the board.
- H2: Users open the controller website by scanning QR-Code.
- H3: Webpage application produces alerts with in correct user input.
- H4: Users rotate the mobile phone to start game.
- H5: Users understand the task.
- H6: Users can navigate the character by moving the face in mobile.
- H7: Screen application produces alerts for incorrect location.

5.4 Design study

Bauhaus-Walk interactive advertisement consisted of two elements, first was the screen that the users see the reaction and advertisement content, and the second was the means of interaction which were body and mobile, to design the test first of all the paper prototype should be capable to show both of these elements to be applicable to the real scenario later.

Actual advertisement screen paper prototype was made along with its interactive objects. The experimenter simulated all user actions on the display even actions like movement of silhouette or character face.

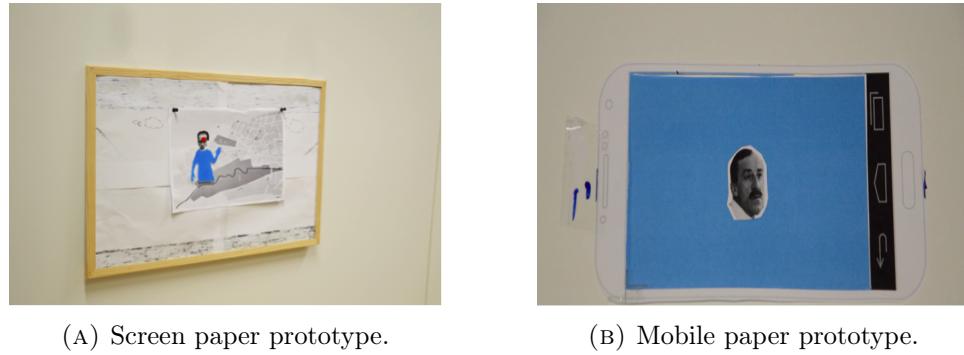


FIGURE 5.1

5.4.1 Subjects and location

The prototype testing was limited to five participants; they were from different background, like Media Art, Media architecture and computer science. Participants were invited in Digital Bauhaus Lab ground floor.

5.4.2 Procedures

The test subjects will be given basically one task by the interactive advertisement screen and by user body movement their location on the paper screen would be changed and checked for possible interactive object so that the content could be changed and for mobile interaction the subjects will be instructed to think-aloud while interacting with mobile interface so that examiner be able to change content on paper screen.

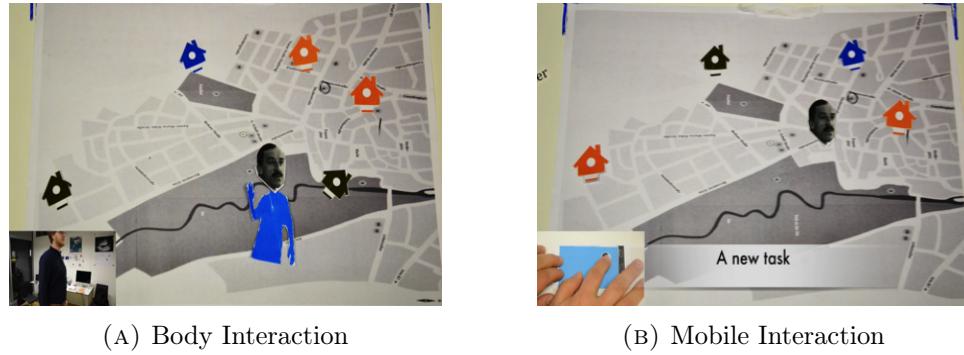


FIGURE 5.2: (A) Body interaction: as can be seen on the left corner, the person is physically walking and in the screen the blue silhouette is changing.

(B) Mobile interaction: In the left corner, the person is changing the cursor in the phone and the effect is shown on the screen.

5.4.3 Data gathering

The process of data gathering was as bellow, the methods are designed in a way to fully answer the research questions and the defined hypothesis.

1. Video Recording

Each participant was video recorded for both body and mobile interactions for later observation and analyzing purpose.

2. Direct observation

Participants were observed during the interaction and also asked about what they thought at that moment while interacting. When participants could not perform a task then they were asked exploratory questions on how would they do the task naturally.

3. Think aloud

Participants were asked to read their mind while interacting with the prototypes. This helped to understand what they thought about a specific interaction at that moment.

4. Interviews

After both paper prototype interactions were finished, a brief interview was taken to further learn about the interactions they did and get other user comments and feedbacks for the prototypes.

5.5 Findings

The important part for analyzing the data is shaped based on the defined hypothesis at the beginning; the bellow procedure was followed to best answer our open questions and to be able to evaluate both paper prototypes. For interview codings see Appendix A.5

5.5.1 Usability issues

5.5.2 Body Interactions issues

1. Confusions

- (a) Participant was confused of how should to walk, because it felt that there is not enough space.
- (b) User thought that if he/she moves to the location names or the icons, someone would guide her.
- (c) User was confused on the new character photo labeled on the top of his silhouette; he thought that the new character is trying to interact with his silhouette. *"Is it like people approaching you and say hi and hello, and then ask me if I can visit his places"*
- (d) He did not know his places (the character's places).
- (e) Could not understand the word move or walk, he taught that it is not applicable at the moment.
- (f) Raise one hand to see if the blue reacts or not.
- (g) Did not recognize the person.
- (h) Did not understand the task.
- (i) Did not understand what is the blue person.
- (j) Asked question about who is the face, he did not know it.

2. Frustrations

- (a) Entering IP address.
- (b) When the wrong house was explored, and she said "*(Ohh No)*".
- (c) Waiting for the houses to load on the screen.

3. Mistakes

- (a) Entered to the wrong location.
- (b) Did not know how to navigate to the places. Even he was told that the silhouette is his body.
- (c) Navigating the silhouette was a problem for her; she wanted to go on top of the map in the screen but physically moved back. And after seeing the reaction she corrected herself.

4. Comments

- (a) There should be very clear instruction in the application on what to do, what it is about and how to do it.
- (b) I did not understand the person; maybe do not use it anymore.

5.5.3 Mobile usability

The bellow chart lists all the possible issues with mobile interaction.

1. Confusions

- (a) The idea of the application was not clear for her because she taught that the mobile application could be used when she goes out in the city. But later she found out that the screen and mobile are both of them used at a place.
- (b) Navigation was a big confusion for him; he was touching the character on the mobile screen.

- (c) The turning phone as shown in arrow, since she could not turn the phone.
- (d) Did not understand what happened after the interaction was over. She did not read the texts or she did not understand why those were about.
- (e) The face in the mobile.

2. Frustrations

- (a) Visiting to all locations to finish the interaction.
- (b) Not enough things when visiting to a location.
- (c) She felt frustrated when visiting the wrong location and find the right location.
- (d) He had to re-login because he accidentally pressed cancel button.
- (e) Visited to the wrong location.
- (f) Waiting for the houses to load on the screen.

3. Mistakes

- (a) Did not understand to scan QR code.
- (b) Took longer time to use the phone prototype.
- (c) Did not understand to rotate the mobile. As the instructions were shown on the phone.
- (d) Took longer time to navigate the person on the screen.
- (e) She tried to continue without putting any name in the form.
- (f) Did not understand how to turn the phone, she touched the arrow on the screen many times. But nothing happened. Later she knew to turn the phone, but did not do it because she thought that the paper prototype should not be moved from its place.
- (g) Could not navigate the person on the screen.
- (h) Entered the wrong IP address, but then changed his mind and scanned the QR code.
- (i) Accidentally pressed cancel.

4. Comments

- (a) There is no enough information about the locations; it would be good to show a short description of the place.
- (b) There could be like choices like when the opening time is for these locations.
- (c) How far are they from my current location, the distance?
- (d) View the transport possibilities to the selected locations.
- (e) It would be good to have more information about the locations.
- (f) And I would like to see the entire map on the phone too.
- (g) I like to see some more information in my phone.

- (h) There should be more guides when I use the phone, like there should be like Samsung, when you turn it on for the first time, it shows how to use what or it should have a finger picture to swipe on the face.

This chart was created to list all the possible, mistakes, misunderstandings and confusions for each of the interactions carried by participants, these lists were categorized under usability problem. This error chart was made during video observations, flow of the tasks were observed and also the words they used during interaction from which confusion, frustration and misunderstandings events were recorded.

Looking through all the usability problem chart of each participant the bellow single chart is being created, each category is separately listed with the possible problems.

5.5.4 Hypothesis decisions

The hypothesis those were defined in the design study, from which some of them are accepted and rejected based on the above findings.

Body Interaction

- H1: Users understand and react to the Call-to-Action approach.

[Accepted]

All of the participants understood call-to-action and reacted to it quickly as soon they read it.

- H2: Users recognizes the character assigned to them.

[Rejected]

All the participants did not understand the character which was assigned to them, This happens when the participants do not have background to the related history that should know the character, It would be better to use someone who is very famous and is known to most of the population and different cultures, using very specific character is a bad idea. Users gets confused. At one occasion even an architect student who must know that face, but unfortunately did not recognized him.

- H3: Users understands the tasks assigned to them.

[Rejected]

Most users did not understand the task in the sense of the defined character, but they did understand that they should walk and explore locations.

- H4: Users can explore locations by moving their body in physical space.

[Accepted]

As soon they understand that the silhouette is them and projected on the screen, then they did the task by moving them selves physically, except one participant who did not understand until the observer gave him hint to move his self physically in right or left.

- H5: Application raises alerts to specific user actions.

[Rejected]

The application did not raise error for user's specific interactions like if the user was out of the screen or very close to the screen. Most of the participants raised their hand up, or turned around, there was no alerts for the participants.

- H6: Application motivates participants to continue playing.

[Rejected]

When the users explored the first location, they were excited and tried to see the other places, but all the locations action was predictable by the participants and nothing new was happening, participants expected more from their interactions to be more excited to play the whole game. They did finish the game because they were told so.

Mobile Interaction

- H1: Users understand the Access Information shown on the board.

[Accepted]

The participants were not shown the phone prototype at first, they were only shown the display and were asked to react based on the messages or whatever the users comprehend, after reading the Access information they asked for the phone prototype and then the phone prototype was shown to them to interact.

- H2: Users open the controller website by scanning QR-Code.

[Accepted]

Four of the participants understood the use of QR-code and from which two of them scanned it and other two typed the IP address, and one participant did not understand the use of QR-code.

- H3: Webpage application produces alerts with correct user input.

[Rejected]

The webpage did not produce error at many occasions while filling the form like, what happens when cancel button is pressed, or when the game finishes the application does not alert user to replay or leave webpage.

- H4: Users rotate the mobile phone to start game.

[Rejected]

Only two of the participants rotated the phone but the rest of the participants tapped on the icon and tried to rotate the icon in the screen instead rotating the whole phone.

- H5: Users understand the task.

[Rejected]

This happened because all of the participants did not recognize the face and did not know where are his locations.

- H6: Users can navigate the character by moving the face in mobile.

[Rejected]

Four of the participants touched and tapped the face shown on the mobile phone many times, they expected that something will happen after they touch the character like a dropdown list would appear to edit it, but one of the users drag it and saw the reaction on the screen.

- H7: Screen application produces alerts for incorrect location.

[Accepted]

The incorrect locations that were explored by the participants were given an alert message.

5.6 Conclusions

Evaluation of low-fidelity prototype of advertisement was very helpful to understand possible design problems and interactions that could have been a headache if had been identified at high-fidelity version.

First, the body interaction was easily understood by most of the participants, this type of interaction is more natural and can be done by any kind of participant without having any technical expertise. Two most important interactions in this technique was the call-to-action which approached participants to come near to the screen and other was to explore the locations using their body position in physical space. This low-fidelity usability testing suggests bringing changes for the next high-fidelity version of the advertisement. The changes would be to remove the character assigning for individuals, improving alert messages for different user actions, improving task description and integrating features to increase interest rate for participants to be engaged with the advertisement.

Second, participants also appreciated the mobile interaction, but they were not so convinced for the usage because of many issues like logging in web application first, then navigating the face character. There was no clear instructions for how to navigate the character, and what will happen if there are many participants playing at the same time, where all of the participant would have the same face and they would get confused that which one is being controlled by their controller and lastly, it was unclear that what happens in web application when the interaction is over. This usability testing helped us to identify the mention usability problems and would bring changes for the new high fidelity version that would solve the current issues.

Third, The advertisement text, which was shown at the end of interaction, did not brought user's attention, it would be better to make a short video for the next prototype that could bring users attention to see the advertisement. After the video advertisement gets over the attraction phase starts again.

Finally, all hypotheses that were accepted or reject will be taken in to account from which new decisions for the high fidelity version will be taken, this version will overcome all the issues discovered until this stage. Participant's recommendations and feedbacks have also much value and would be considered in the development phase.

6

Advertisement application

6.1 Introduction

The use of technology in advertisement plays a major role in advertisement industries, it would have been much difficult to reach to their customers without technologies, and technology enhances the two-way communication much with client and customers. The companies can now easily express their thoughts and vision to their customers with the use new technologies. Advertisement are everywhere like in websites, in your smartphone, in Television and radio and especially from past decade it is more common on the streets, supermarkets, airports and areas where is crowded, So for every context or setting there are set of technologies that are being used to make the advertisement more appropriate, and when it comes to interactive advertisement the use of right technology plays another major role in terms of usability and understandability, Interactive advertisement in websites are usually interactive using keyboard and mouse, in smartphone is using the capability of the touch or other sensors to make the interaction easy and at the same time funny, and interactive advertisement in public space has again another bunch of technologies that could make the interaction usable like using face recognition, body and position recognition, hand gesture recognition and also touch sensors, proximity sensors and much more.

This chapter explains all the technical aspects of advertisement system that were developed during the thesis work. This chapter discusses what technologies and hardware have been used and what algorithm and methods have been implemented to accomplish the goals. This chapter explains the software for three main parts, attracting attention application, main advertisement application and the enhanced advertisement application.

6.2 Attracting attention Application

The goal of attraction attention was to develop systems that could attract the attention of the passers-by, in which three different applications were developed and later compared.

6.2.1 Requirement gathering

The bellow are the required elements used for the applications.

Hardware requirement

- **Microsoft Kinect Camera [39]**

This is one of the most used camera in public context a lot, this camera can track up to seven user's position (X, Y, Z) in real time; it is capable of recognizing hand gesture and even can track facial movements. The camera does not work well when it is exposed in sunlight, which makes it ideal for indoor use only. In our experiment Microsoft Xbox 360 Kinect camera was used, The Kinect camera should be used with an extra adapter in order to connect it to computer.

- **Computer**

A normal laptop was used with Core i7 2.7 Ghz processor, and 4 GB RAM and USB of 2.0 version. If you want to use Xbox Kinect One

Kinect then the computer should support USB version 3.0. The laptop was connected to the University monitor via mini display port.

Software requirement

The software can run in any operating system except because of the processing programming language. In experiment mac OSX operating system was used with bellow library and processing version.

- Processing v2.2.2 or higher version.
- SimpleOpenNI library for Processing [40]
- 32bit JRE (Java Runtime Environment) v1.8 or higher.

6.2.2 Following eye application

The name is given *Following eye* because the application shows eyes for each individual when pass from the front of the screen and those eyes follow the person where they walk. The interaction works with the Kinect camera that provides each individual positions. Explore the attached CD for the source code.

6.2.3 Firework application

This application also uses kinect camera to track user position and renders a firework animation for each person. The fireworks are created with using random number of circls (balls) with random colors and sizes, the circles burst from the person's location and spreads to random directions with a high speed and slows down at the end. One part of the application's code is freely taken from openprocessing community that could generate random firework bubbles. For more detail please check the CD for source code.

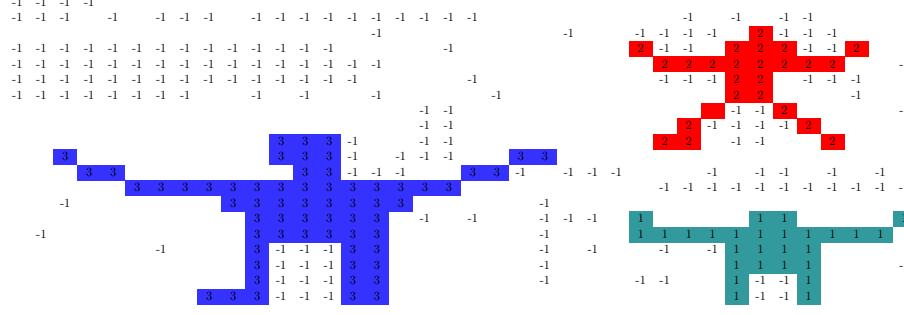
6.2.4 Silhouette application

This application uses Kinect camera to produce colored silhouette of passers-by, the camera has a resolution of 640x480 pixels and the application requests UserMap from Kinect camera, userMap is a 1xD integer array from that corresponds to the pixels of the Kinect image, which normally looks like bellow.

```
Int upix = context.userMap();
upix = [1,1,1,1,1,1,2,2,2,2,2,2,-1,-1,-1,-1,-1,2,2,2,2,...]
```

The above example shows the structure of the array, the index of the elements of array correspond to the pixel number of image and the element values correspond to the user id standing in front of the camera, the user id is always above zero, any value which is not above zero in fact could be background or non-user pixel, the example shows that there are at least two people standing in front of the camera, which has user id (1 and 2) the -1 value is a non-user pixels. So the application iterates to this array and assigns specific color to each of the pixels of the user image and does not give color to the non-user pixels.

TABLE 6.1: UserMap and application color mapping



The above picture has very limited pixels; it is not an original picture but is made to clear the idea of how the coloring of silhouette works. As you can see from above picture, the white areas or the -1 values are background and non-user and the remaining positive number represent the pixelse related to the user. For more information about the source codes, please refer to the CD.

6.3 Main advertisement application

In this section the main advertisement applications are being discussed. According to the plane there was a need to develop three-advertisement application (non-interactive, body interactive and mobile interactive), which had the same functionality but were different in terms of interactivity and control.

The advertisement application was designed to show important places of Bauhaus that were included in Bauhaus-Walk tour, the pictures of these places are attached on top of the Weimar map with a name on top and a small description at bellow this technique helps participants to build a relationship of location and the map, only five locations are randomly chosen by the software to be shown on the map, each come one after another and when all the locations are explored then the advertisement video will be played and after that the application will repeat it self.

6.3.1 Interfaces



FIGURE 6.1: Initial interface of advertisement: The picture shown is the *Gropius walter* room, and the Event name on the upper left side, and the Bauhaus University logo at the bottom right.



FIGURE 6.2: Second Interface: This is map of Weimar that has some interest regions shown on the top of the map. Those regions are blinking to signal the users.

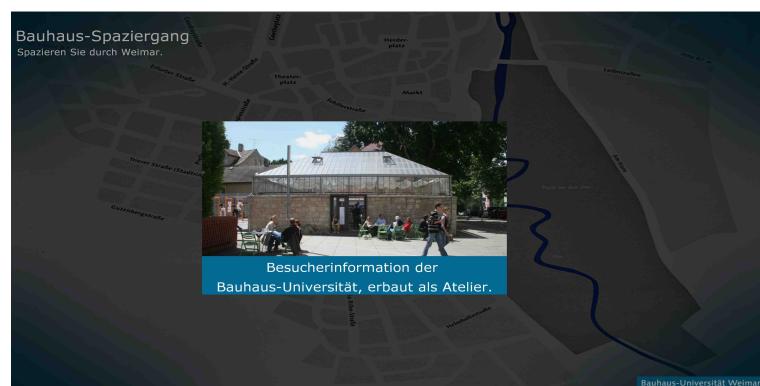


FIGURE 6.3: Second interface: Before the image is shown on the map, first the picture is animated to become enlarged then the picture is resized to fit on the map.



FIGURE 6.4: Second interface: This shows a map with the picture elements, each picture contains a name



FIGURE 6.5: Third interface: In this interface the video is being played, this picture is a screenshot of one of the frames of the video



FIGURE 6.6: Third interface: This is the last frame of the video that shows information about how and where to join the Bauhaus Walk.

Please watch the complete animation stored in DVD.

6.3.2 Advertisement video

The advertisement video was created in powtoon [41] with a free version account, to see the full advertisement video visit bellow link.

<https://www.youtube.com/watch?v=-y1Dbz6E6bU&feature=youtu.be>

6.3.3 Hardware setup

The bellow setup is the hardware setup for the advertisement. The same setup is used for all three weeks.

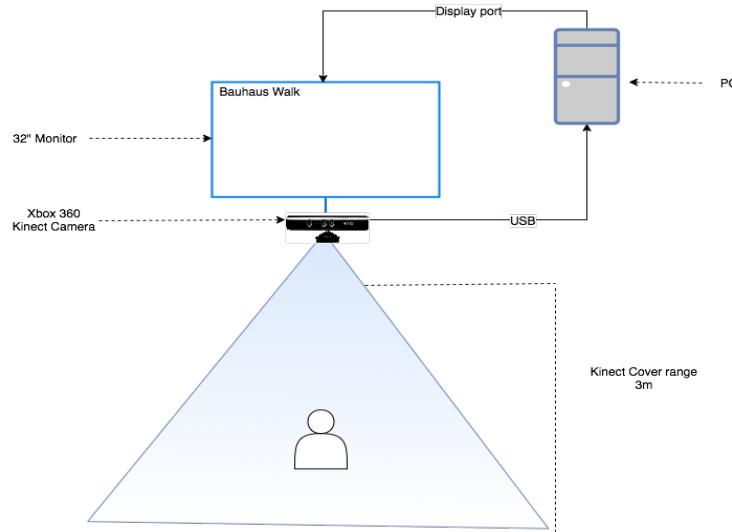


FIGURE 6.7: Hardware setup

put the picture of the screen here

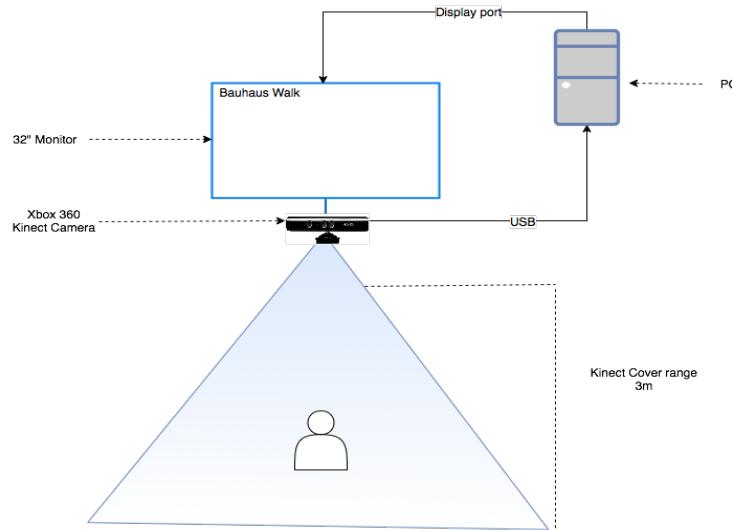


FIGURE 6.8: Picture

6.3.4 Non-Interactive application

As can be understood the application is not influenced by the passers-by but triggers automatically, it automate through whole three phases (Initial screen, Map screen and video screen) and at the same time records colored image frames using Kinect Camera.

Flowchart Diagram

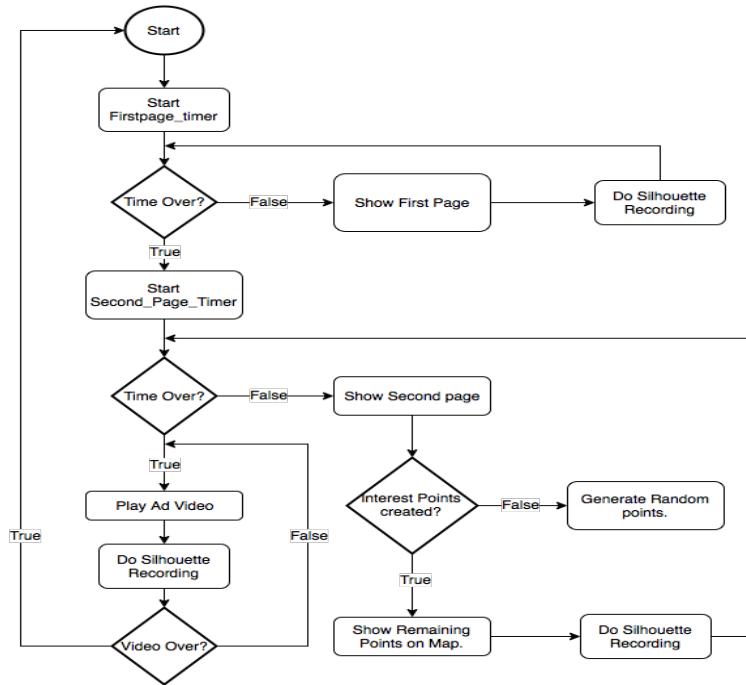


FIGURE 6.9: Non-interactive Flowchart diagram

6.3.5 Body Interactive application

This method allows participants to interact with using body on the map, in this case exploring the interest points on the map by moving physically (forward, backward, right and left) in front of the screen in order to move their silhouette and reach to the interest regions.

As discussed earlier there are three phases of the application, First Interface, second interface and then the advertisement video. The first two interfaces are interactive as described below.

First interface

This interface is basically the attraction attention and call-to-action interface, as you can see below there is someone standing in front of the screen and the interface calls him to come near. This area also has alert message on the top right area of the screen and alerts the participant if they move away from the camera range, in this example the person is standing but there is also the second person but got immediately untracked and the system pops that message to raise his hand to be tracked again.

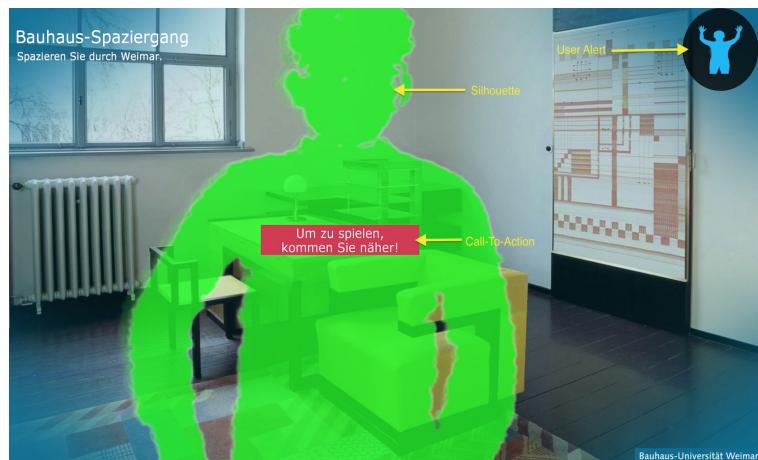


FIGURE 6.10: **First Interface:** When the person steps in the range of the Camera, his silhouette is projected on the screen with a different color; the application calls the person to come near in order to trigger the game.

Transition to second interfaces

The transition happens when the person stands close to the screen for more than 3 seconds and the below things happen.

1. Loading animation:

The loading animation is a reaction to the action of the participants, and at the same time participants waits for something to be loaded.

2. Scaling down the silhouette:

To walk freely on the map and to give the participant the feeling of walking, the participant's silhouette is scaled down, the scaling happens smoothly frame-by-frame.

3. Show task instruction:

Every interaction has instructions, the instruction is fairly very easy and it is simplified in one sentence to explore locations on the map.

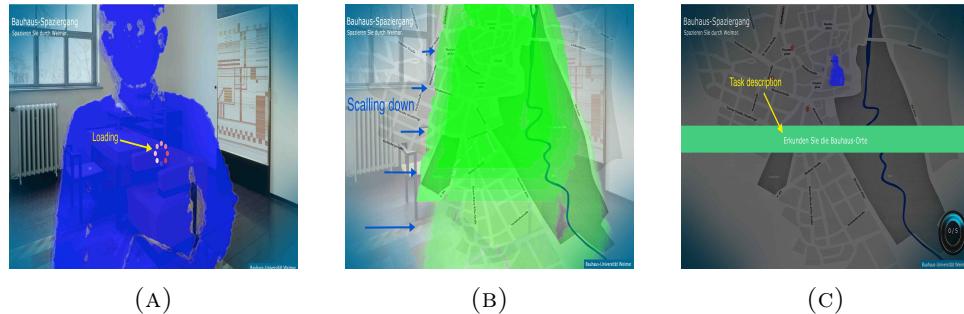


FIGURE 6.11: As can be seen in picture A, the person is close to the screen and the loading animation is started, in picture B the person silhouette is being scaled down (in this example the silhouette color is green) and in picture C the instruction is shown.

Second interface

In this interface participant can interact with the elements on the map. In bellow picture, the silhouette has visited two locations therefore has 2/5 score, to finish the interaction he needs to visit all the location or the timer on the corner right will be over.

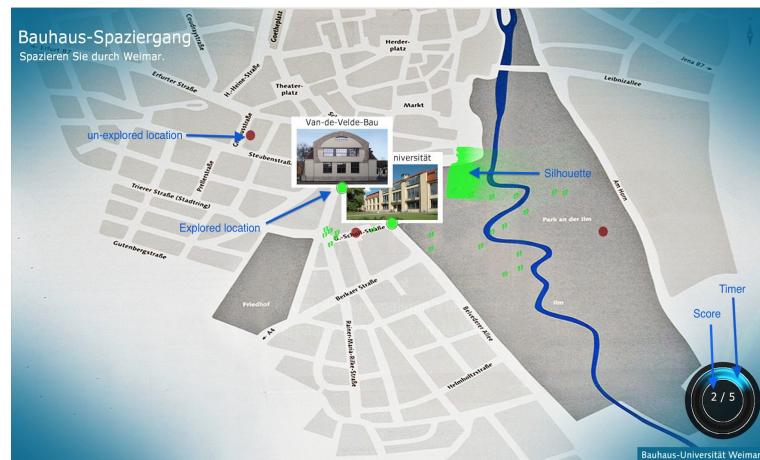


FIGURE 6.12: Second Interface

Flowchart Diagram

The bellow chart roughly shows the flow of the application.

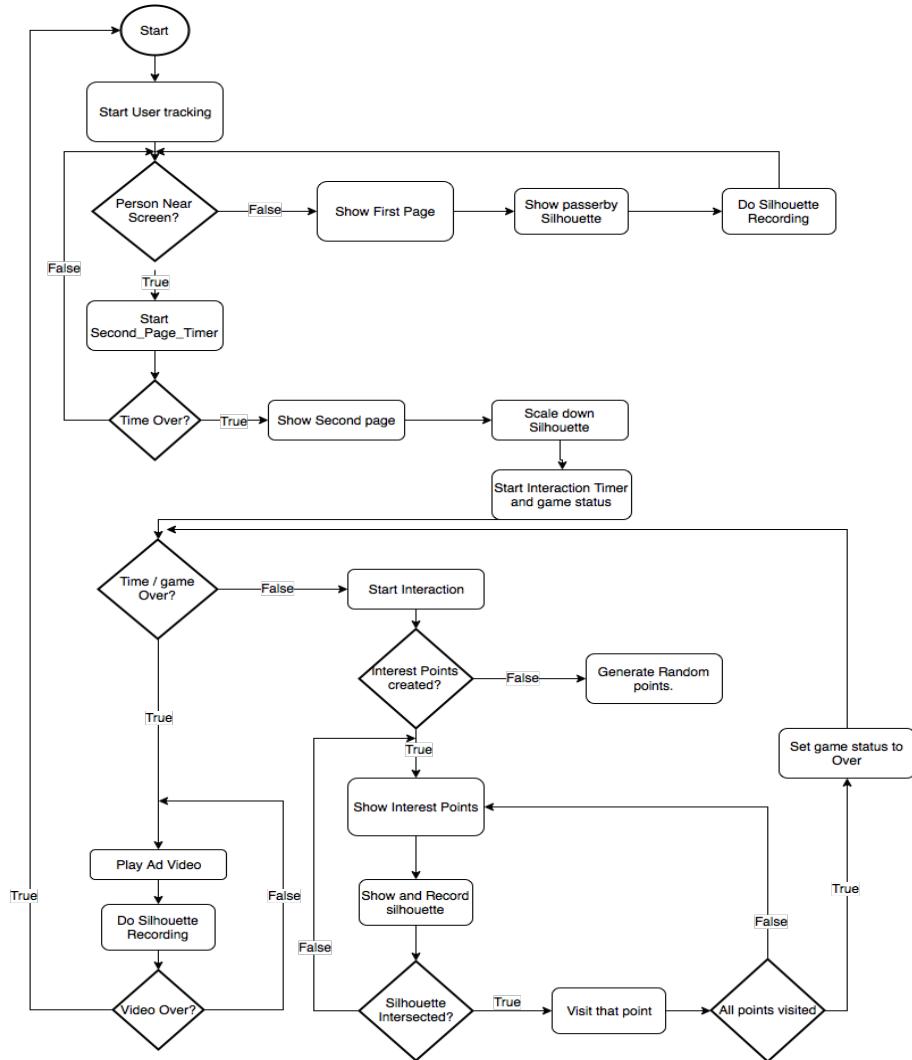


FIGURE 6.13: Body Interactive advertisement Flowchart diagram

Software Details

The application is developed in Processing language with the support of Kinect Library. The application can run in Windows and OSX operating systems the system should have bellow requirements.

- Processing v2.2.2.
- SimpleOpenNI library for Processing [40]
- 32bit JRE (Java Runtime Environment) v1.8 or higher.
- Windows / Mac OSX
- RAM: 4GB or above.
- CPU: Core i5 / i7 2.3Ghz

Refere to source code in DVD that has all the libraries and important things you require to run the application.

6.3.6 Mobile Interactive application

The interaction in this application is carried out with a smartphone, the interface is absolutely the same as the other two applications; the only different is that there is a colored circle pointer to select map elements.

First screen interface

This interface is designed in such a way to attract passers-by and also guide the participant on how to use their smartphone to access the advertisement application. The attraction is again the same method that was used for body, the passers-by silhouette is projected at the back of Access information. The interface has QR code that could be easy to be scanned instead of typing the whole IP address, and there is an alert area, that gets activated when a logged in person has not turned their phone in landscape orientation.



FIGURE 6.14: Mobile interactive interface:

Transition to second interfaces

The first user will not be able to trigger the game, until his/her has not physically hold the phone in landscape, when it is in landscape the bellow process will be triggered.

1. Loading animation:

The loading animation is a reaction to the action of the participants, and at the same time participants waits for something to be loaded.

2. Creating Colored cursor:

A colored circle will be created for the participant in the center of the screen; each participant would have different colors matching to their controller interface in their phone.

3. Show task instruction:

The instruction is fairly very easy and it is simplified in one sentence to explore locations on the map by using their phone.

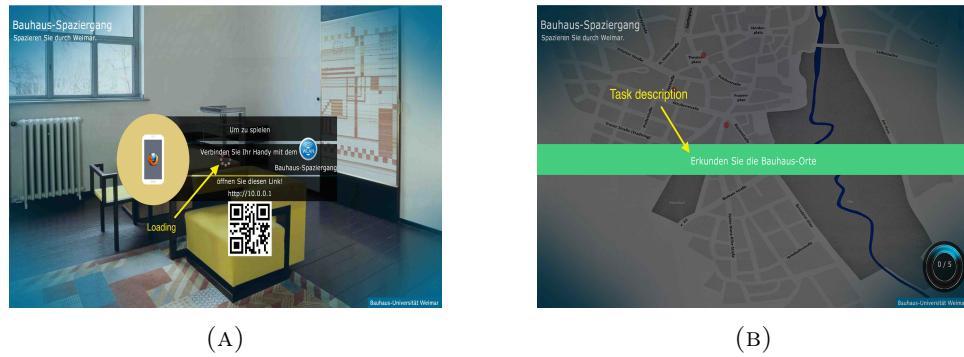


FIGURE 6.15: In picture (A) a user has logged in and the screen is loading, in picture (B) the task description is shown.

Second screen interface

Second screen is the interaction screen for the participants, participants can navigate the cursor using their phone controller page. As can be seen in below picture, the user is controlling the cursor and has explored one location, the user's defined name is also shown on the cursor, to provide a hint that they have reached an interest point a small circle is shown to determine the area of that interest point. The interaction will finish when all the locations are explored or the interaction time finishes.

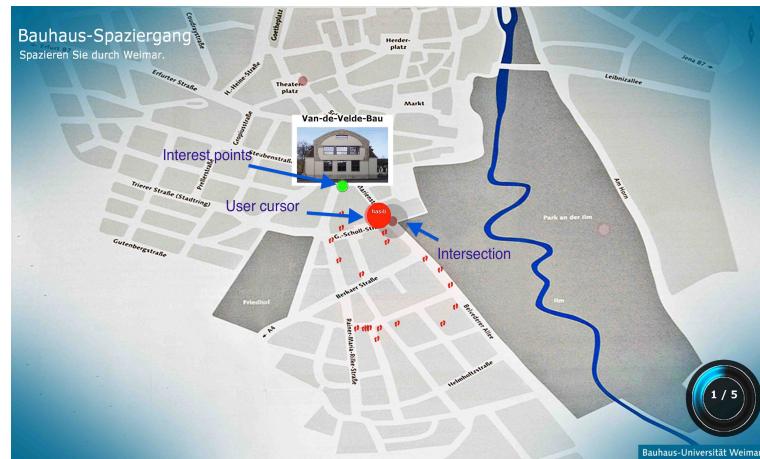


FIGURE 6.16: Mobile interactive interface

Mobile interface

After opening the web page in smartphone, and entering name, the bellow interface would appear. The interface is very simply designed and has two elements, the cursor and the select button, with cursor the user can navigate inside the map for interest points and when reached on an interest point the participant presses the select button to explore that location, see the picture bellow.



FIGURE 6.17: Mobile controller interface: The left side is the cursor and the right side is the select button.

Hardware setup

The hardware required for the type of interactive application, would be to use one Access point that enable participants to connect to the system, Kinect camera to record colored user images, a mobile phone at client side and obviously the screen and a workstation.

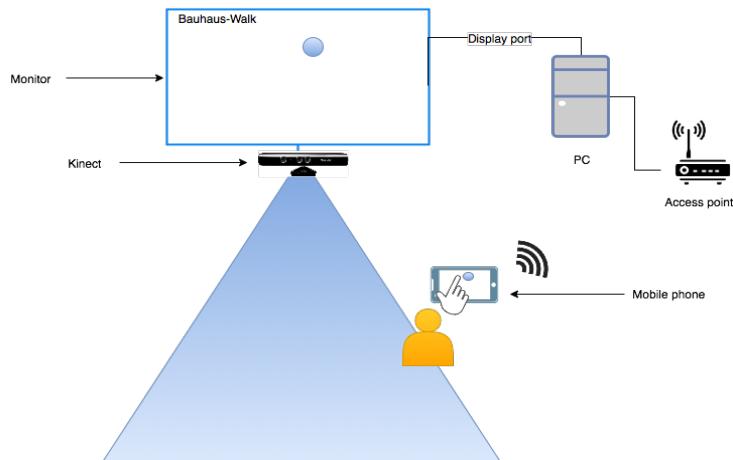


FIGURE 6.18: Hardware setup

Software setup

In order to make the system running we would need the bellow things.
The controller is taken from another project MMM ball

- Apache webserver:
The web server could be running in the same application system side-by-side. The web controller is using WebSocket client at the backend. Check the JavaScript configuration file to have the IP address configured where application system is using.
- Processing and WebSocket:
The application should be started and along that the WebSocket server

should also be running simultaneously. Processing should have WebSocket library installed before hand. The system should have a valid IP address to be reached by webserver.

- OpenProcessing Library:

Processing should have OpenProcessing library installed to be able to run Kinect Camera for color image recording.

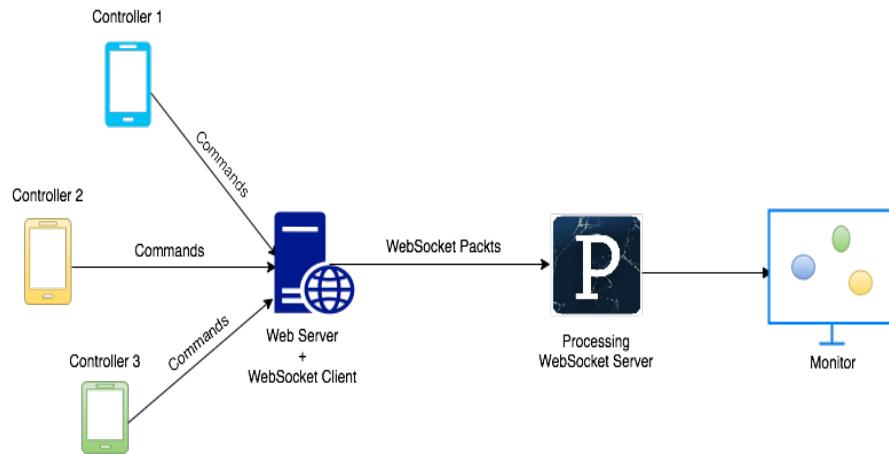


FIGURE 6.19: System architecture

To have a full look to the software, please refer to the DVD to see all the source codes and the relavent applications.

Flowchart Diagram

The bellow chart roughly shows the flow of the application.

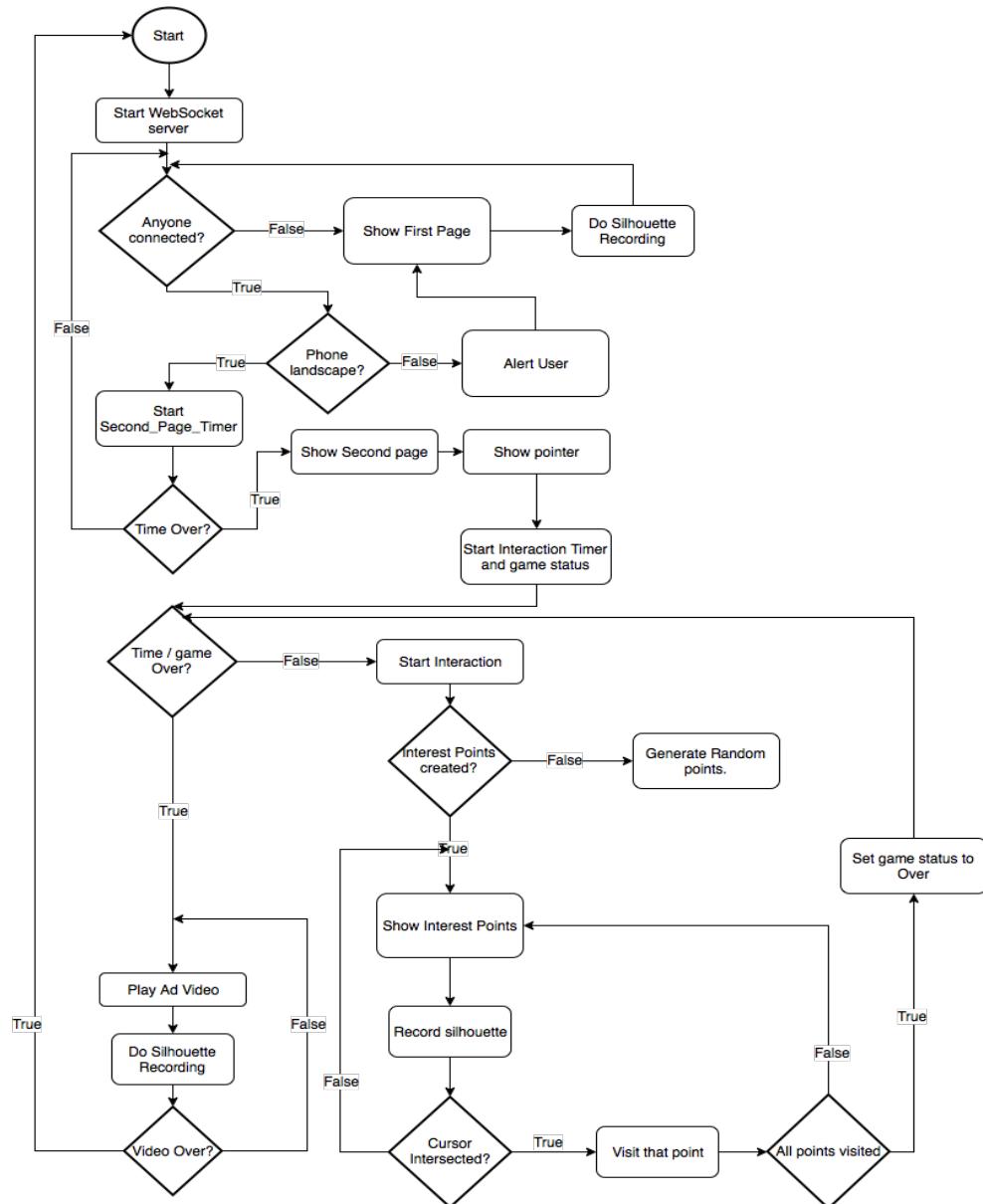


FIGURE 6.20: Mobile Interactive advertisement Flowchart diagram

What other things i should include?

7

Advertisement High Fidelity prototype

7.1 Introduction

Various studies are conducted in different stages of a research, at this level the chapter concentrates to Experimental study, which is mostly done in a controlled environment or even at fields and finds variable that causes of a direct influence on another variable, there have been many Experimental studies like “*Sweep and point & shoot*” [23] that evaluated prototypes of interaction of personal computing device with large public displays, another was an evaluation of “*mobile interaction with live video*” [26] in that the participants performance were measured for automatic zooming and temporary image freezing, which was an experimental with-in subject study design. Sebastian .D [30] assessed the general performance of drag and drop interaction on large displays and compared it with a traditional drag and drop. Jorg Müller [8] did pre-studies (lab and field) on noticing interactivity of a display in which the time required for recognizing interactivity by participants were measured.

After low-fi prototype evaluation and refining the prototype, the Hi-fidelity prototype version of advertisement got ready and this chapter explains the steps taken for advertisement application evaluation. The focus of this study were more on user performance like task completion time and call-to-action [34] understandability, it also investigated on user acceptance that how much the interaction techniques were motivated for them and if they would interact in future, it also focused on the possible usability issues of the techniques.

This usability testing was to understand whether both mobile and body interactive advertisement would function in the public or not, what were other difficulties, confusions, common mistakes, and behavior toward the applications. As the application would be in public crowd and not just one person would pass by the screen we were also interested that how the application deal with many users while interacting and observe multi user behavior in front of the screen.

7.2 Research questions

In this part of the study the bellow research questions should be answered after the study is conducted.

7.2.1 Body and Mobile interactions

1. How fast do users understand call-to-action?
2. How fast participants react to the call-to-action?
3. How easy participants understand the interaction task?
4. How long participants take to finish the interaction or visit all target locations?
5. What are the major usability flaws that prevent users from advertisement interactions?
6. What is the difference between mobile and body performance.

7. How the applications would perform in one user interaction and in multi user interaction?

7.2.2 Video advertisement

1. Do participants understand about the content of advertisement?
2. How many elements of display can participants recall after their first interaction?

7.3 Test Design

Within-Subject Design was chosen, in this test participants were asked to experience with both Body and Mobile Interactions, The interaction sequences were vary for participants in order to counterbalance to be able to limit the effects of learning transfer.

7.3.1 Participants

12 participants were invited for the usability testing; from which five participants were female and seven were male, most of the participants had computer science background and were familiar with mobile and had seen or worked with body sensing technologies, one participant was not familiar with QR-code.

7.3.2 Task

Participants were not told about any specific task, they were told to explore the system by their own and understand what to do, To avoid different outcomes participants were told to continue interaction until they encounter the very first stage of the application. So the tasks for participants were to start from initial stage of the interaction (body /mobile) and continue until reach again the initial stage.

As for body interaction no extra device was required to accomplish the task, but for mobile interaction a mobile phone was required, Participants were not told that the use of mobile is required unless participants used their own phone or asked for it from us.

call-to-action understandability

To determine this, the participants will be asked to approach the screen and perform what is relevant as soon as possible, The participants will not be told that the screen would ask them to do something, The participants should understand the task by the call-to-action method used in both interaction methods. The duration from approaching to screen and triggering the game would be considered as time taken to understand call-to-action.

Body interaction application can count how long does it take for the user to trigger the game, but for mobile interaction there is no pre-counting for each individuals because mobile users and Kinect camera are two separate technologies that is very hard to know which user hold the phone, therefor we used manual timer and asked the participant to think-aloud anything he understood about the task.

Task understandability

Participants should think aloud that what they will do after reading the task.

Task completion time

Task completion time is measured from the time game starts until the game ends.

Content of Advertisement

To check if the users understand the content of advertisement while interacting and while advertisement was shown, participants will be given paper and pen to write down words that they could recall from entire session.

Usability issues

Each participant was given five minutes to interact with advertisement after one another and questions were asked regarding the issues they faced. The usability issues are all observed by the moderator at the scene and later while watching the recorded videos. To understand better each interaction is separately listed as below.

Anything, which was confusing and unclear for the participants, committed errors and misunderstood events, which were done by participants, will also be counted as a usability issue.

Data Gathering

The below data were gathered.

7.3.3 Performance data

The below is the performance measures data that will be gathered after successful conduction of the test.

1. Duration of call-to-action understandability.
2. Duration of the reaction to call-to-action
3. Task completion time.
4. Count of usability issues.

Each individual's performance with both mobile and body interactions was created in bar chart, this data could also be used to check for efficiency of the interactions techniques too.

Mean time value for call-to-action understandability, game triggering, task completion and whole interaction time was computed for each interaction techniques. Along the mean time the confidence interval was also taken in consideration.

7.3.4 Preference data

The preference data, which is the measures of participant opinion or thought process, like the think-aloud each participant performed, or the answers for the interviews and their feedbacks.

7.3.5 Think aloud quotes

Think-Aloud quotes were noted during the video observation, these quotes were important to check at which point in time users understand about the interaction and tasks. It also helped to analyze their reaction and feedbacks toward the tasks being done.

7.3.6 Interview transcripts

All the interviews were transcribed and color-coding technique was applied to analyze and comprehend different aspects and categories from the defined questions. attach the color code chart

7.3.7 Recordings

There were two different recordings done during the session, first was video recording using camera at the backside that could record user actions and computer screen, the second recording was the screen recording of the application using QuickTime screen recorder. These recordings were used to analyze behavior, application performance and listen to the things participants said during interaction.



(A) Participant in body interaction mode.

(B) Participant in mobile interaction mode

FIGURE 7.1

7.4 Findings

7.4.1 Mobile Interaction performance

The bellow chart shows four different aspects when the mobile interaction happened for participants. The y-axis shows duration in seconds and x-axis shows the aspects as bellow. You can see performance chart for each individual in Appendix put number

- Understand call-to-action,
- Trigger game time
- Understand task time
- Game time.

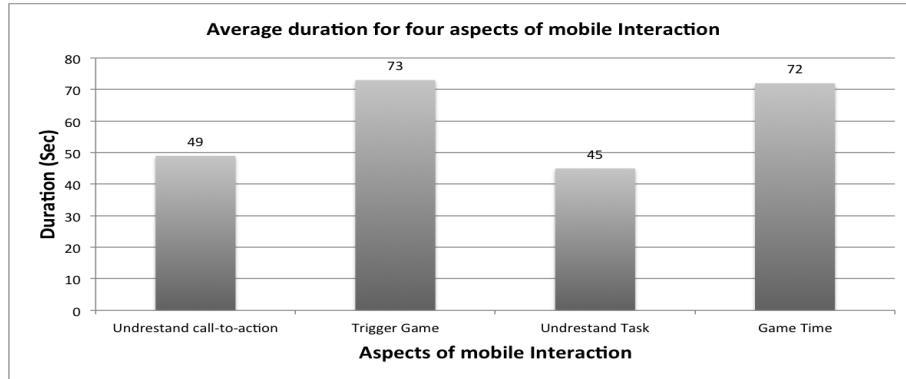


FIGURE 7.2: Chart that shows each aspect with respect to duration.

As can be seen above participants took longer time approximately 240 seconds for whole interaction time. Participants took 49 seconds in average to understand how to access the system (call-to-action), After participants understood what to do it took 73 seconds in average from taking their phone, opening the web page, logging and starting the game, it took 45 seconds in average to figure out how to do the task and 72 seconds to complete the task.

7.4.2 Body Interaction performance

This also shows four different aspects of the body interaction in the bellow chart. To see all participant's interaction see Appendix. [put number](#)

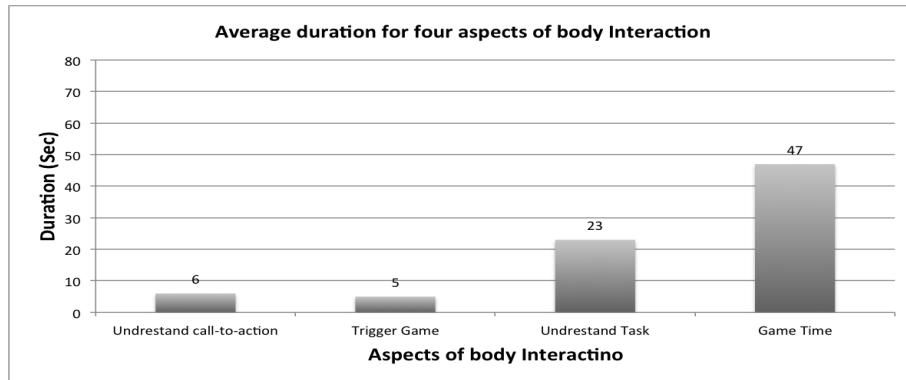


FIGURE 7.3: Chart that shows each aspect with respect to duration

As can be seen above most of the participants finished the whole interaction in approximately 81 seconds, which is much better than mobile interaction. It took 6 seconds to understand call-to-action, 5 seconds to trigger and start the game, 23 seconds to understand the task and 47 seconds to complete the tasks.

7.4.3 Body Vs. Mobile performance

As can be seen bellow body interaction seems to be much better than mobile interaction in terms of performance. The whole interaction time of body is less than the half of the time of mobile interaction.

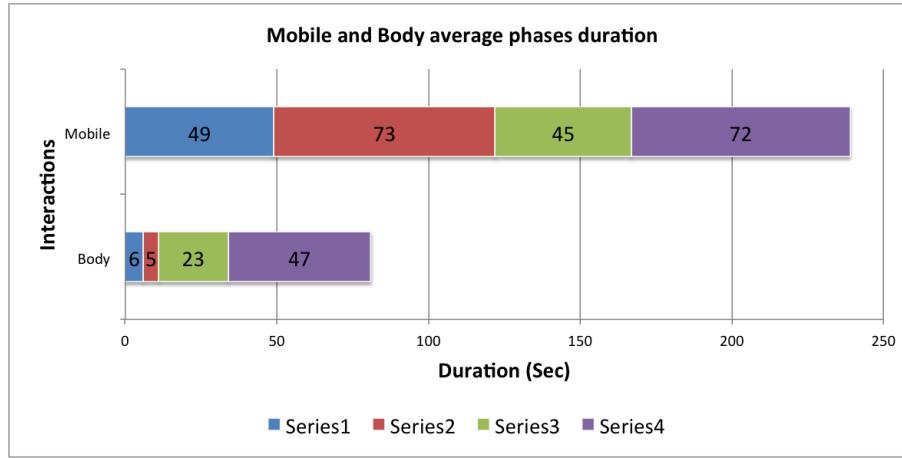


FIGURE 7.4: Comparison of body and mobile interaction performance

81 second is the mean value of the all participants with body interaction and 240 seconds is the mean value of the same participants with mobile interaction. The bellow chart shows other comparison of aspects as described.

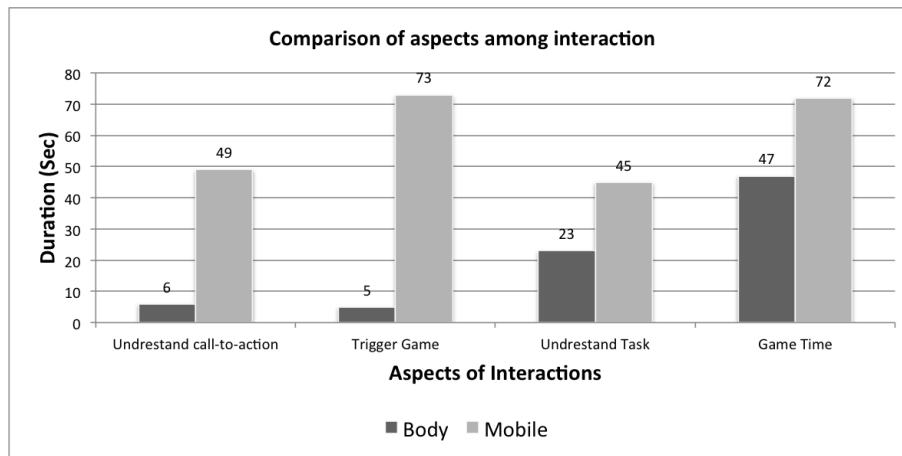


FIGURE 7.5: Comparison of the aspects of interaction among body and mobile

As can be seen in the chart mobile interaction took much longer than body interaction for each phase or aspects, ANOVA reveals a significant effect of call-to-action of (body vs. mobile) ($F_{1,11}=22.4758, p < .001 (p=.0001)$). A post-hoc tukey test shows that participants understood very quickly the call-to-action of body interaction compared to mobile interaction technique, maybe because it is very easy and understandable by any person because of the action “*to play come near*”is very usual and easy compared to using mobile phone which is not expected at that moment and the users should read and see the information text to understand that requires more cognitive load than simple action of body interaction.

ANOVA reveals a significant difference of triggering game between (body vs. mobile) ($F_{1,11}=124.1066, p < .001$). post-hoc tukey test shows that in body interaction the triggering happens much faster than mobile interaction, This is because mobile technique has many steps to follow in order to trigger the game (like connecting to WiFi, logging to website).

ANOVA reveals a significant difference of task understandability between (body vs. mobile) ($F_{1,11}=7.1340, p < .05 (p=.0147)$). A post-hoc tukey test shows that participants understand the task very faster compared to mobile technique, one hint could be the body representation itself and in mobile an abstract circle is shown and the interface that takes time to try and error and find what to do.

Interaction time is also significant different as ANOVA test suggests a significant difference between the game interaction ($F_{1,11}=19.7000, p < .001 (p=.01)$) post-hoc tukey test also strongly recommends that body interaction takes less time to complete the interaction compared to body.

7.4.4 Usability issues

The below usability issues are gathered from participant while observing them during the interactions.

Mobile Interaction

1. Call-to-Action

- (a) At the first glance and moment most participants did not try to read the text on the screen, despite they were expecting other way to get quick information, but after many try with their body they had to read the information text. This could be because of many issues like (amount of text, text size and used icons). And most importantly the text information was being covered by the silhouette, if participants were far the text was readable but when participants would get near to the screen to scan the QR-code or read the IP address, the silhouette drawn by the Kinect camera would occlude part of the information text, which resulted that participants should move a side to scan while facing toward the screen.
- (b) Participants did not understand about the phone icon or the browser animation on top of it until they figured by themselves.
- (c) IP address was complicated and took time to type in phone.
- (d) The size of QR code was small.

2. Use of mobile phone.

- (a) Participants did not expect at the beginning that they would use their own phone for the interactions; many times participants asked, "*Should I use my phone?*"
- (b) Most participants did not read the instruction to tilt their phone and even if they accidentally had tilted the phone, it would have not effected because by default the tilt-sensor of the phones were off because of power saving settings.
- (c) There was no instruction to turn-on the tilt-sensor in mobile phone.

3. Login page

- (a) Some of the participants were confused with the word Login, Participants thought that they would have to provide some sort of

username and password to the system, and one participant reacted to this strictly and refused to login to the webpage using his phone.

4. Task description

- (a) The task description was shown after the participants login to the system despite of whether the phone is tilted or not, Most participants missed to read the task description because they were busy with their phone to tilt it and by that time the description on the screen was gone.

5. Controller

- (a) Beside small instruction for controller usage but still it was not sufficient because most of the participants did not give time to read it.
- (b) Many participants complained about the elasticity (automatic centering feature) of cursor. They had to reposition the cursor for another location to explore.

Body Interaction

1. Call-To-Action

- (a) The silhouette is projected in the largest scale for attraction attention but when users trigger the interaction by coming close to the screen then participants could not see themselves, because the silhouette was projected on the top of the screen or sometimes when participants were very close their silhouette was projected on top out of the screen image, This happens because of the mapping of participant location in relation to the screen, if participant moves back then they could see themselves.

2. Controller

- (a) Participants tried themselves to find a way to interact, by moving their body; there was no instruction on how to control their silhouette.

3. Alert image

- (a) Alert image that shows a Hands-Up person lead to confusion at the moment where users were much closer to the system.

Advertisement video

- 1. The slides were switching fast.
- 2. Some did not liked the colors and theme.

7.4.5 Advertisement goal

Did users understand about advertisement?

The criteria for recalling the advertisement was that participants should recall “*Bauhaus-Walk*” word and explain what does it do or if the interaction technique gave them an idea what could be the advertisement about, At best users can recall the date, timing and location of the tour program.

1. Ad goal description

Therefor to find out this, when all participants experienced with the very first interaction technique mobile or body, they were immediately asked about the goal of advertisement, we wanted to know if the participants would understand about the advertisement at their very first try. All of the participants were speaking in English language and the advertisement interaction and the entire participants responded as they finished the interaction. 9 participants accurately described the goal of the advertisement and 2 participants generally described about the goal, the reason behind that was advertisement video, which was shown was in German language, later the video was changed to English for the rest of participants and they responded precisely.

2. Ad-related elements recalled

After the participants described the goal, they were given a piece of sheet to draw and write any element related to the interaction and advertisement with in five minutes. All the sketches drawn and keywords written by the participants were manually analyzed and counted

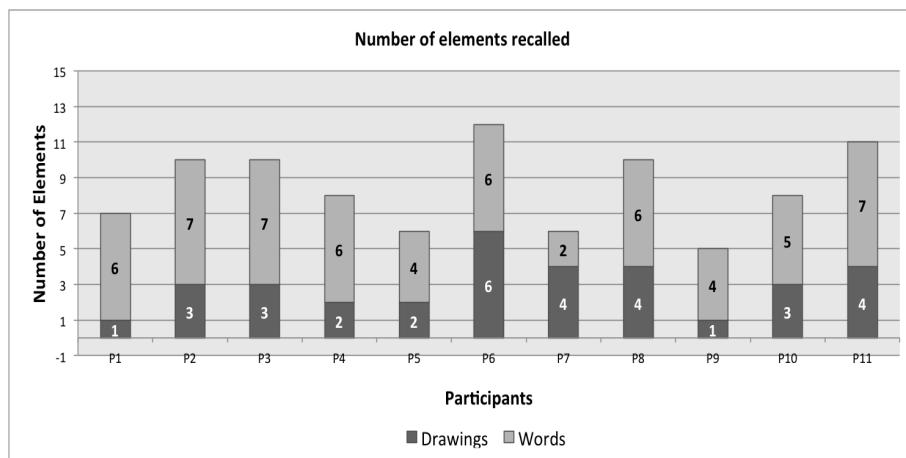


FIGURE 7.6: Number of words and drawings of the advertisement elements

Word cloud (Wordle)

All the keywords written in the papers by participants were collected in one text file and using an online tool [42] the bellow word cloud was generated.

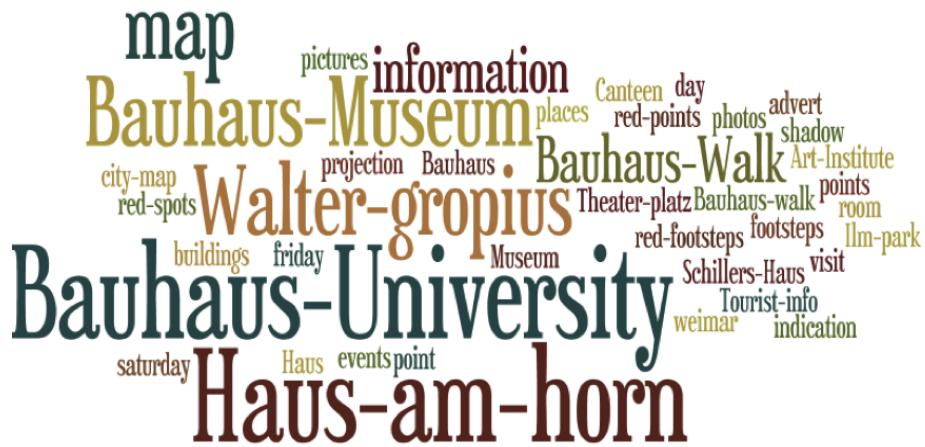


FIGURE 7.7: Word cloud representation of the keywords

As can be seen, most key words that has high frequency are the ones actually related to the advertisement it seems most location names that participants interacted with are recalled a lot like “*Bauhaus University*”, “*Haus-am-horn*” and others, The program name “*Bauhaus-Walk*” is also in high frequency, and even the day of the event is mentioned too.

Key factors for advertisement understanding

1. Game environment

The game environment designed for the interactions had a major impact for understanding the advertisement goal, for example one of the participants replied “*I saw a map and different places, so I guess touristic places that I can visit in Weimar.*” Beside the map the blinking points on the map, which more people are familiar that shows interest regions of a city, one participant replied “*I think it was about tourist places in the city, at first I saw the map, and there were points on the top*” By analyzing their reply, they already linked the points with the touristic places.

2. Interaction technique

The interaction technique especially with the body interaction where walking is involved, participants got clue about the advertisement indirectly only by walking and linked walking as visiting locations, like one of the participants replied “*Discovering Weimar. The Bauhaus-Walk. It was the advertisement about those locations that the people can visit in the tour.*” It is very fascinating to read that answer from which the whole goal of the advertisement can be derived.

3. Advertisement video

The advertisement video had an impact on the participants to be able to recall the advertisement, one of the participants replied that “*I saw many pictures coming about Bauhaus and the program times and day*”,

despite that the users understood a little about the advertisement they also complained about the video for being fast.

7.4.6 Interview Findings

All the interviews transcripts were coded for better analyzing and finding appropriate connections to categories and these categories are shown as a big diagram attached to appendix B. Each category is discussed separately

Mobile Categories

Many important categories were created from the responder's codes; these categories reflect the functionality, nature, issues and complications of mobile interaction technique. Most of them points out negative concerns and some positive feedbacks too about the interactions, which is discussed bellow.

1. Comfortable

Mobile interaction is more comfortable in the context of public environment, users do not feel shy to work with their phone, they have more privacy as one user said "*I think for people moving in public could be more embarrassing if you just use your phone the people passing by will not pay attention*". Users can also work with the display from a far location rather than standing in front as one participant said, "*you can comfortably set far away see the screen and start interacting*".

2. Activity

This method has less Activity, participants do not have to move their body to reach certain points in the map, instead they can use their phone and stand or sit steady and with the tip of their finger can easily explore locations, as one of the user said "*I could go with the tip of my finger and it helped me all the places I visited*".

3. Dependency

On the other hand, this interaction is dependent to many things like obviously a mobile phone, if the user does not have a mobile phone the interaction cannot happen, a participant asked, "*How would I have played if I have not brought my mobile phone?*" Another dependency is the WIFI connection, one participant pointed out "*And then the fact that I had to be connected to a WIFI, that was because I did not understand do we have to be in the same Internet (Network)?*"

4. Complicated

The process seemed also complicated like first entering the IP-Address or scanning the QR-code, then looking at the instructions and logging with a name, then tilting the phone and finally interacting with the controller elements like the button and cursor, most of the participants complained about this stating like, "*Because it is a headache for me to take out my phone and use all this login, and waste my time.*" another commented like "*for exploring you have to push that red button, that was a bit confusing.*"

5. Annoying

One of the annoying things pointed out by the participant was the QR-Code was being covered by the person silhouette standing in front of

the display the user said “*QR-Code was small and when I was coming near the screen to scan the code, my body was covering it*”.

6. Clarity

There were many instructions like Access-information, mobile instruction and task instruction, but these instruction was also not clear to them as one of the participant mentioned, “*that controller was also not clear, because I though the red areas is the touch area that I can scroll and the red button was a click*” another participant replied like “*there were very few descriptions, I guess the word login was miss-phrased, it was not really a login it was just chose a name*”. Another participant was not sure if to use mobile phone or the screen has touch capability as he replied “*at first I saw the map, and there were points on the top first I tried to touch*”.

Body Categories

Body interaction was more appreciated by the participants; from the interview transcripts the bellow positive and negative opinions were derived and categorized.

1. Enjoyment

Participants had the sense of enjoyment and fun, as one of participants said, “*I liked the second one because it seemed more involving and I think it was more fun*”, another user said “*I liked this interaction; it was more good and fun.*” ,

2. Easy

Users found the interaction to be very easy, simple and smooth, a user said, “*The body movement was good it was smooth*” another user said, “*It was much easier than the previous one, it was much better, umm it was not confusing*”. The call-to-Action seemed much easier, one user said, “*I saw saying me to come near, and when I came the game started, that was very easy to use*”, and the interaction with the game elements was also easy to understand, one participants said “*it was easy to come near to the screen and first I did not understand how to play the game but when I saw my avatar that is moving with me then I realized and did the tasks*”

3. Immersion

Some participants said they were some how immersed with the game, like one said, “*I felt that I was really part of it*”, another said, “*With the body you look your own avatar in the map and you feel that you are in the map.*”

4. Engaging

The body technique seemed also very engaging and users wanted to play more and more, one said, “*It is so engaging and it is like that it needs you*”, another said, “*it is like you want to put the footsteps exactly on the street*” , “*it seemed more involving*”.

5. Issues

On the other hand, body interaction had also some issues, like one of

the participants pointed out that the interaction would be difficult if it is in crowded area, one said, “*If two people interact then they can crash at each other*”. Participants complained about physical space “*I felt was the space there was not enough space in here*”. Bad tracking of the body and unexpected locations were triggered by fast movement like, one participants said, “*I guess the application was tracking me really bad*”, “*when I was moving to some areas fast suddenly that point was being triggered.*”

6. Embarrassing

Some participants said that they would not try at public because it could be shame or embarrassment for their selves, ?moving in public could be more embarrassing?

7. Confusion

The projection of silhouette on the advertisement also made some participants confused and that was also distractive, like one said, “*I saw my silhouette at the last time I was playing, because I was curious that why is it there*”.

Advertisement

1. Interface

The interface was appreciated by all the participants, as one said, “*I really liked the map*”, another user said, “*the footsteps were cute*”.

2. Non-controllability

The flow of the interaction was also observed by the users, which they found annoying like, one participants noticed that “*I do not want to be forced to see all the places and then see the advertisement*”, the video advertisement was also not in the control a user said, “*There was nothing to answer, it gave me the impression that okay; this was an advertisement someone did it and I could not change the flow of it.*”

3. Distraction

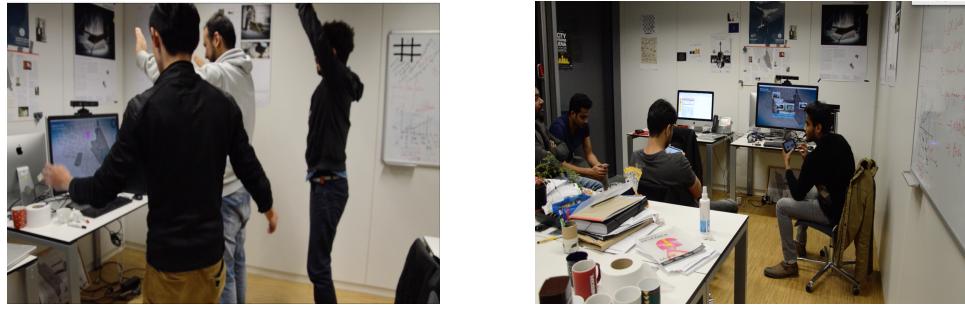
The projection of silhouette after the interaction body or mobile technique was a distraction factor, because participants would not notice the video advertisement but would notice themselves.

4. Speed

The pictures for the locations and the advertisement video were fast, a user said, “*The description of the places were very fast, when I was trying to read it, it disappeared.*”

7.4.7 Application Performance

Application performed quite well for both single and multi-user interactions, Application did not crashed nor hanged in the middle of interaction. In multi-user interaction, application faced some delay in both body and mobile because of many participants 5-7 at the same time, this issue got solved by changing the JRE version 32bit to JRE version 64bit and along with this the processing version was also changed from 32bit to 64bit and increased the maximum usage memory to highest in processing.



(A) Group body interaction.

(B) Group mobile interaction.

FIGURE 7.8

7.5 Conclusion

This chapter concludes that with body interaction technique, participants felt more satisfied than mobile technique and preferred the use of body than mobile in public environment.

Learnability of body interaction was better than mobile interaction, because of the problems mentioned like (unclear access-info text, unfamiliarity with QR code or phone icons, Registration) and many other things that made the process quite complicated whereas the body interaction had none of them. The efficiency of accessing the system was also significant between body interaction and mobile interaction, because of the lengthy process, which was required for mobile interaction, which made it really hard for participants. Body representation on the map provides a strong clue of “walking” which was the main task and the learnability of task was very significant compared to mobile technique, which showed a circle colored shape, along the understandability task completion time was also significant, participants completed the task much earlier than mobile technique. Along the usability issues most of the participants understood the goal and purpose of advertisement in both techniques.

Considering the above issues, the next step would be to refine both prototypes and make it ready for evaluation on public space.

8

Interactive and non-Interactive Advertisement field study

8.1 Introduction

Talk more general on advertisement and other displays

Evaluating high-fidelity prototypes of advertisement provided several of feedbacks to refine them for the final evaluation on the field, the study focuses on conducting a *summative study* [35] “*is used to evaluate how well the design meets the usability requirements*” it is to make some final decisions on the prototype in this case Interactive advertisement with large number of participants on the field. There have been many kinds of these tests in lab and also in field, as Beyer, G [31] in which the user behavior and user experience was compared between flat and cylindrical displays, and Müller, J [8] did a study on how passers-by notice interactivity of public displays, the studies were done in both lab and field environments, Another study conducted by Anthony Tang [13] that focused on consequences of the design choices with respect to encouraging *bystanders* to interact with the public displays, and classified *bystanders* who may never engage with the displays but contribute to interaction at some level. Junko Ichino [10] researched on how different display angles could impact social behaviors of people around displays and also in one of his another paper [11] investigated on User’s cognition and subjective responses in relation to different display angles.

Audience Behavior is an important research question in most of the public display evaluations; audience behavior is how a person or user(s) react around a situated display, for example the (1) *honeypot* [9] that is the effect that people who are already involved in interaction with display attract other people around, it is also called “*sociable buzz*” by the author, in public displays this effect can even create multiple rows of people interacting [8]. Another audience behavior is (2) *landing effect* [8], where the passers-by realize the interactivity of the display after they passed the display and they tend to walk back for confirmation or for interaction. Another audience behavior is (3) *sweet spot* [31] where is a location that most people stand in relation to the display. At some occasions individuals do not feel comfortable by the presence of other people or situated displays and they tend avoid [1] and researches have been done to investigate spaces around display and on how to design a shared space for displays [32].

Effectiveness is another important area for public display evaluation, which is defined by many factors (also discussed on chapter 3) like (1) Number of passers-by [19, 29], (2) among passers-by how many glanced [19, 20, 28] to it, (3) how many started interacting [8, 19] and (4) how long passers-by were engaged with display.

This study also focuses on user behaviors (landing effect and honeypot effects) attractiveness, effectiveness of Non-interactive and interactive advertisement application and compares them among each other. The field study was executed in Weimar tourist Information Center at (Weimar Markt 10) which is one of important location for many tourists who visit Weimar. This location was chosen by Bauhaus-Spaziergang program personals that are providing tours for new visitors in Weimar. Bauhaus-Spaziergang does advertisement as brochure at this location. The location was reserved for our new advertisement starting from 1st February for three weeks.

Two different Interactions and one non-Interactive Advertisement were made as described in previous chapters, the first one was body interaction

where passers-by can interact using his/her own body movement in the physical space and influence advertisement element, and the second was mobile interaction, where users by opening the advertisement web application in their smartphone can interact with advertisement and the third is a non-interactive advertisement where the interface and elements are completely similar but are not influenced by people around, the elements change based on time-based random sequence.

8.2 Interactive Advertisement

The interactive advertisement was originally designed as a three distinctive phases.

1. Attraction / Motivation phases:

This phase is the first interface for the advertisement, the passerby silhouettes are being projected on the screen and in this interface Call-to-action is implemented to motivate passers-by to start interacting with the screen. Call-to-action techniques were different for mobile and body interactive system.

2. Interaction phase:

This phase allows participants to actively influence the advertisement elements, which were highlighted regions of Bauhaus in Weimar, the participant could explore those regions just by reaching to them, a picture of the area with a short description would appear for three seconds and then fade out. This phase is constraint with time and will automatically be over with in 40 seconds and would switch to the last phase called ad video phase.

3. Advertisement video phase:

This phase only shows a 20 second non-interactive Bauhaus-spaziergang Ad video and whenever the video is over it will switch back to the initial phase.

8.2.1 Body Interactive

The body interactive advertisement has the ability to detect up to seven people at a time and project their silhouette in the screen each with different colors, the Call-to-Action feature asks viewers to come near to the screen to start the interaction, when the interaction starts participants are given a short instruction on how to play the system, participants should walk physically in front of the screen in order to move the silhouette on the map to explore the regions. The interaction finishes if all the regions are explored or the 40 second time gets over and the Ad video is shown.

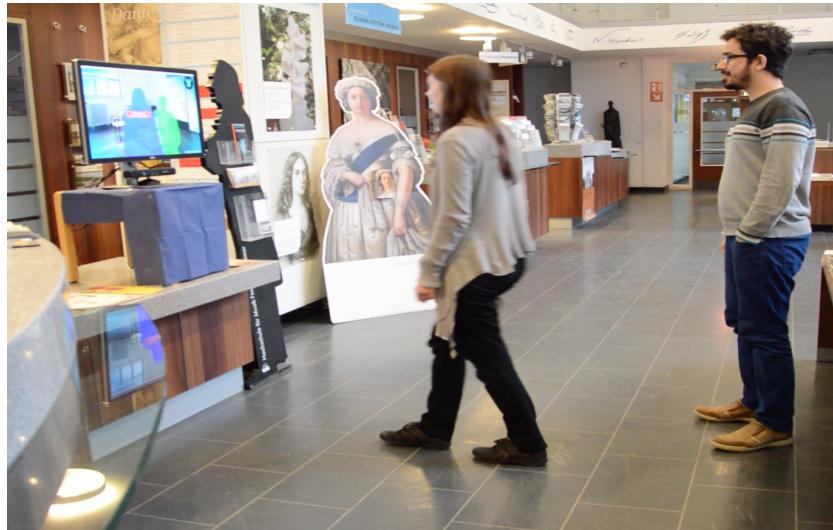


FIGURE 8.1: Two persons are standing far from the screen, and their colored silhouettes are shown, the girl is getting closer to the screen to start the interaction.



FIGURE 8.2: Both are in interaction phase, as you can see the girl has explored one location and a picture is shown

8.2.2 Mobile Interactive

As you already got the idea that this technique works with smart phone, the system also shows partially passers-by silhouette for attracting attention, but the Call-to-Action is done through using a mobile phone, the screen gives instruction on how to access the system. Passerby should connect to the wireless local area network and browse the controller website from their phone, and the control opens in their phone to use navigate to different regions on the map to explore interest locations. The interaction is also constraint to 40 second time and after that the Ad video is shown.



FIGURE 8.3: The person is connecting to the advertisement web controller using his phone.

8.3 Non-Interactive Advertisement

This technique is also composed of the same three phases but each of them is triggered without the influence of people around, we call it auto active advertisement too. The first phase shows only the screen with the Bauhaus-spaziergang title and has no Call-to-Action feature and after few seconds switches to the second phase, in second phase the locations are automatically explored in random sequence each time and has the same expiration time (40 seconds) as others and after that the same ad video is shown and switches back to the first mode. The entire cycle of the phases is around 60 seconds which is almost similar to the other two interactive advertisement.

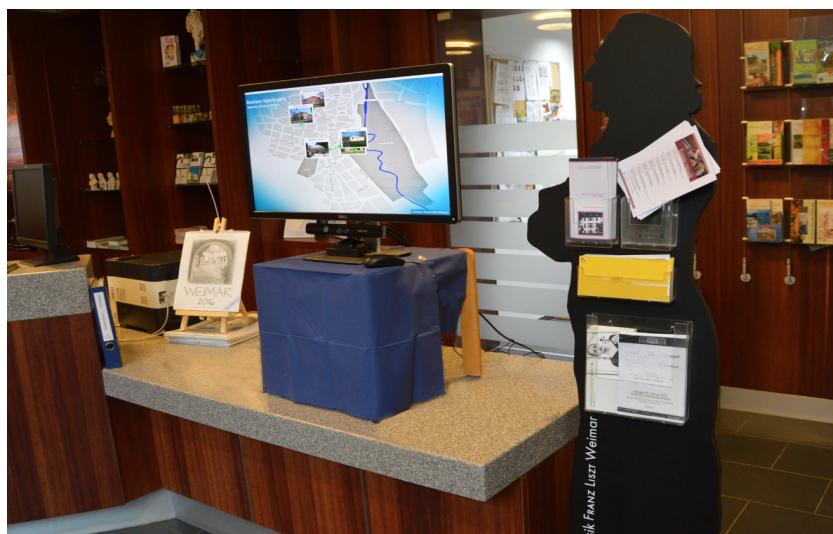


FIGURE 8.4: The screen is automatically exploring locations on the map

8.4 Research questions

1. For which of the three conditions (body, mobile and non-interactive advertisements) passers-by
 - (a) Are more attracted toward?
 - (b) Perform Honeypot and Landing effects?
 - (c) Are engaged with the screen?
 - (d) Watch the remaining advertisement video after interaction?
2. How many people remember advertisement?
3. What are passers-by feedback about the advertisement techniques?
4. What are the difference between effectiveness and audience behavior for Interactive and Non-interactive advertisement?

8.5 Design study

8.5.1 Location

The screen was installed in Weimar Tourist Information center. This center is one of the famous tourist information in Weimar where a lot of tourists visit. Most importantly this location was chosen because our target audience (tourists) mainly elders visit.



FIGURE 8.5: Weimar Tourist Information Center Top-view picture, The locations are marked with yellow arrows.

8.5.2 Duration

Each type of advertisement technique were installed for five days in the following three weeks.

TABLE 8.1: Week sequence

Advertisement	1st Week	2nd Week	3rd Week
Non-Interactive	X		
Body Interactive		X	
Mobile Interactive			X

8.5.3 Internal Validity

To be confident that the change in the weeks would not effect the findings, extra effort was done to make all the week environmental conditions the same as much as possible. The screen was installed in the same location, had the same screen brightness, height and also the surroundings of the screen were not altered, we asked the responsible person in tourist information center not to change anything in the surrounding. The luck was also with us that almost the weather conditions were the same too, but the only thing we could not control was the number of passerby; The flow of passers-by were also be nearly the same.

8.5.4 Participants

The participants were the ones who pass by the screen, none of the participants were informed about this study nor any notes were put at the entrance. Roughly %60 of the participants were elder aged between 30-60, %25 were young and the rest %15 were children.

8.5.5 Data gathering

Several types of data from different aspects were gathered for each individual week to be able for analyzing and also be able to answer new arising questions after the onsite evaluation, the bellow types of data were gathered.

1. On-Site Observation

Observation periods were arranged in two different time slots per day, the first time slot was from 10:00 – 12:00 and the second was from 14:00 – 16:00, except for Saturday and Sunday where the tourist information center was open only until 14:00, then the observation period was from 10:00-12:00 and 13:00-14:00. During these two time slots the bellow observations were made and to remove the effects of specific time order, the orders were counterbalanced.

(a) Attention Level measurement

Attention level is how much a person gives attention to the display, which consist of number of glances and number of ignores and how much long a person is standing in front of the display. At the beginning gaze-tracking method was considered for accurate measurement of attention level, a very impressive work have been done from Intraface [18] that can not only detect glances but also human emotions at the time, but because of high flow rate that method was not used and instead the glance counting which was

proposed by [19] that has formalized a ranking system from which glance is considered if a person reacts to the display by turning his/her head toward it that last less than 3 seconds.

One hour attention level counting for each time slot was conducted, in which the observer was writing the number of people passing by and how many of them glanced and ignored the screen.see the glance counting sheet in Appendix: A.1

(b) **Passerby behavior and Interviews**

During one hour per time slot per day the passerby behavior were observed like how they approach to the screen, how do they react, what path the passerby take and what are they looking for and even how they ignore the display and after they are done with the screen engagement a very short interview was taken from them.

2. System Logs

The Advertisement application can generate the bellow logs.

(a) **Non-Interaction application**

Only duration(seconds) spent in front of the display is logged for each individual person.

(b) **Interaction application**

For this type the system can detect

- Time user joins.
- Interaction completion time.
- Number of tasks (locations) explored.
- Whole duration spent(sec).
- If the user has seen advertisement or not.

3. Interviews

Interviews were taken from the passerby that had some sort of engagement with the display like for non-interactive advertisement the people were interviewed that they stood for a while and saw the advertisement and for the interactive advertisement the people were interviewed that interacted or tried to interact with the system. A leaflet, that describes the thesis goal and interview consent form was handed to the participants and after signature the interview was conducted. All the interviews were audio recorded and later transcribed for analysis, all interviews took in average 4 minutes, the reason we took short interviews was that most of the people were tourists and had little time to stay and even some of them rejected interview because of shortage of time. Each week there were some variation in the questions dependent to the type of advertisement. See appendix A.7.1

4. Colored-image recording

Colored-image recording from Kinect camera was done during entire three weeks for non-interactive and interactive advertisement for many reasons.

- Match the log data with the video data for accuracy.
- Measure the number of Honeypot effects and landing effects.

- Observe passerby behavior in detail.

Because of limited space and processing power, the actual depth information (x,y,z) for individual points was not stored but a 2D colored image was taken per second and after the image recording was done, in lab another post processing script was applied to integrate a static background using Adobe Photoshop application. To match the data logs and the image frames each image name consisted the date and time as (10.12.43.21.png).

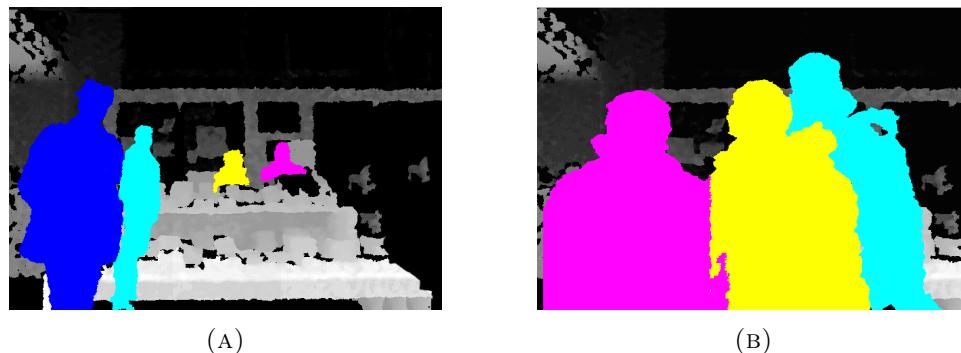


FIGURE 8.6: Depth recording examples

Other pictures were also taken using mobile phone from the scene, verbal permission were taken before the photographing them.

8.6 Data Analysing

8.6.1 Glance counts

The glance counts were transformed from paper to spreadsheet in which number of glances and ignores were recorded individually and then combined from which mean value and percentages are extracted. fix appendix see Appendix A.7.2, A.7.3 and A.7.4 for each week.

8.6.2 Interviews

All the interviews were transcribed and color coded from which interesting categories had emerged, each code is separately discussed in the finding section, To see color coded diagram see Appendix A.7.5, A.7.6 and A.7.7 for each week. fix appendix

8.6.3 Display Engagement phases and time

Log files along depth images were seen and compared to have accurate values for each engagement phases and the whole interaction phases. depth frames were manually frame-by-frame analysed and the logs were cleared from any possible mistakes.

8.6.4 Honeypot and landing effects

These two effects were observed mainly from the depth frames and also partially from onsite observation.

8.6.5 Other observations

The observations were done onsite, the observer wrote down any important event happened at that moment, These notes also include observer own point of view of understanding the scenario during the entire day and week. Most of the notes have time stamp. See Appendix A.7.8, A.7.9, and A.7.11. The depth recordings were also observed frame-by-frame to see anything that was missed when the observer was not present at the center. Different behaviors are extracted from the observation, which you will find in findings.

8.7 Findings

8.7.1 Non-Interactive findings

- Attention Level measurements** The number of glances and ignores were measured for the five consecutive days as shown below, each day (bar) has less than half number of glances compared to number of ignores and in total the average glance is %25, which corresponds to (1/4) portion of passers-by.

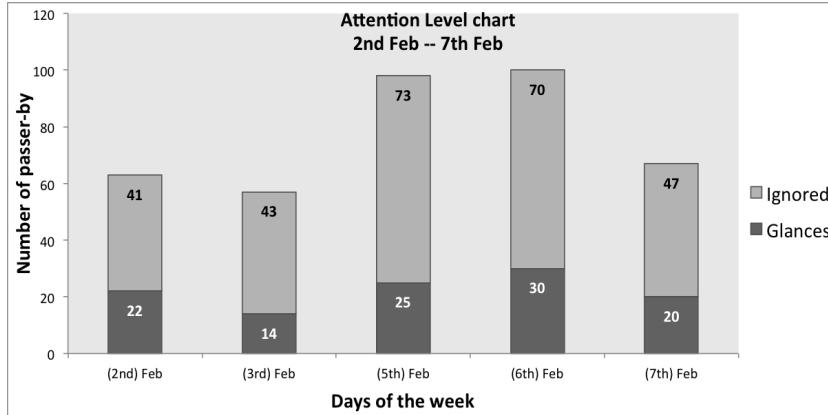


FIGURE 8.7: Non-interactive attention level chart

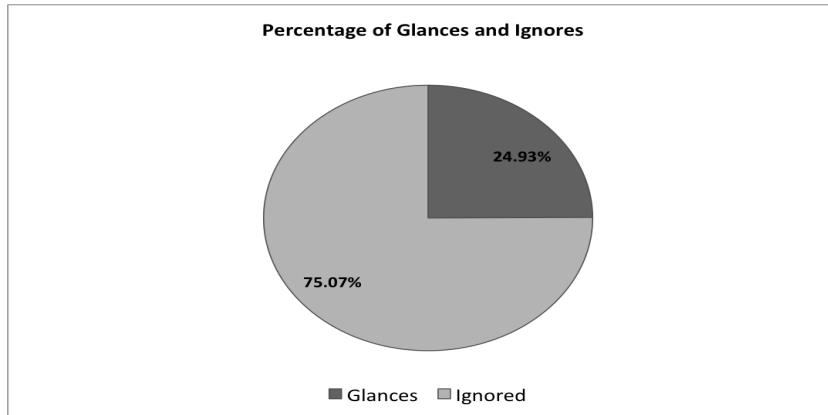


FIGURE 8.8: Non-interactive Attention level percentage

- Engagement Time**

Not all people would take time to see the advertisement, some participants took very little time like 4-5 seconds and some also saw the ad for about 100 seconds which is almost twice of the advertisement time, so dependent to the interest people were engaged in different durations and in average it took about 34 seconds to be engaged.

- Passers-by and Engagement** Counting the entire passers-by was a challenge and there was not accurate automated method to do therefore each day's recordings were watched and the numbers of passers-by were counted manually, this intense work was carried out with a number of computer science students who voluntarily participated. And out of

those passers-by the people who watched the screen for more than 5 seconds were flagged as an engaged passer-by.

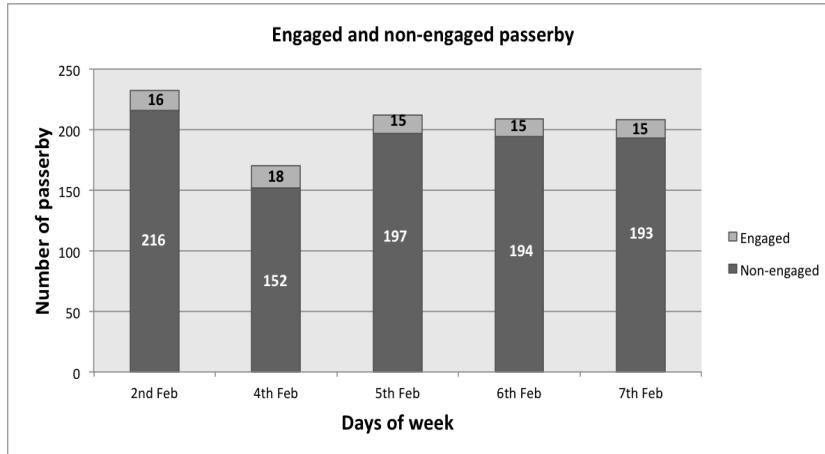


FIGURE 8.9: Non-interaction Number of engaged and Non-engaged passers-by

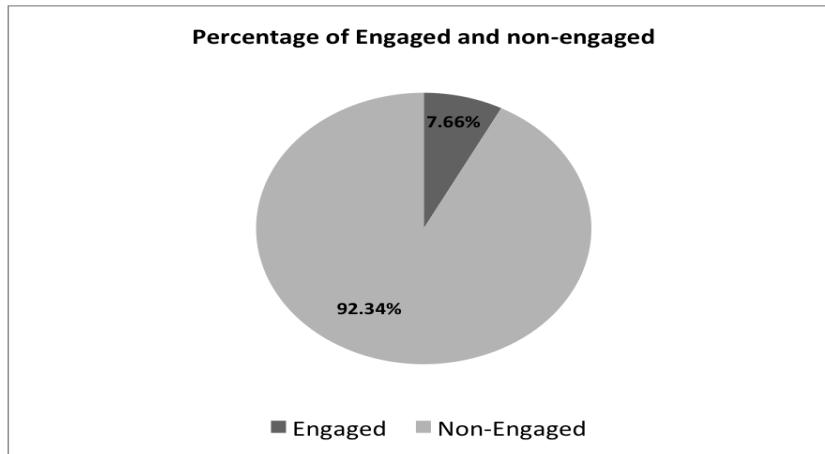


FIGURE 8.10: Non-Interactive Percentage of engaged and passerby

As can be seen in above chart it shows the number of passers who were engaged and number of passers-by who did was not engaged. The chart shows very few engaged people for each day and as an average %7.66 of the whole population are engaged in 5 days.

4. Landing and Honeypot effects

there is no honeypot or landing in non-interactive. The below shows the frequencies of both effect for each day.

The effects like honeypot or landing effects can not be defined in non-interactive displays but still similar incidents are seen.

In non-interactive the silhouette is not projected and the passers-by do not see themselves in the screen but still for some other reasons (define why) turn back. As in the figure in the right (A) a person passes-by the display (B) then he notices something and he stops (C) He turns back toward display and (D) comes near to the screen.

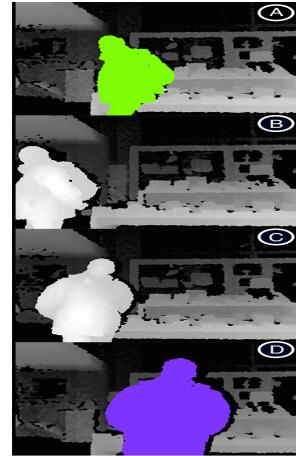


FIGURE 8.11: Landing effect

In picture (A) a lady is standing in front of the monitor and reading the content and after a while in picture (B) another person is approaching the monitor to see what is happening and immediately another person in picture (C, D) was also attracted to come close and see what is going on. The honeypot effect in non-interactive could be due to that a friend is watching the screen and another friend of him / her is attracted to the screen or just has another intention like to talk to or call him. The scenarios seemed to be very personal and during the observation not other than friends were attracted to see the screen.

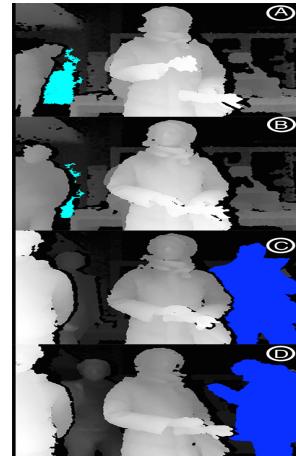


FIGURE 8.12: Honeypot effect

TABLE 8.2: Landing and honeypot effects

Days	Landing effect	Honeypot effect
2nd Feb	1	1
4th Feb	0	1
5th Feb	2	3
6th Feb	0	3
7th Feb	1	1

1. Interview

(a) Likes

Many things from the advertisement were interesting, like the concept of map and the design. As one stated that, “I find the idea good, it is nice to see the pictures of the places on the map”, “it is

very nice idea because it will be remembered and when I go to the city I will remember”

(b) Dislikes

Most of the respondents complained on the speed of the advertisement that how fast the image changes as one said “*But the pictures were changing very fast*” other said, “*advertisement is a little fast*” They mentioned that why speed is an issue as stating, “*we wanted to see the map*”, “*Could not read the text*”. Many things were disliked by some of the respondents like the advertisement theme, one said, “*It did not have Bauhaus Theme, the color and that design*” One respondent also disliked the blinking points.

(c) Participation

Respondents mentioned the same excuses that were given at body interactive advertisement, one said, “*I will join if I am free*”, other said, “*I have no time*”, or “*if the weather is good*”.

(d) Advertisement recall People could recall the ad, as one mentioned, “*It is for a tour of Bauhaus in Weimar*” other said, “*People can visit the city*” and some mentioned directly the name of the program “*Bauhaus-Spaziergang*”.

(e) Recommendations

There were many recommendations proposed by the responders, which was on content, speed, design. Content related recommendations was that one said, “*If the prices are mentioned it would be good so that they can decide if they want to take it or not*” other said on timing, “*how long does this tour take so people arrange their*”. Another mentioned on speed like “*it must be little slow*”.

2. Note taking

Note taking helped to analyze the environment and behavior of people around the display. During the non-interactive technique week, the surrounding of display was very quite and very little people would come and read, individual's would come at beginning first to read and then later if there was a friend would also join. In normal circumstances if there was a couple coming inside tourist information center one of them would ask question from the help desk and the other person would see around the posters and other things. There was an interactive object in front of the display on the table, which many people tried to play.

See appendix A.7.8 fix this appendix

7. Other audience behaviors

The behavior toward non-interactive during the 5 days observation seemed to be very calm and passive, passers-by selectively came to watch the screen there was no curiosity nor attractiveness that had driven their attention. It was thread as a source of information and whenever they approach the screen the participants would normally stand for a very short time and after looking for 1-2 pop-up pictures on the screen they would leave, except for participants that was looking for some events that stood for the complete duration of the advertisement.

- Display negligence

At most of the occasions the display was neglected and passers-by were busy with their own personal activities and discussions even though they were standing in front of the display facing toward it.

- Display blindness

Passers-by also ignored and passed by the display because they did not expect to be something special related to them.

- Display as information board

Some of the passers-by expected the display to be a source of information, for example some tourist stood in front of the display to see the map and find out locations by reading the street names on the map.

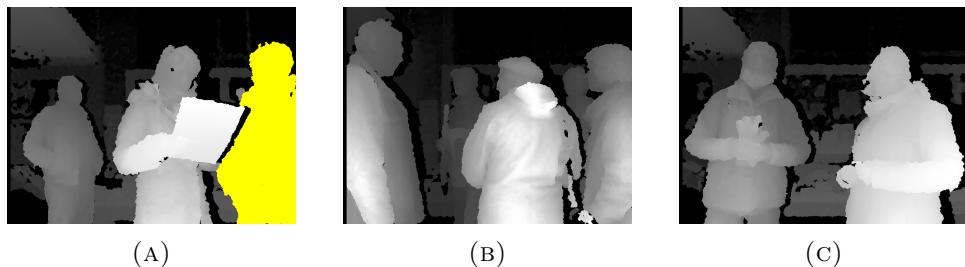


FIGURE 8.13: The first two pictures show that the display is completely ignored and people are busy with themselves.

Picture C shows two couples are reading the screen.

8.7.2 Body Interactive findings

1. Attention Level measurements

The bellow chart shows the observation number of glances and ignores of passers-by for two distinct hours of five days. As can be seen the in most days the number of glances and ignores are almost near but not still ignores percentage is higher, as can be seen in the pie-chart %41.41 are the number of glances and around %59 is the number of ignores.

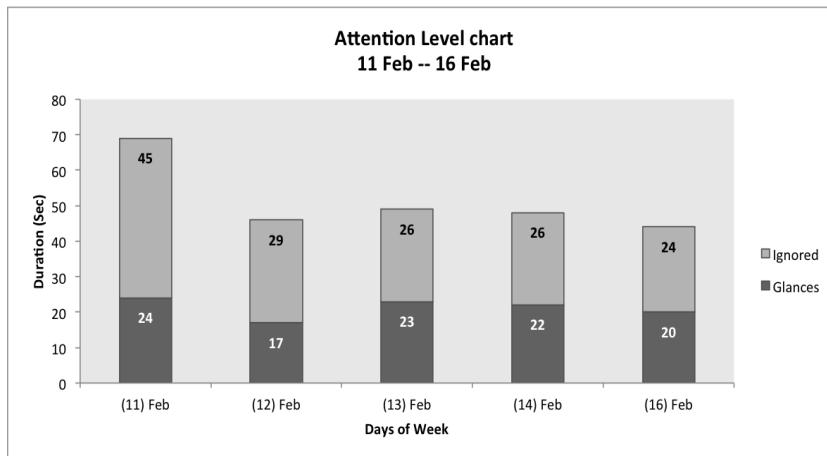


FIGURE 8.14: Body interactive attention level chart

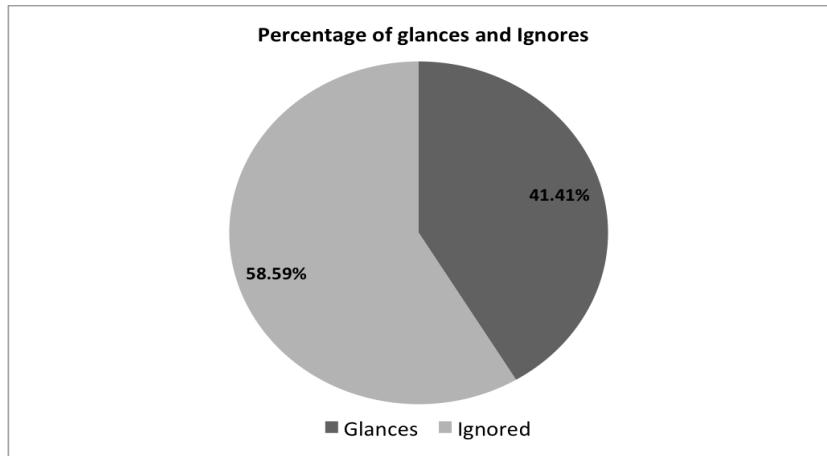


FIGURE 8.15: Body interactive Attention level percentage

2. Engagement phases and duration spent

There were passers-by who were very interested in the interaction that played the game even three times, some people triggered the game and left in the middle and some people were just staring at the screen and did not triggered the game therefor people were engaged in different stages of the game differently and took between (10, 200) seconds and in average it took around 42 seconds.

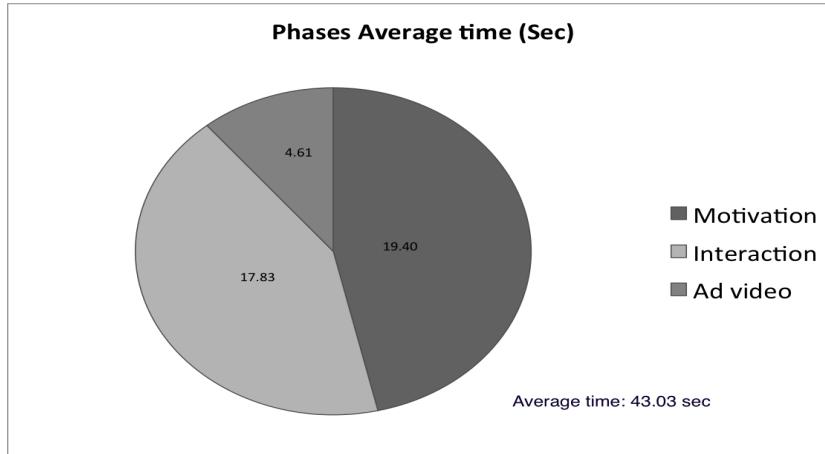


FIGURE 8.16: Average time for each phase

The advertisement was divided in three main section (1) motivation, which is the pre-interaction phase that the participant has not started the game and just playing with body or looking to the screen or reading call-to-action text, this part was different for people some people by just looking to the screen approached and started the interaction less than 5 seconds and some people took longer time to think and then triggered the game, at some occasions participants just left without triggering the game so in average it took around 20 seconds for this stage. (2) The interaction part in which people again took different times some people played more than two or three times and some played the first element and left so in average it took about 18 seconds for this stage. (3) The advertisement video which had the least time spent most of the participants left the screen after they saw the advertisement video in 2 seconds and some were excited to play again so they waited for a while In front of display until the end of advertisement video this was very rare among participants, so in average it took around 4.5 seconds for advertisement video.

3. Passerby and engagements

We were interested that how much people pass from display and how much of them would be engaged with the display, From depth recording entire passers-by were counted along with the passers-by who got engaged with the screen the counting was done manually with the help of many computer science students. If the person who stood longer than 3 seconds was flagged as engaged.

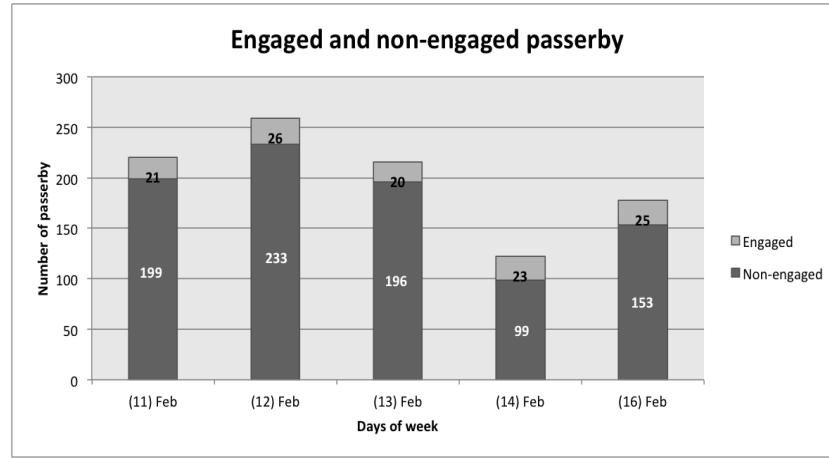


FIGURE 8.17: Body interactive Number of engaged passerby

As can be seen from the chart bellow the number of them are shown in bar chart for each of the day. And in average around %12 of the passers-by were engaged with the screen.

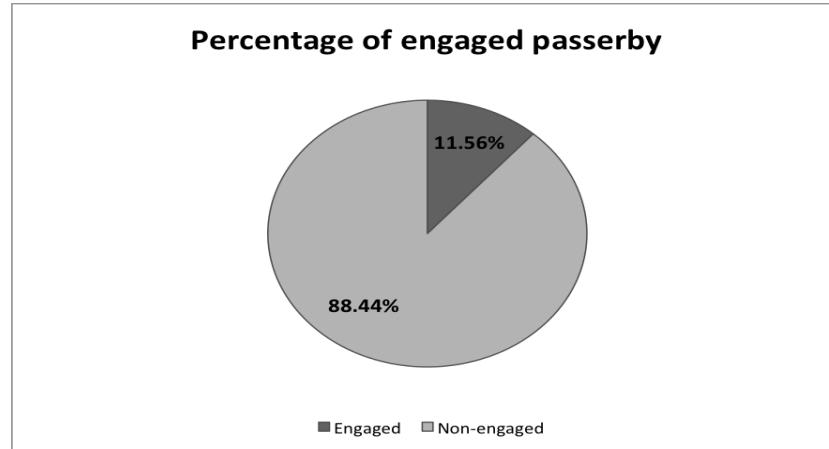


FIGURE 8.18: body interactive percentage of engaged passerby

4. Landing and Honeypot effects

Many landing effects and honeypot effects were observed for body interaction technique.

As before landing was discussed that a person recognizes the interactivity after he /she has already passed the screen, in the picture in the right the two person silhouette are projected on the screen when they are passing the second person who has yellow color (A) notices the interactivity while his friend is still continuing to pass (B, C) but the guy the person is standing to see what is going on (D) and at this point his friend notices and walks back to see the screen (E).



FIGURE 8.19: Landing effect

The honeypot effect is the effect that other people are attracted by noticing the current people that are somehow involved (interacting) with the display.

The picture on the left shows a boy interacting with the system (A) when the body move a bit behind from the display (B) at this time another random person who does not know him or has notice before, tries to approach to the screen (C) and then when the person sees himself then from he actively tries to take control of the interaction (D) and the other active person was left behind the scene.

The bellow chart lists all the frequencies of honeypot effect and landing effects that was recorded from the depth recordings and onsite observations.

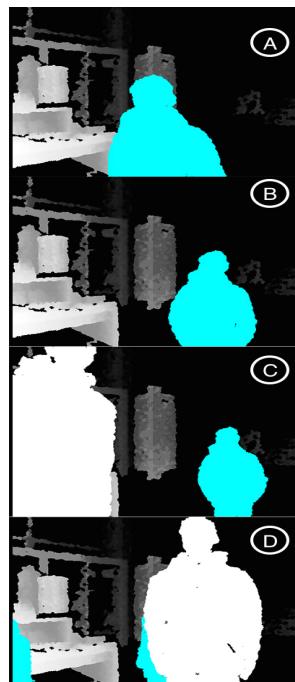


FIGURE 8.20: Honeypot Effect

TABLE 8.3: Body Interactive Landing and honeypot effect

Days	Landing effect	Honeypot effect
11 Feb	2	2
12 Feb	3	3
13 Feb	2	2
14 Feb	2	5
16 Feb	3	3

5. Interviews

The interviews were coded each individually and as a result the below categories are extracted, these categories are mainly taken from the questions and others are from the replies of the participants.

(a) Noticing

Different people had their different experience and reaction when they noticed themselves in the display for the first time. Some of the people were standing and looking some books for long time when they saw themselves and for confirmation they waved toward the screen, as one said “*Yes at first I thought that it is not me. I waved my hand and came near.*” Other said, “*Yes I saw my blue color body*”. Other participants noticed at the time of passing from front of the screen, “*when I was passing I saw myself in the screen.*” Other people saw their friend first then noticed themselves like one said, “*I saw my friend in the screen and came near and I was also there with blue color.*” One participant who usually comes to the center every week said that because the screen was newly installed I came near to the screen to see what is new inside.

(b) Ad recall

Respondents responded accurately the content and goal of the advertisement as one said, “*It was about a tour of Bauhaus, Bauhaus Spaziergang.*” “*It was about tour in the city.*” And other said, “*It was about Bauhaus-Walk. City tour.*” And other said, “*it is something to do with Bauhaus city walk*”.

(c) Interest

People find this type of interaction very interesting, funny and motivative, one participant mentioned that, “*I liked to see myself in the screen, it was funny.*” Other says the use of media is very interesting and comfortable for people, “*I think that the people with the use of media is comfortable*”. The use of this type of interactive advertisement give people some sort of good feeling toward Bauhaus-Walk event like one said, “*Bauhaus is very interested to me and it sounds fun*”. People also liked the way content was inside the advertisement like one said, “*It is very interesting to see the pictures*” and even one participant exactly mentioned the goal of the advertisement interaction, “*it was a very interesting idea and it is like a small interactive tour for the people who want to take Bauhaus-Walk.*”

(d) Event participation

Respondents showed sign of interest to join the program in future but are not able to join quickly because of many reasons like they are here for short visit as one said, “*We are here in Weimar for short visit*”, others said they are busy with many other programs like one said, “*Now we are going to Weimar Museum*”.

(e) Confusions

There was some confusion during interaction, like the interaction seemed unclear, one said, “*I did not understand how it works*” other said, “*I left because I did not understand*” and some people also experienced this by coming very close to the screen and

nothing is shown to them at that time, “*when I was standing I saw that it says come near, and I came near to the screen and the map came but I left after standing for a short time because I did not understand it.*”

(f) Dislikes

When a person hovers on a location in the map, a related picture is shown on the screen and deems off after a while, some participants complained about time and said, “*Pictures goes very fast*”, one person complained about the rendering speed and said, “*Pictures come very late*”.

(g) Recommendations

Respondents recommended that the advertisement should be able to hint users on how to use it, as one said, “*It would be good to put some more information that how we can use it.*” Other said that “*Maybe explain how someone can walk with these body figures*”. One person even said, “*It is good that here someone stand and describe it to the people who come near to the screen.*” Some of the participants also recommended to slow down the picture changing of the advertisement.

6. Other observations

fix the note taking check appendix A.7.9 and A.7.10

During the body interactions despite honeypot and landing effect other different kinds of behaviors have been observed and how passers-by reacted when there was an interactive display, the behavior with the display was much different compared to non-interactive as listed bellow.

- Group interaction

Most of the passers-by interacted when they were in a group maybe they felt much secure and confident, and mostly their interaction last longer, few individual participants interacted with the display which was shorter compared to group interaction. The bellwo pictures show group interaction between two friends In (A, B) and another three persons in (C, D).

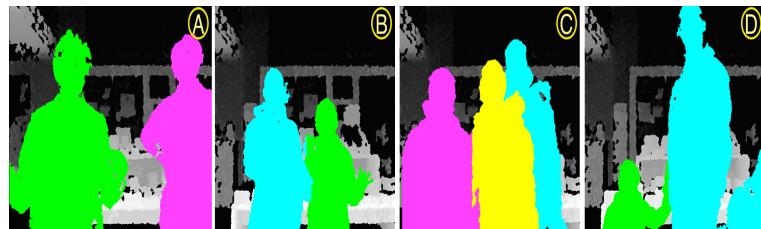


FIGURE 8.21

- Calling others People were getting really excited and liked to call his / her friends to come and join and have fun with the interaction, most of this reaction was seen between children and parents and couples. As can be seen in frame (A) a person is watching the display and then moves out in frame (B) and in frame (C) calls a friend of him/her and in frame (D) both of them are in center of the screen and watching themselves in it.

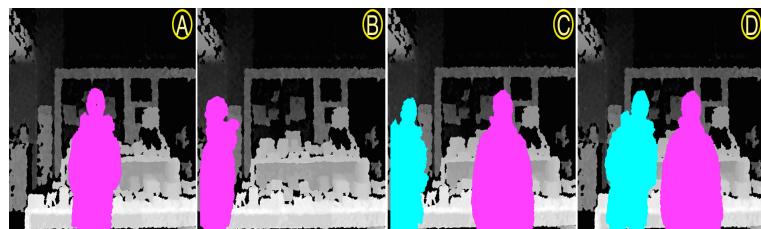


FIGURE 8.22: Calling others

- Playing with silhouette

Passers-by liked the different colors specially when they were couples or children before they triggered the interaction. As can be seen in bellow picture there is a couple that likes to play with the different colors of their silhouette.

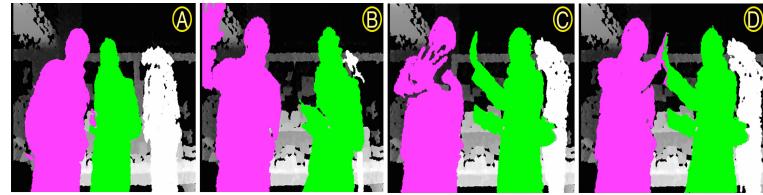


FIGURE 8.23: Playing with silhouette

- **Interactivity confirmation**

People who saw their selves from far distance were not sure if the screen was interacted so they started waving their hands, body or their heads to see if their silhouette reacts to their movements. Some of the people did not apparently act but progressively came near to screen like (spying) and then left. As can be seen in bellow frames, in (A) a person notices his/her silhouette and immediately raises hands in frame (B) and his fellow friend also notices and raises hand up in (C and D).

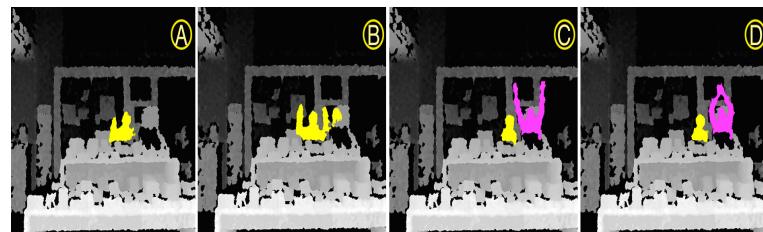


FIGURE 8.24: Noticing interactivity

- **Raising hands up**

During the interactions some of participants raised their hands up mainly because of the alert message that was shown on top right corner of the screen if they were undetected by Kinect camera. As can be seen in the pictures that shows different frames people during interaction and prior to interaction are raising their hands up.



FIGURE 8.25: Raising hand

- **Physical space domination**

The people in front of the display were either interacting or either leaving the space by walking away or turning their face back from display, people felt some sort of influence of their presence in front of it.

- **Call-to-action reaction**

Most people came very close to the screen when approached by

the application, this lead to confusion later in interaction because the camera could not longer track them.

- Interactions behaviors

The movement of silhouette during interaction is by moving forward / backward or left / right, some at early interaction leaned down or jumped higher to go forward or backward on the map.

- Incorrect expectations

Some passers-by who started the interaction using their body, expected that the screen should be working using touch, they tried many times to touch the elements, one of the main reason of this behavior seemed to relied on the fact that they were called to come near, and they felt became more personal with the display and the display which was small in dimension also provides the hint of being personal. Touch interaction is know to be more personal action than using body or other gestures.

- Interaction negligence (technology skeptical)

Some of the elder participants ignored the interaction even after understanding the call-to-action, and after interviewing them they responded that they did not know how that thing works, and after interviewing an employee of the tourist information, he said that the elders are a bit skeptical about the use of technology.

8.7.3 Mobile Interactive findings

7. Attention Level measurements Attention attraction technique was quite similar to body interaction technique, which was projection passers-by silhouette but with a difference of access information text rendered on top, people would partially see their silhouette but still it was an attention mechanism, the measurement was done for five days each day for only two hours of direct observation.

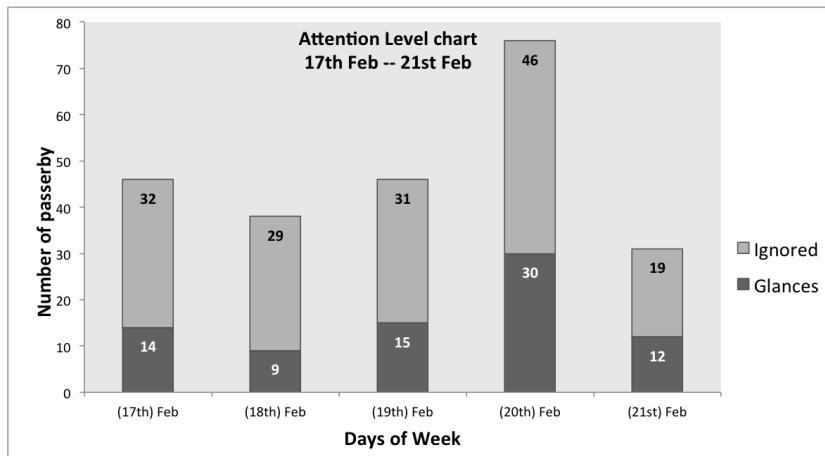


FIGURE 8.26: Mobile interactive attention level chart

As can be seen the number of glances have decreased compared to body interaction, since other things were not changed except for the access information so it could be the result of that, that people have not fully seen themselves or recognized.

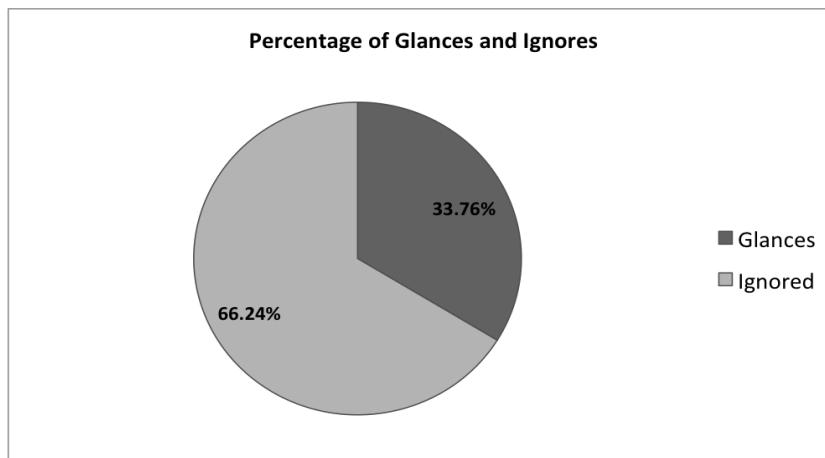


FIGURE 8.27: Mobile interactive Attention level percentage

The percentage of the whole week of glances was around %34 and %66 of the cases the screen was ignored.

8. Engagement time

Although no passers-by interacted with the system, all of the participants were in the first screen of the advertisement that showed the

Bauhaus-walk name and their silhouette. It took in average around 22 seconds to be engaged passively with the screen, which is less than non-interactive and body interactive applications.

9. **Passerby and engagements** The entire five days were observed using the depth recordings and manually the number of passers-by were counted and from which the passers-by who stood for more than 3 seconds were flagged as engaged, as can be seen below in pie chart that shows one day each. Most of the passers-by stood for a very short time.

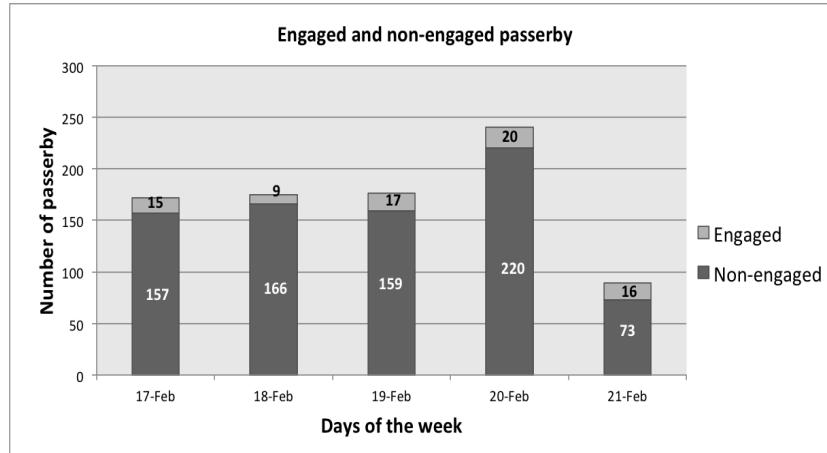


FIGURE 8.28: Mobile interactive Number of engaged passerby

Only %9 of the passers-by were engaged with the system.

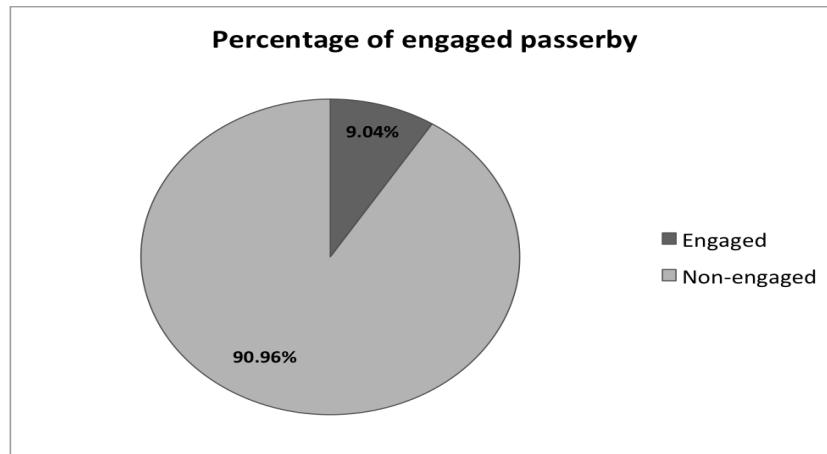


FIGURE 8.29: Mobile interactive percentage of engaged passerby

4. Landing and Honeypot effects

Landing and honeypot effects in this technique were very not strong enough mainly because no passers-by interacted with the system.

Honeypot effect was mainly because of the silhouette representation as said before this effect was very week because of info-screen that showed partial body representation, passers-by rarely noticed the text. Only two times honeypot effect occurred and people did not get engaged with the system afterward. This effect could have been improved if passers-by had actively participated to play game. The picture bellow shows a green colored person at frame (A) at this point he was watching the screen for a while and when he moves out of the screen (B, C) another yellow colored person appears from the back side (C) and walks toward the screen (D, E) and gets close very close (F).

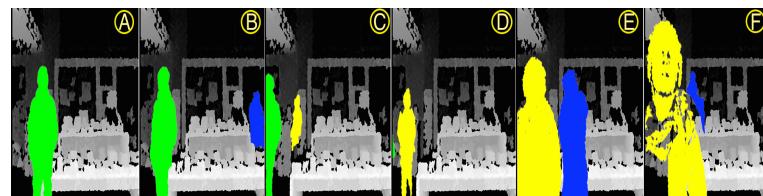


FIGURE 8.30: Honeypot effect

Landing effect was also recorded in some occasions and mainly happened because they saw their silhouette, very less people noticed and most ignored as shown in the picture from right to left a person is crossing the screen (A – E) but on frame (F) stops and move a little back to see what is on the screen. The person does not entirely come in the center of the screen.

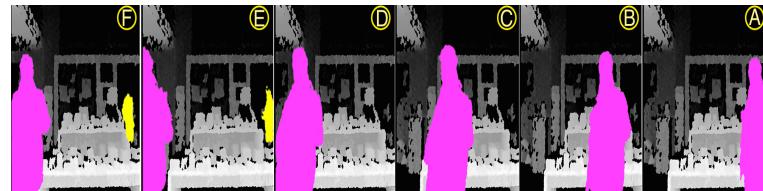


FIGURE 8.31: Landing effect

TABLE 8.4: Mobile Interactive Landing and honeypot effect

Days	Landing effect	Honeypot effect
17 Feb	0	1
18 Feb	1	0
19 Feb	2	0
20 Feb	0	0
21 Feb	1	1

5. Interviews

complete the interview report

6. Other observations

fix Appendix A.7.11

Passers-by were attracted to the system when they saw their silhouette, which was kind of similar to the body interaction technique. The below are behaviors people had with the system.

- Curiosity

Passers-by who noticed showed curiosity and tried to come near to the screen or started waving their hands toward the screen.

- Interaction ignoring

All the people who were attracted ignored to interact, that could have many different reasons, like the lack of enough knowledge of how to do, or not having mobile phones or not interested to play, as one of them were interviewed he said that he does not use phone for in public he only uses it for calling.

- Scanning code

During five days only two persons tried to scan the QR-code and after scanning they just left.

- Playful

Most of the kids that noticed felt excited only to see their different colored silhouette and even at some point started to dance in group.

- Inappropriate physical space

Because most of the passers-by pass and do not expect interaction with the displays and especially with mobile phone would be very difficult to be convinced because the screen is situated in the pathway of people, people would not interact with phone standing. I believe for mobile interaction it would be nice to place display where people can sit and interact.

- Limited time

Passers-by have limited time to pass the screen and by mean time they should be convinced to start interaction, but as found out in the usability testing of mobile phone in previous chapter, it take much longer to understand how to start the game, this results to ignore the interaction with the smartphone.

- Being skeptical

The old generation are most of them skeptical about using technology and specially things that are their own like mobile phones, even though having a smartphone they do not tend to use their phone for public use and in this case for an advertisement.

- Feeling unsecure

Some people may think unsecure of using their personal phone, thinking that maybe other information may be extracted from their phones, so they try to stay away from using their phones in public space.

8.7.4 Comparison of advertisements

Number of passerby

Because the advertisements techniques were not conducted in the same days, which could ruin comparison because of different number of passers-by everyday and each week, there was a need to first compare the number of passers-by and prove that they were not statistically different in between.

Hypothesis:

- **H0:** There was no difference between numbers of passerby of each week.
- **H1:** There was a difference between numbers of passerby of each week.

The bellow is the table of passerby for three weeks.

TABLE 8.5: Number of passerby in three weeks

Days	First week	Second week	Third week
Day 1	232	178	172
Day 2	170	220	175
Day 3	212	259	176
Day 4	209	216	240
Day 5	208	122	89
Total	1031	995	852

ANOVA test revealed that there is no significant different of passers-by between each of the weeks. ($F_{2,5}=0.8873$, $p > .05$ ($p=0.437$) So based on this the H_0 hypothesis is being accepted and H_1 hypothesis is being rejected. This gives us confidence to proceed our comparisons.

Attention Level Comparison

As can be seen Non-interactive (first week) had %28.83 number of glances, the Body-interaction (second week) had almost %10 high number of glances (%38.70) than non-interactive, The mobile Interaction had higher glances (%33.75) from non-interactive but still less than body interaction. But with this we can not conclude that body interaction had higher until we statistically state them.

To compare which of the the three methods drove more passers-by attention, the data of number of glances for each of the weeks are gathered as bellow and first we want to find out if these data are statistically different or not.

Hypothesis:

- **H0:** There was no difference between numbers of passerby of each week.
- **H1:** There was a difference between numbers of passerby of each week.

TABLE 8.6: Cross tabulation for each week attention level

Method	Glanced (%)	Ignored	Total
First week	111(%28.83)	274	385
Second week	106 (%41.41)	150	256
Third week	80 (%33.75)	157	237
Total	297	581	878

Running Chi-squared test to see the significant between different advertisement conditions and the bellow result shows that they are statistically significant. $\chi^2(2, N=878)=10.863, p < .05 (p=.004376)$, so H_0 is rejected and H_1 hypothesis would be accepted. To find the actual difference, each pairs were tested in between using again Chi-squared test.

1. Non-Interactive Vs Body Interactive

The finding shows that body interactive advertisement had significant number of glances than non-interactive advertisement.

$$\chi^2(1, N=641)=10.8581, p < .005 (p=.000984)$$

2. Non-Interactive Vs Mobile Interactive

The finding suggests that there is no significant difference between Non-interactive and mobile in this case.

$$\chi^2(1, N=622)=1.6716, p > .05 (p=.196039)$$

3. Body interactive Vs Mobile Interactive

As can be expected the glances are not statistically significant among the body and mobile interactive advertisement too.

$$\chi^2(1, N=493)=3.0663, p > .05 (p=.07993)$$

Engaged and Non-engaged passers-by

This test is to find out if there is a difference between number of Engaged passerby or not between the weeks.

Hypothesis:

- **H0:** There is no difference between the numbers of Engaged passerby between the weeks.
- **H1:** There is a difference between the numbers of Engaged passerby between in each weeks.

The bellow table lists all number of engaged and non-engaged passers-by for three weeks.

TABLE 8.7: Number of engaged passers-by in three weeks

Days	First week	Second week	Third week
Day 1	16	25	15
Day 2	18	21	9
Day 3	15	26	17
Day 4	15	20	20
Day 5	15	23	16
Total	79	115	77

The ANOVA test strongly suggests that there is a significant difference of the number of Engaged passersby between these three weeks.
 $(F_{2,5})=11.20, p >.05 (p=.002)$

To find where are the main difference between them are, the Post-Hoc Tukey's HSD test was conducted on each three pairs of the week to point out which of them exhibit statistically significant difference.

TABLE 8.8: Post-Hoc Tukey's HSD

Methods	Tukey HSD Q statistic	Tukey HSD p-value	Tukey HSD inference
A vs B	5.6337	0.0047509	** p<0.01
A vs C	0.3130	0.8999947	insignificant
B vs C	5.9467	0.0032197	** p<0.01

Method A, B and C refers to (Non-interactive, body interactive and mobile interactive) advertisement accordingly. As can be seen from the above chart, there is no significant difference between group A and C and group B which is body interactive advertisement shows a significant difference between A and C. it shows that the body interactive advertisement engaged significantly more passersby than other two types of advertisement.

Landing effect

The bellow table shows how many landing effects were recorded from the depth observation video for each of the weeks.

Hypothesis:

- **H0:** There is no difference between the numbers of Engaged passerby between in each week.
- **H1:** There is a difference between the numbers of Engaged passerby between in each week.

TABLE 8.9: Number of Landing effect in three weeks

Days	First week	Second week	Third week
Day 1	1	2	0
Day 2	0	3	1
Day 3	2	2	2
Day 4	0	2	0
Day 5	1	3	1

ANOVA test reveals that there is a significant difference between one or two above conditions, ($(F_{2,5})=7.529, p >.05 (p=.008)$). So we reject the Null hypothesis and state that one of the above conditions are statistically significant from the others, to confirm this we again run Post-Hoc Tukey's HSD test on the above data.

TABLE 8.10: Post-Hoc Tukey's HSD results

Methods	Tukey HSD Q statistic	Tukey HSD p-value	Tukey HSD inference
A vs B	4.7527	0.0144554	* p<0.05
A vs C	0.0000	0.8999947	insignificant
B vs C	5.9467	0.0144554	* p<0.05

Group A, B and C refers to (Non-interactive, body interactive and mobile interactive) advertisement accordingly As can be seen the test shows that the condition A and C are insignificant but condition B is significant from A and C, which means that body interactive advertisement has statistically higher landing effects than other

Honeypot effect

The bellow table shows how many honeypot effects were recorded from the depth observation video.

Hypothesis:

- **H0:** There is no significant difference between the numbers of honeypot effect for the above three advertisement types.
- **H1:** There is significant difference between the numbers of honeypot effect for the above three advertisement types.

TABLE 8.11: Number of Honeypot effect in three weeks

Days	First week	Second week	Third week
Day 1	1	2	1
Day 2	1	3	0
Day 3	2	2	0
Day 4	2	5	0
Day 5	1	3	1

ANOVA test reveals that there is a significant different between the groups ($(F_{2,5})=12.29$, $p > .05$ ($p=.001$)), and after doing Post-hoc Tukey test it revealed that there is significant difference of Honeypot between Body Interactive and Mobile interactive advertisement, but less statistical different between Non-interactive and body interactive as the online tool gave one star for A and B and two stars for B and C.

TABLE 8.12: Post-Hoc Tukey's HSD results

Methods	Tukey HSD Q statistic	Tukey HSD p-value	Tukey HSD inference
A vs B	4.2762	0.0264780	* p<0.05
A vs C	2.6726	0.1836687	insignificant
B vs C	6.9488	0.0010053	** p<0.01

8.8 Discussion

Talk about non-interactive, body and mobile problems and other related things
How to enhance the future interactive in this physical space?

8.9 Conclusion

This chapter concludes the findings and observations of three different advertisement technique from which one was non-interactive and two of the others were interactive as described below.

Non-interactive advertisement in tourist information was very quiet and people reacted normally, the sense of joy and excitement was not felt with display, participants selectively stood and read the advertisement for a short period of time and most of others ignored the displays, 1/4 passers by glanced among each two hour of observation and %7.6 were engaged of all the passers-by in the entire days of week and spent in average 34 seconds, people liked the design of the interface, but also complained about the speed and theme of content.

Body interactive advertisement started with joy and fun, the behavior toward the screen was different from the non-interactive, many landing effects and honeypot effects were observed and along that, people reacted differently to notice the interactivity and approached toward the screen, most of the interactions happened in groups and the attraction attention method was appreciated and participants understood how to trigger the interaction mode. In this technique a lot of passers-by seemed to be active at front of the monitor the physical space around the screen directly had influenced the people behaviors, people called other friends to join the interaction and raised a sense of awareness around.

Mobile interaction technique was one of techniques that did not really find its value in the space, except for the attraction attention area, No one interacted with the system and no one were motivated to try at-least for one time, but still people were interested to see their silhouette and spent a little time in front of the display. The reason of showing no interest with mobile interaction was that feeling of insecurity, lack of trust, interest and knowledge of using phones in public space and also the physical environment felt to be in appropriate for mobile interaction because there was no comfort zone for people sitting to spend much greater time to start interaction.

At the conclusion from the findings and observations and comparisons of all three different techniques body interaction technique was the most statistically attractive which received %42 number of glances, increased the number of whole passers-by to be engaged up to %12, increased the duration to 42 seconds and raised number of honeypot and landing effects compared to other two advertisement techniques, this technique was one of the most acceptable and preferred techniques for interaction in the area by participants.

9

Advertisement enhancement

9.1 Introduction

Advertisement enhancement is another follow-up study of the previous experiment in which the body interaction was found to be the most attractive and engaging advertisement compared to the other two techniques (Non-interactive and mobile Interactive),

9.2 Advertisement enhanced version

The advertisement interface was exactly the same, but the only change was brought in it was the integration of multiple Kinect cameras to cover the sides of the screen, a person passing from the side could see his self at the side of the screen and when moving to the middle of the screen the camera could smoothly transition the person from side camera to the center camera by having the same silhouette color, physically the cameras are positioned side-by-side therefor there is a small gap for each camera range, which is also not perceivable by passers-by. Refere to chapter 7 for more technical details.

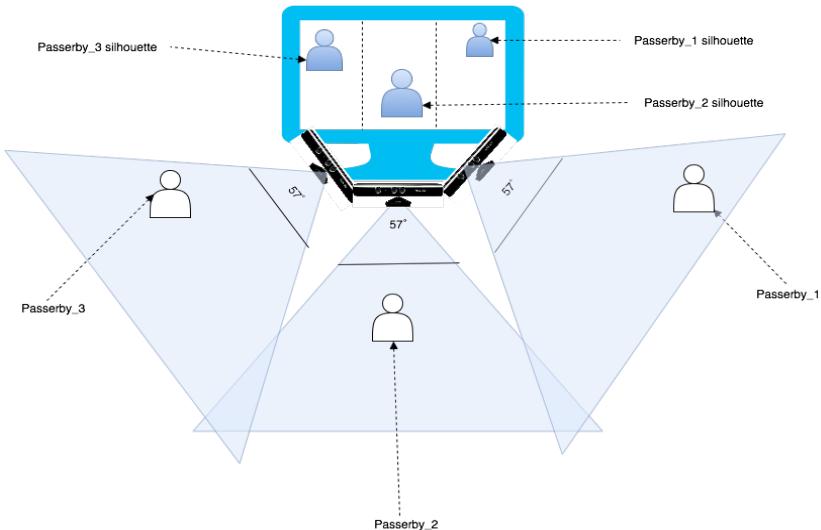


FIGURE 9.1: Advertisement extended version using three Kinect cameras.

9.3 Research question

This experiment was conducted to find out that what are the major effects when the coverage area is expanded in both right and left side of the screen.

1. Would the attention level change?
2. Would the number of engaged passers-by increase?
3. Would the average engagement time rise?
4. Would there be any changes in number of Honeypot and landing effect?
5. What would be other passer-by behavior to the screen?

9.4 Design study

9.4.1 Location

The same location that the last experiment was conducted was chosen again, it was in Weimar tourist information center, It was positioned in the same pathway of passers-by.

9.4.2 Duration

This experiment was conducted only with advertisement's extended version for three continues days; the days were the crowded days of the week (Friday, Saturday, Sunday),

9.4.3 Participants

The participants were from Tourist information center; they were not informed that there is an interactive screen. Most of the participants were of old age, and the rest were middle aged and young aged participants.

9.4.4 Data gathering

The bellow types of data were gathered during three days.

1. On-Site Observation

Observation periods were selected the same as the previous study, from 10:00 – 12:00 and the second was from 14:00 – 16:00, During these two time slots the bellow observations were made.

(a) Attention Level measurement

Number of glances and number of ignores were counted by observing the passers-by from a fixed location, anyone who turned his/her face less than 3 seconds were counted as glance, see the full report of glances in Appendix A.19.1

(b) Passerby behavior

The behaviors of the passers-by were observed by direct observation in onsite and also from the Camera depth recorded frames. From the observation two important effects were taken in consideration (honeypot and landing effect).

2. Colored-image recording

A 2D colored image was taken per second from each of three cameras, and meanwhile were joint together side-by-side and after the image recording was done, in lab another post processing script was applied to integrate a static background using Adobe Photoshop application. To match the data logs and the image frames each image name consisted time as (12.43.21.png). Below three kinect images stacked together, as can be seen that people' colored images rendered on the images (1,2 and 3) these images are stacked together so that the transition of one person be smooth from one camera to the other.

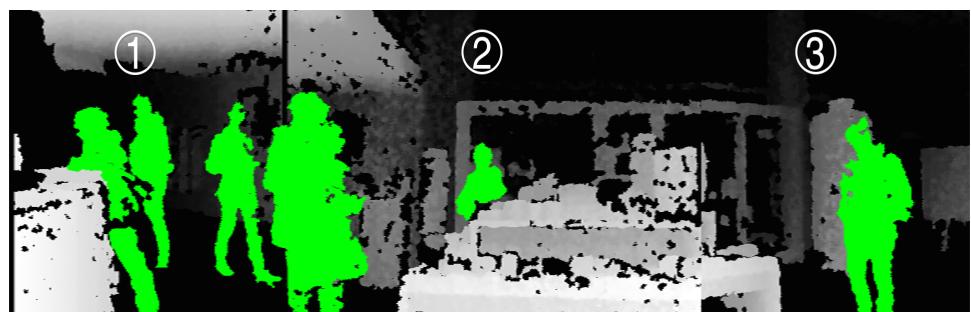


FIGURE 9.2: Three Kinect images

9.5 Findings and results

9.5.1 Attention Level measurements

The bellow chart shows the number of glances and ignore for the following three days.

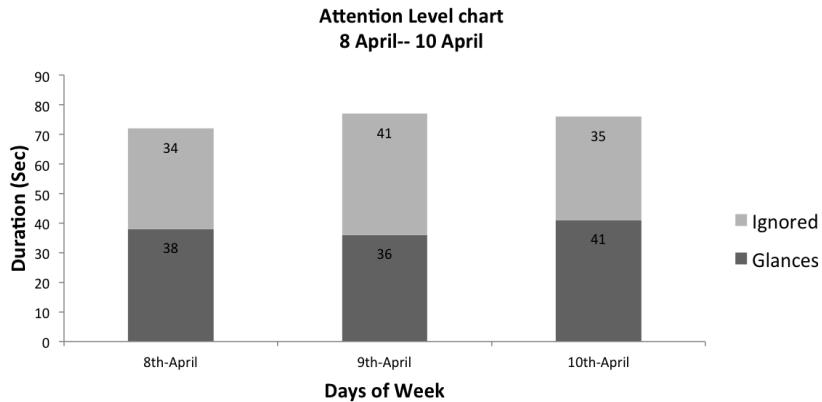


FIGURE 9.3: Attention level chart

As can be seen from the above chart every day has almost similar number of glances and ignores and in average it makes about %51 glances and %49 ignores which is a great difference compared to the previous body interactive advertisement.

Percentage of Glances and Ignores

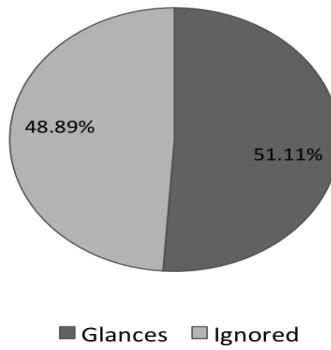


FIGURE 9.4: Attention level percentage

9.5.2 Engagement phases and duration spent

The engagement time for phases were measured from system logs and depth recording manually and in which people spent 16.10 seconds in average for the motivation phase some people took longer and some shorter, and some of them may have left without switching to the rest phases. 16.20 seconds in average was spent for interaction phase, which was different from person to person, and only 3.63 seconds in average was spent for video advertisement.

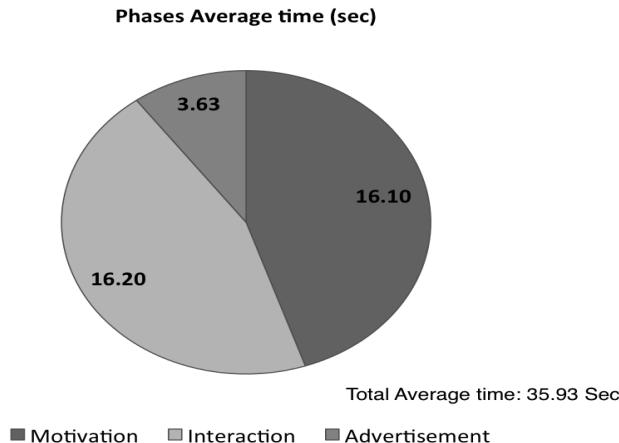


FIGURE 9.5: Average time for each phase

9.5.3 Passerby and engagement

The entire number of passers-by and engaged people were counted manually and people who interacted for more than 3 seconds were flagged as engaged. As shown in the chart below all three days are individually recorded.

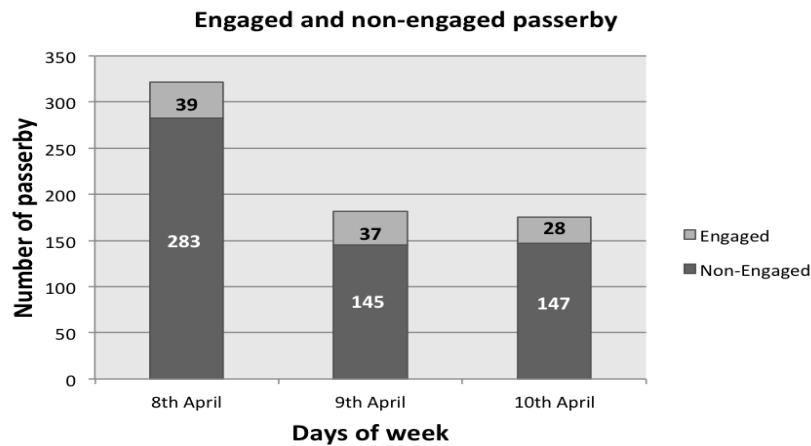


FIGURE 9.6: New body interaction Number of engaged passerby

From entire passers-by %15.32 of them were engaged with the display and the rest might have only glanced or simply ignored.

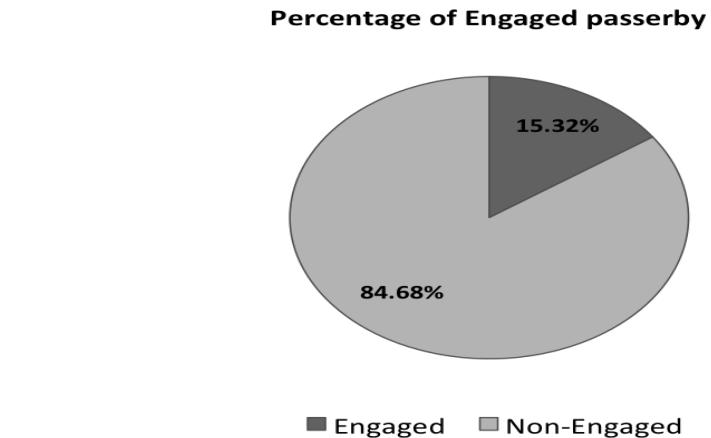


FIGURE 9.7: Percentage of engaged and passers-by

9.5.4 Landing and Honeypot effects

Landing and honeypot effects were observed for this type of technique although the number of days was only for three days.

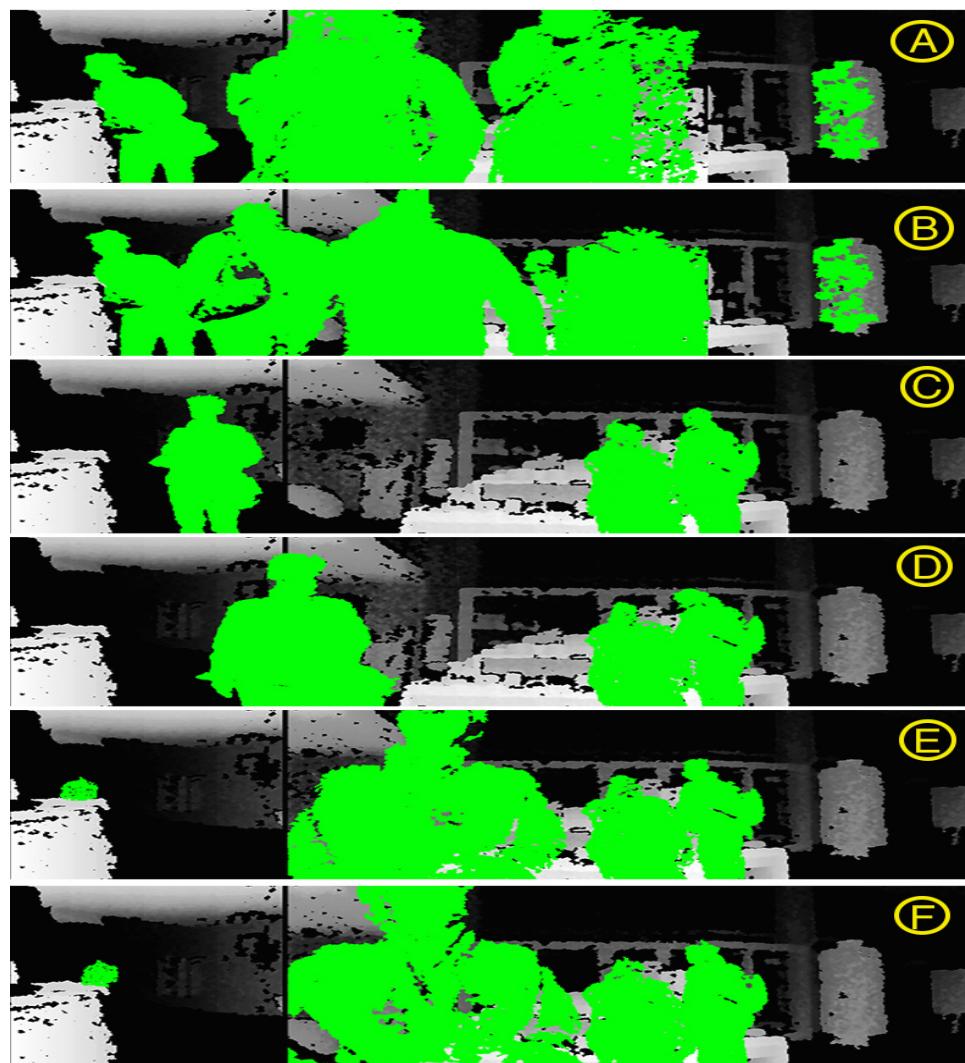


FIGURE 9.8: Honeypot effect

As can be seen from the picture above, in first frame (A) two person in the middle are engaged with the system and a women at the right is busy with the help desk, but she is attracted to the screen and has looked many times in previous frames, in (B) the two guys leave and in Frame (C) that women is left alone and then approaches toward the screen in frame (D and E) and starts actively interaction in frame (F).

Few landing effects has also been happened which were similar like previous some noticed the interactivity in the middle and stopped and moved back toward the screen.

The chart bellow shows the frequencies of landing and honeypot effects.

TABLE 9.1: Landing and honeypot effects

Days	Landing effect	Honeypot effect
8th April	3	3
9th April	2	5
10th April	1	2

9.5.5 Other observations

see Appendix Appendix A.19.2

9.5.6 Comparison with Body interaction

1. Comparison of number of passers-by

To be on safe side that the number of participants were statistically the same the bellow computation has be applied on three similar days, which provides the base for further evaluations.

TABLE 9.2: Number of people for three conditions

Days	Non-Interactive	Body Interactive	Enhanced body Interactive
Day 1	212	259	322
Day 2	209	216	182
Day 3	208	122	175
Total	629	597	679

ANOVA test revealed that there is no statistical significant different between the passers-by in each of the conditions ($(F_{2,3})=0.1449$, $p >.05$ ($p=0.868$))

2. Attention Level comparison

The number of glances and ignores for both body interaction and enhanced body interaction was collected as bellow.

TABLE 9.3: Cross tabulation for each condition attention level

Method	Glanced (%)	Ignored	Total
Body Interactive	106 (%41.40)	150	256
New body Interactive	115 (%51.11)	110	225
Total	221	260	481

As can be seen the new body interactive advertisement has a higher percentage about %51 of the glances compared to the old body interactive advertisement, this means that a rise of %10 the number of glances have been increased. To examine if these have statistically significant difference, the Chi-square test was applied on them and revealed $\chi^2(1, N=481)=4.5413$, $p < .05$ ($p=.033086$) that they are statistically different and the new body attraction technique does have higher effect the attention level.

3. Landing effect comparison

The landing effects were recorded for non-interactive, body interactive and enhanced body interactive in bellow table.

TABLE 9.4: Cross tabulation for each condition Landing effect

Method	Non-Interactive	Body Interactive	Enhanced body Interactive
Day 1	2	2	1
Day 2	0	2	2
Day 3	1	3	3

After conducting ANOVA test, it states that there is no significant different between three days for all of the conditions.

(($F_{2,3}=1.857$, $p >.05$ ($p=0.236$)))

4. Honeypot effect comparison

Honeypot effects were also gathered from those days as bellow in table.

TABLE 9.5: Cross tabulation for each condition Honeypot effect

Method	Non-Interactive	Body Interactive	Enhanced body Interactive
Day 1	2	2	3
Day 2	2	5	5
Day 3	1	3	2

ANOVA reveals that there is also no statistical difference between these conditions.

$$((F2,3)=1.667, p >.05 \ (p=0.266))$$

5. Engaged and Non-engaged passerby

TABLE 9.6: Number of engaged passerby in three weeks

Days	First week	Second week	Third week
Day 1	15	26	39
Day 2	15	20	37
Day 3	15	23	28
Total	45	69	104

9.6 Discussions

9.7 Conclusion

10

Conclusion

10.1 Introduction

10.2 Attention attraction study

10.3 nteraction

10.4 Motivation

10.5 Future work

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A large, stylized, serif capital letter 'A' is positioned at the top right of the page. It is rendered in a dark gray or black color and has a slightly irregular, hand-drawn appearance.**Appendix**

A.1 Glance count sheet

Glance Count sheet

Date:

Location:

Observer:

Hour: minute	
:00	
:05	
:10	
:15	
:20	
:25	
:30	
:35	
:40	
:45	
:50	
:55	
:00	
:05	
:10	
:15	
:20	
:25	
:30	
:35	
:40	
:45	
:50	
:55	

Findings:

	Male	Female
Glances		
Ignored		
Total		

Symbols:

(F) === Female

(FFMM) === Group

(M) === Glanced Male

(M) === Male

(F) === Glanced Female

(FFMM) === Glanced Group

A.2 Consent Form

Date: / /

Bauhaus-Universität Weimar

Human Computer Interaction Questionnaire Consent Form

This is a study of attention attraction toward screen, conducted by **Hasibullah Sahibzada** because of his thesis research on Interactive Advertisement Vs. Traditional Advertisement. The purpose of this study is to help improve advertisement using existing technology. You are being requested to **answer** the questions in the interview and at the same time being **audio recorded** to assist us in the study.

The identities of all people who participate will remain anonymous and will be kept confidential. Identifiable data will be stored securely in a password protected computer account. Your participation is entirely voluntary and you may quite at any time from the study.

Contact Information About the Project

If you have any concerns about your rights as a research subject, you may contact directly Hasibullah Sahibzada at Hasibullah.sahibzada@uni-weimar.de or at phone # 015216967648.

Signature: -----

A.3 Interview Questionnaire

Questionnaire

- 1 Do you like advertisements on the displays?
- 2: Which kind of Advertisement do you like / dislike?
- 3: What is that makes advertisement annoying or Interested for you?
- 4: What do you know about Interactive Advertisement?
- 5: What is your expectation about Interactive Advertisement?
- 6: What attracted you toward the screen?
- 7: What do you think about this type of technique?
- 8: Do you have any recommendations?

Note: **This is an open-ended questionnaire the sequence and questions are no entirely exact.**

A.4 Focus group sketches

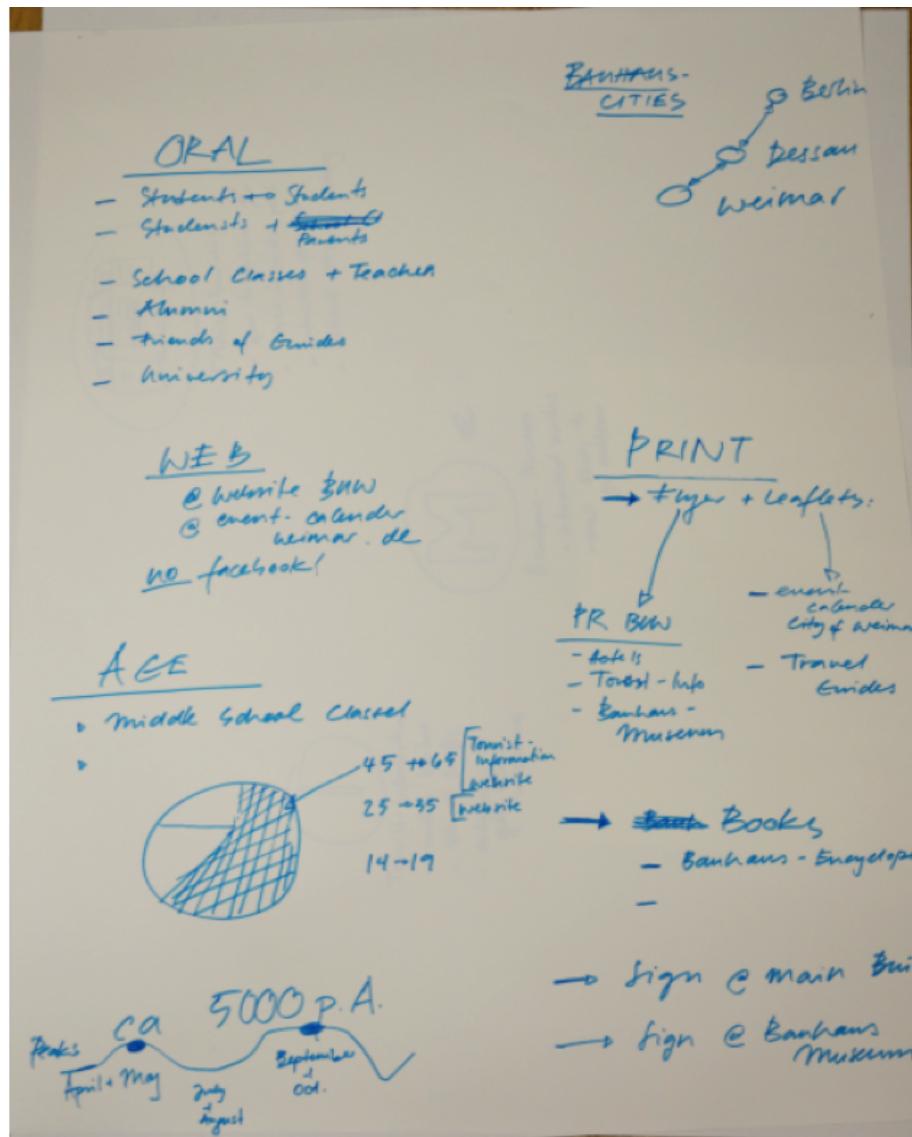


FIGURE A.1: First sketch

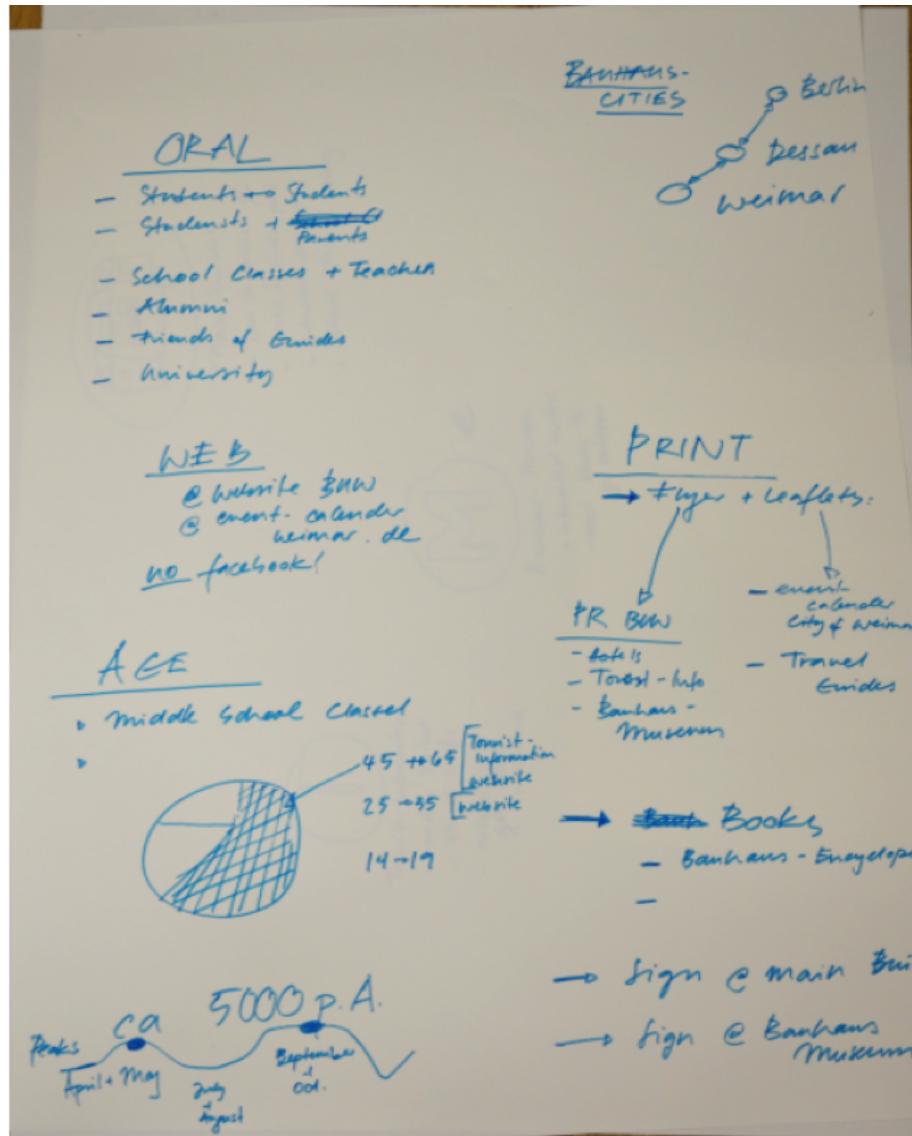


FIGURE A.2: Second sketch

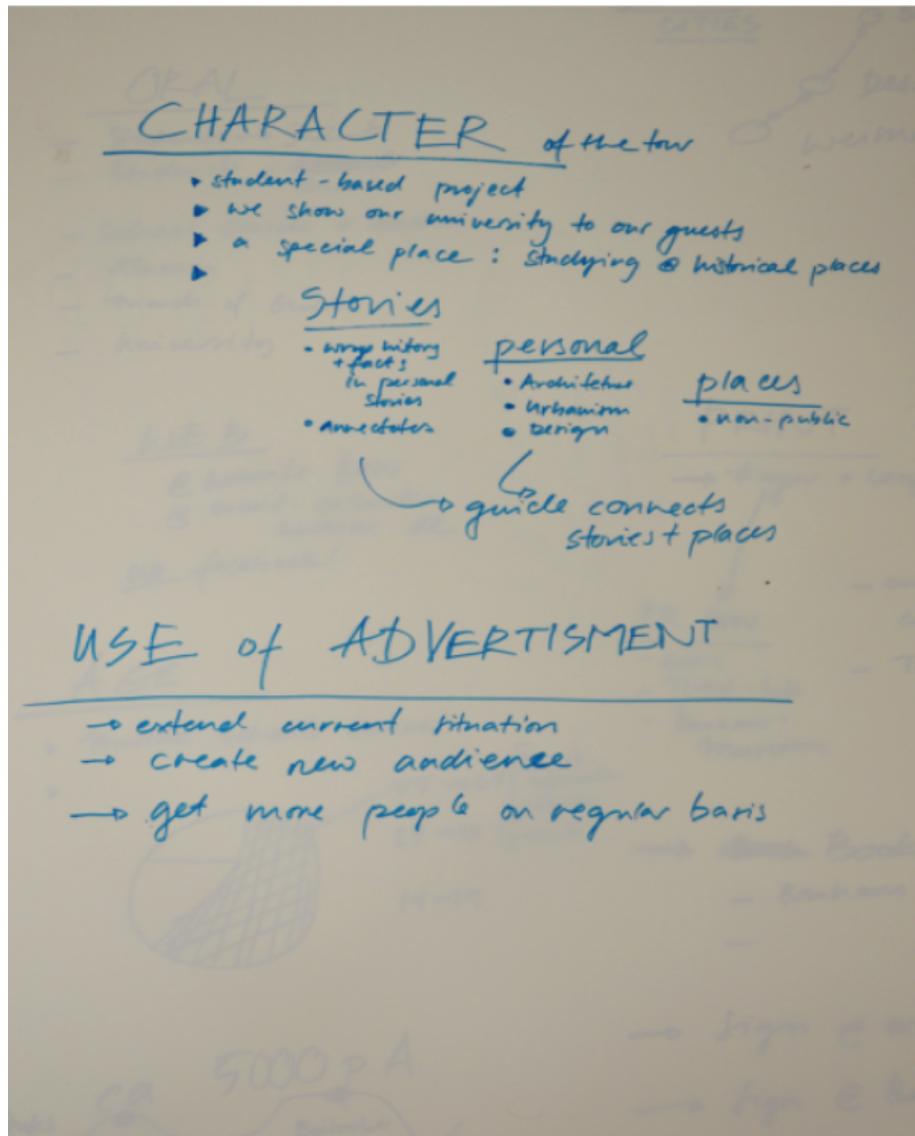


FIGURE A.3: Third sketch

A.5 Low fidelity

A.6 Coded Interviews

	Like	Dislike	Confusing	Recommendations
Body	<ul style="list-style-type: none"> • Physical walking / Moving • Funny. • It is a good technique. • Interesting. • I liked obviously the body interactive prototype. • Easy fun and interesting. • Coming near to screen is a very nice. • Fast and easy. 	<ul style="list-style-type: none"> • Understanding the role or task. • Face was not understandable. • The face was so confusing. • I did not know him 	<ul style="list-style-type: none"> • Face character. • Not really sure what you are making. • But it makes people confused in the sense that if it is you then why not your face. • I did not get that the blue picture. • I did not understand that I am on the screen. • I did not know when I saw myself on the screen. 	<ul style="list-style-type: none"> • Show the route that we can follow • There I should be able to choose then it should show me like house of Goethe. • Change some colors. I do not have any other idea. • There could be instructions for that • If there are more colors and good design for the application would be more attractive,
Mobile	<ul style="list-style-type: none"> • It is good that you visit this place • Interesting. • Mobile was also fine. • I liked the QR code. 	<ul style="list-style-type: none"> • Not enough instructions. • A bit difficult. • Face was not understandable. • Mobile wanted a lot of login to write. • I do not like that the login part, • I do not like the login. • I guess typing the IP address was difficult for me 	<ul style="list-style-type: none"> • I did not understand what to do. • I could not understand what to do with it. • It said visit my houses or locations, but I had no houses. • I did not know how to change the face position. 	<ul style="list-style-type: none"> • It would be also good to show information about the locations I visited. • Some changes you can bring like more information about the houses. • I should not be forced to write my name or other information. The system should automatically get my phone IP address or something else. • I recommend about good fonts and design. • There must be like Do you want to try again after the game is over. • There should be instructions on how to use the face in the mobile.

A.7 Onsite study

A.8 Interview Questionnaire

Non-Interactive questionnaire

(German version)

1. Um was handelte es sich bei der Werbung?
2. Würden Sie am Bauhaus-Spaziergang teilnehmen?
3. Hat Ihnen diese Art der Werbung gefallen? Bitte begründen Sie Ihre Antwort.
4. Haben Sie weitere Anmerkungen oder Verbesserungsvorschläge?

(English version)

1. What was the advertisement about?
2. Would like to take a tour with Bauhaus-Walk program?
3. Did you like this technique of advertisement? Why? Or Why not?
4. Do you have any other feedback and comments?

Body interactive questionnaire

(German version)

1. Haben Sie gesehen sich auf dem Display?
2. Wie haben Sie sich zum ersten Mal gesehen?
3. Um was handelte es sich bei der Werbung?
4. Würden Sie am Bauhaus-Spaziergang teilnehmen?
5. Hat Ihnen diese Art der Werbung gefallen? Bitte begründen Sie Ihre Antwort.
6. Haben Sie weitere Anmerkungen oder Verbesserungsvorschläge?

(English version)

1. Did you see yourself in the screen?
2. How did you see yourself at first time?
3. What was the advertisement about?
4. Do you want to take part in Bauhaus-Walk?
5. Do you like this kind of advertisement?
6. Do you have any other feedback and comments?

Mobile interactive questionnaire

(German version)

1. Um was handelte es sich bei der Werbung?
2. Möchten Sie Ihr Mobiltelefon für die Interaktion zu nutzen, warum / warum nicht?
3. Würden Sie am Bauhaus-Spaziergang teilnehmen?
4. Hat Ihnen diese Art der Werbung gefallen? Bitte begründen Sie Ihre Antwort.
5. Haben Sie weitere Anmerkungen oder Verbesserungsvorschläge?

(English version)

1. What was the advertisement about?
2. Do you like to use your mobile phone for interaction why/why not?
3. Would like to take a tour with Bauhaus-Walk program?
4. Did you like this technique of advertisement? Why? Or Why not?
5. Do you have any other feedback and comments?

A.9 Non-Interactive glance count

Date	Timings	Glance counts				Total			
			M	F	Total		M	F	Total
2-Feb	10:00— 11:00	Glanced	10	7	17	Glanced	12	10	22
		Ignored	13	14	27	Ignored	18	23	41
	14:00— 15:00	Total	23	21	44	Total	30	33	63
		Glanced	2	3	5				
3-Feb	10:00— 11:00	Ignored	5	9	14				
		Total	7	12	19				
	15:00— 16:00	Glanced	2	3	5	Glanced	4	6	10
		Ignored	5	10	15	Ignored	14	27	41
4-Feb	11:00— 12:00	Total	7	13	20	Total	18	33	51
		Glanced	3	1	4	Glanced	9	5	14
	14:00— 15:00	Ignored	10	14	24	Ignored	17	26	43
		Total	13	15	28	Total	26	31	57
5-Feb	11:00— 12:00	Glanced	7	6	13	Glanced	11	14	25
		Ignored	14	16	30	Ignored	34	39	73
	15:00 – 16:00	Total	21	22	43	Total	45	53	98
		Glanced	4	8	12				
6-Feb	10:00— 12:00	Ignored	20	23	43				
		Total	24	31	55				
	11:00— 12:00	Glanced	15	15	30	Glanced	15	15	30
		Ignored	32	38	70	Ignored	32	38	70
7-Feb	11:00— 12:00	Total	47	53	100	Total	47	53	100
		Glanced	11	9	20	Glanced	11	9	20
	11:00— 12:00	Ignored	19	28	47	Ignored	19	28	47
		Total	30	37	67	Total	30	37	67

A.10 Body Interactive glance count

Date	Timings	Glance counts				Total			
		M	F	Total		M	F	Total	
10-Feb	11:00— 12:00	Glanced	8	7	15	Glanced	10	8	18
		Ignored	8	8	16	Ignored	12	14	26
	15:00— 16:00	Total	16	15	31	Total	22	22	44
		Glanced	2	1	3				
11-Feb	10:00— 11:00	Ignored	4	6	10				
		Total	6	7	13	Glanced	13	11	24
	15:00— 16:00	Glanced	7	3	10	Ignored	18	27	45
		Ignored	10	13	23	Total	31	38	69
12-Feb	11:00— 12:00	Total	17	16	33				
		Glanced	4	6	10	Glanced	6	11	17
	14:00— 15:00	Ignored	2	10	12	Ignored	7	22	29
		Total	6	16	22	Total	13	33	46
16-Feb	10:00— 11:00	Glanced	4	9	13				
		Ignored	6	7	13	Glanced	8	12	20
	14:00— 15:00	Total	10	16	26	Ignored	9	15	24
		Glanced	2	5	7	Total	17	27	44
13-Feb	10:00— 11:00	Ignored	5	12	17				
		Total	7	17	24	Glanced	12	11	23
		Glanced	4	3	7	Ignored	11	15	26
		Ignored	3	8	11	Total	23	26	49
14-Feb	10:00— 11:00	Total	7	11	23				
		Glanced	11	15	26	Glanced	7	15	22
		Total	23	26	49	Ignored	12	14	26
		Glanced	19	29	48	Total	19	29	48

A.11 Mobile Interactive glance count

Date	Timings	Glance counts				Total																																			
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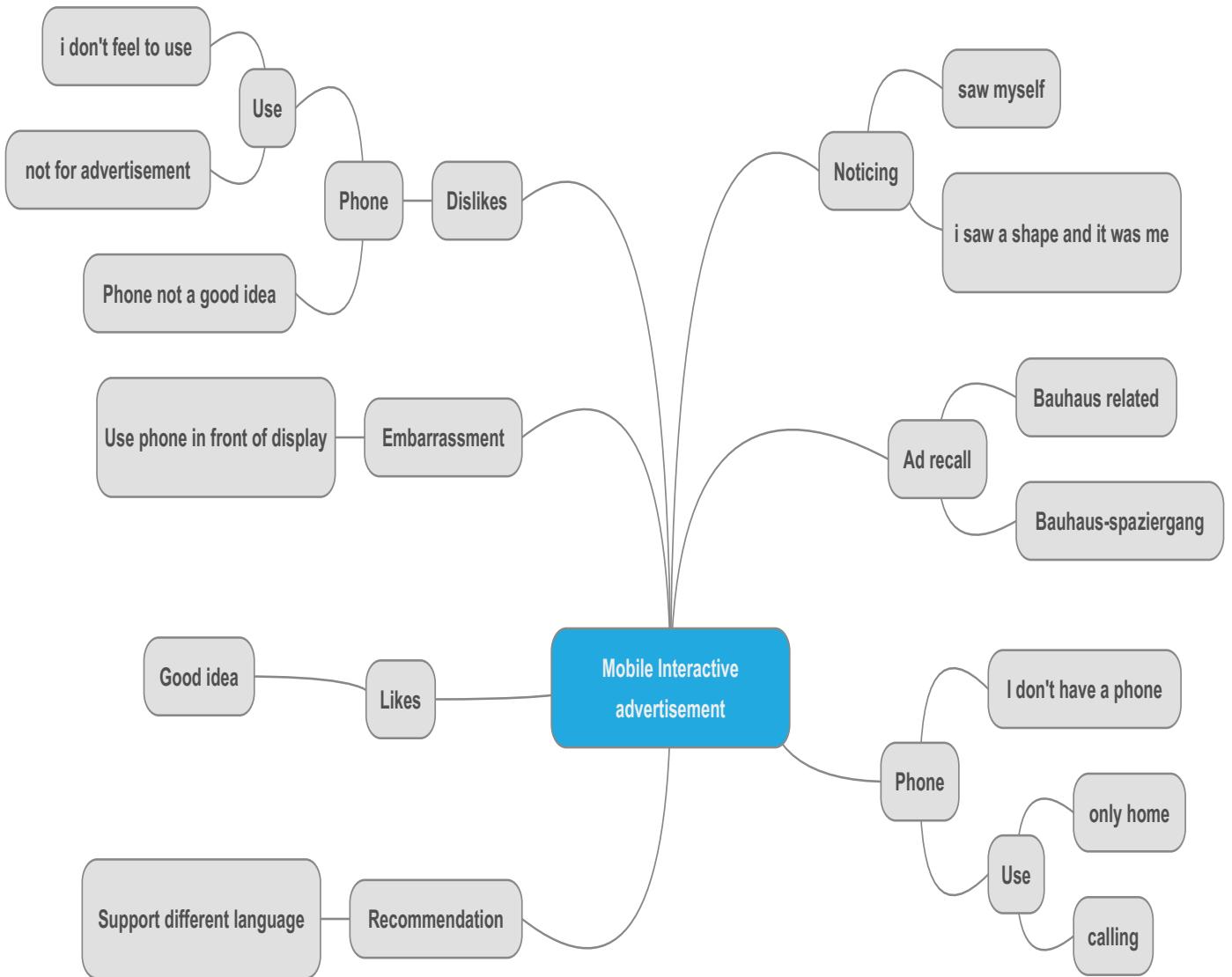
A.12 Non-Interactive interview code



A.13 Body Interactive interview code



A.14 Mobile Interactive interview code



A.15 Non-Interactive observation notes

Date	Notes
1 st Feb	<p>Observations</p> <ul style="list-style-type: none"> • There are many people but no one watch the screen. • 14:20: A man is reading the screen. • The woman waiting long time in desk watched the advertisement once for 10 sec. • 15:36: People do not look at advertisement at all. <p>Comments:</p> <ul style="list-style-type: none"> • People lose interest after some pictures popping up.
2 nd Feb Cloudy	<p>Observations:</p> <ul style="list-style-type: none"> • 10:28: an employee noticed and came back to see the content of advertisement for 4 sec. • A man noticed for 15 sec. • 10:43: A man busy with his phone in front of the screen is waiting for his friend. He started reading the advertisement and came near, he is curious about Kinect Camera. 14 sec • A man is watching screen from information desk location. • 11:21: Two couples saw ad completed two times, the woman asked the man to see the ad. • 14:51: Two people watched the ad two times; they stopped looking when it repeated for the third time. • 12:36: A group read the advertisement. <p>Comments:</p> <ul style="list-style-type: none"> • People look at the interesting objects in front of the screen.
3 rd Feb Cloudy / cold	<p>Observations</p> <ul style="list-style-type: none"> • 14:41: The weather is sunny and a bit warm. • Asked the employee, how many people come per day? She replied that around 100-120 people from which some come to get information and some only see around. • 14:46: an interviewee asked me about the advertisement to give him some more detail, so I showed him the screen. • 15:30: A woman stood with her phone and glanced. She is talking while standing near screen.
4 th Feb weather cloudy cold	<p>Observations</p> <ul style="list-style-type: none"> • 11:14: An employee is standing to see ad for one time complete. She came again to see advertisement she is reading the content. She came to ask me about the price and I approached to take her interview, but she refused to sign in the consent form and she left. • 11:58: A man reads the entire ad and for second time. He approached after talking receptionist again and asked his friend and laughed. • Another man saw the previous man and saw the screen.
5 th Feb Cloudy and warm	<p>Observations</p> <ul style="list-style-type: none"> • 10:52: A woman looked the advertisement for a while (half). • 11:20: A woman saw the ad and pulled her husband to see the ad and kept looking for brochure around. • 11:40: A man came after a while again and fully saw the advertisement. • 11:53: The man saw the ad and came closer to ad and looked for complete and then the friend came also and joint to read for two times. They also asked about ticket from help desk. • 11:51: A man saw ad while her wife was playing the music with handle. • 15:15: An employee first time noticed the advertisement while passing the screen. And then walked back to see the content. • 15:35: A couple see ad and standing to see more about the city from the screen. And later they asked about the Bauhaus Atelier from help desk. <p>Comments</p> <ul style="list-style-type: none"> • Normally people come in couple, ones ask questions from information Desk while the other looks around, and finishes when questions or work is done by the first person. • Today there are many people coming inside. • In front of monitor on the table there is an interactive music player that with handle movement music plays. • People are looking things random and want to find something interesting.
6 th Feb Partially cloudy Warm	<p>Observations</p> <ul style="list-style-type: none"> • Two men want to see map with advertisement. • 10:40: A woman looking at the screen. • 10:58: A man looked the entire ad. <p>Comments</p> <ul style="list-style-type: none"> • Today a lot of people coming inside. • 11:30: The people are less; no one looks to the screen to read.
7 th Feb Warm / cloudy	<p>Observations</p> <ul style="list-style-type: none"> • A man is standing and read the entire ad. • 14:40: People are very less now. <p>Comments</p> <ul style="list-style-type: none"> • People are coming and the center is very crowded. • A lot of people are playing piano with the handle. • People look for brochures.

A.16 Body Interactive observation notes (1)

Date	Notes
10 th Feb Sunny / cold	<p>Observations</p> <ul style="list-style-type: none"> • A boy noticed himself and then showed others that there is a Kinect camera. • 11:44: A man saw himself and starred for a while and moved out. • 14:23: Two office employees passed by screen and saw themselves on the screen and the first woman told and pointed on the screen and showed his partner. • 14:05: I was working in the screen. • 14:27: A man saw the screen but did not perceive even his silhouette was projected on the screen. • 14:47: A man saw himself on the screen, but turned back. • Two couples noticed the screen. • 15:49: The man noticed and ignored <p>Comments:</p> <ul style="list-style-type: none"> • People are very less. • System got overloaded because of the recording silhouette. • The reason people do not notice is because it is at corner of desk and people tend to change their head orientation toward the table, which has items.
11 th Feb Sunny / cold	<p>Observations:</p> <ul style="list-style-type: none"> • 10:15: an employee is arranging books in front of the screen. • 10:22: A woman saw and then ignored to interact. • 10:47: A man noticed and attempted to start the game, but left quickly less than 2 sec and the game could be started. • 10:59: Three young boys saw the Kinect and stood for a while beside the screen, and did not understand how it works because they were out of camera range and Kinect could not project their silhouette. • 11:08: A girl saw herself and then did not approached. • 11:17: A couple noticed themselves from back side of the table in the screen, to confirm if actually they were, they started waving to see the feedback, then both of them came near to screen, the boy started the game by coming more closer and completed one task, but left because he was called by her friend to leave for city tour. • 11:46: A man noticed and then stood in front of the screen but did not proceed to trigger the game, instead he called his child to play. The girl triggered the game but she was standing very close to the screen and camera could not track her, she saw the alert message to raise her hand and so she did, but nothing happened because she was close. Then she tried to touch the screen on the locations that were blinking in the game. But nothing happened she got frustrated and left. • 12:52: Three of the employees tried the system individually, Each had the touch event on the screen. • 14:42: Two people noticed and approached to the screen, but could not open because they were very close to the screen. • 15:10: An employee started the game but did not know how to work because she could not see her silhouette. She started to touch the screen thinking that it is touch.
12 th Feb Sunny / cold	<p>Observations</p> <ul style="list-style-type: none"> • 10:10: A man saw himself but he ignored • 11:26: A child saw her in the screen and moved toward the screen and smiled. • 11:40: Eva Hornecker came; we slightly changed the camera angle toward the entrance. • 14:15: A man standing beside the screen, accidentally triggered the game, because camera was facing to the right side. • A boy is looking the screen from far away • 14:18: The man noticed the screen after he triggered the game accidentally, but then he did not continue and surprisingly came near to the screen and completed a task without noticing. • 14:22: I showed the advertisement for two people that asked me how it works. • 14:36: A man saw the screen and stood for a while and seemed he read the Call-to-Action text but he did not approach and then left the screen. (I wanted to know the reason by taking interview but he did not participate because of the city tour he had at that time.) • 15:16: A girl accidentally triggered the game. • 15:22: An old lady noticed herself in screen and moved a bit to confirm but turned away. • 15:27: A girl noticed herself but did not understand what to do the instruction was not shown because she was beside the screen. <p>Comments</p> <ul style="list-style-type: none"> • Some people see a lot of detail in the posters and brochures and wall in tourist information center.
13 th Feb Sunny / warm	<p>Observations</p> <ul style="list-style-type: none"> • 10:00: The monitor face slightly changed to the entrance. • 10:12: A man approached but was not able to play with the game because he was close enough to the screen. • 10:25: A woman noticed and moved a bit to confirm and left. • 10:27: The above woman saw her again but did not do anything. She was waiting for information desk. • 10:42: Two couples tried to interact, the girl started interacting and the boy kept looking the girl's interaction, the boy left because of a work the girl continued to do a task. And then left. • 10:48: Two boys came to try the application but application crashed. • 11:32: A woman accidentally stood beside table and triggered the game 3 times and left without noticing it. Because the camera and screen are not in right orientation. • 12:00: The screen rotated opposite to the entrance. • Two people noticed and looked at screen but did not approach to play. • 13:15: The system crashed for the second time while I was introducing the system to an employee. <p>Comments</p> <ul style="list-style-type: none"> • People wait at information desk and their first priority is to get their job done, and interaction with the game comes in their least priority. • Path way is a problem for people in order to use the body interaction, because people do not want to block others way by interacting. • Application should not be at side of information desk. People avoid these sides, because they might feel to be noticed or asked questions (may I help you?). • People take much more time looking things on the tables, which is in front of the monitor. • People always try to interact with their hand, like raising their hand that could be also the effect of the alert function.

A.17 Body Interactive observation notes (2)

	<ul style="list-style-type: none"> The employee liked it to be with a keyboard like buttons or different buttons not with body, because body seemed difficult. Use basic elements that could be easy to understand like handle or moving hand, touch or something other.
14 th Feb Cloudy / Rainy and cold	<p>Observations</p> <ul style="list-style-type: none"> 10:03: Very less people coming currently. A person looking at the sides and wall, now interacting with the headphone. 10:17: A woman noticed someone else in the screen from information desk. 10:19: A girl noticed herself others also saw it, and pointed to the screen meanwhile another boy noticed from her pointing and went near to the screen and triggered the game and left because he was called by his friend. 10:22: Two couples played the game, the girl played most of the tasks. 10:24: Another girl did interact when the interaction finished, after a second she left because she lost interest to see the advertisement. 10:25: A man stood to see what is going on but did not interact. 10:30: Weather became cloudy. 10:42: A girl interacted with the screen, but could not play because she was touching the screen. She kept reading and watching the screen. 10:50: A woman triggered the game but did not succeed to play, she understood that she could play with body, but could not because of the space, which was occupied by other person. 11:00: The sun is shining on the Kinect camera, makes it difficult for people detection. 11:33: A girl saw and told to other girl to play with and did two tasks. And the time passed they left. Meanwhile another girl noticed them interacting with the screen. 11:50: A boy noticed himself and wanted to interact, his sister held him up to be visible for the screen, he asked his father to show him how the system works, His sister triggered the game and did two tasks and when got over they left did not completely saw advertisement. 12:00: A man tried to play, his silhouette was projected on the screen, but he did not understand and kept touching screen and when the game time elapsed he left. 12:02: A woman triggered the game. She had tried it before with her daughter too she saw the advertisement too. 12:07: The employee was curious and tried to trigger but did not do it and saw me. 12:10: A woman noticed the screen, but did not approach the screen, and she turned back. 13:55: A man came near and triggered the game and did one task but did not continue then left with his two kids. <p>Comments</p> <ul style="list-style-type: none"> The instruction while playing the game should be visible and clear; the time for game instruction is not enough. Attraction and engagement rate is higher but people take less time to see the entire ad.
15 th Feb Partially cloudy Warm	<p>Observations</p> <ul style="list-style-type: none"> 11:43: A man saw himself stood and then left. 14:18: A woman approached to screen but did not understand what to do she was touching the screen. 14:35: A man noticed the screen, triggered the game and explored some locations by moving his body, but was not interested and left with his two kids. 15:17: An old woman noticed herself and pointed for her husband and read the Call-to-Action but she did not approached and laughed. <p>Observations</p> <ul style="list-style-type: none"> 10:05: A group of students noticed and then explored locations, a participant tried to lean down to reach to the objects then she learnt by moving her body. Another group saw the first group and came to check out what is going on. This group just played with the body silhouette. 10:22: A woman saw her in the screen. 10:42: A man tried 4 times to get to know the functionality of the system and now he is trying again. 10:57: A girl saw herself but did not come in center to Call-to-Action be triggered. 11:40: A boy noticed himself and looked strange on the screen. 11:42: Another group noticed and triggered the game. A boy triggered the game and did two tasks but his mother was angry on him and did not allow him to play. 15:53: Two boys noticed, triggered and explored the game and saw the advertisement. The above boy's father also noticed and was looking to the boys interaction. <p>Comments</p> <ul style="list-style-type: none"> With small sized screen, it is good not to show a whole group because they do not seem to fit in the screen and physical area. May be show a circle like alert around small silhouette while playing to drag user attention two or three times. Alert participants to move back if they are very near to the screen.
16 th Feb Cloudy / cold	

A.18 Mobile Interactive observation notes

Date	Notes
17 th Feb	<p>Observations:</p> <ul style="list-style-type: none"> • 10:47: A man saw by waving his hand but did not continue to approach. • 10:51: Another man also saw the screen and his silhouette too. • 11:29: A woman noticed her but did not do anything, probably because of the phone. • 11:30: Another woman notice again but did not approach. • 14:03: A kid saw her and then her mother noticed that they are playing with their image. • 14:50: The employees are arranging the books on the table. • 15:00: No one has played with the advertisement until now. <p>Comments:</p> <ul style="list-style-type: none"> • Because of the books and other items on the table people look down most of the time, which drives their attention away from other things, placed up (screen). • I approached to a person for an interview but he denied and said I do not have any idea how it works. • Most old people do not have a phone, or if they have one, they do not know the functionality to use. • The mobile is a big restriction for old aged and youngsters for interaction.
18 th Feb	<p>Observations:</p> <ul style="list-style-type: none"> • 10:00: Screen orientation changed toward entrance. • 11:56: A man glanced two times (1st non-intentionally, 2nd time intentionally). • 14:00: Screen orientation changed opposite to entrance. • 14:05: Man saw himself when turned him self from front table. But did not interact.. <p>Comments:</p> <ul style="list-style-type: none"> • For mobile maybe people do not prefer to stand and interact, It is better to give people enough time somewhere to sit and make decision to interact with their phones. • It does not make sense interacting with their phones while the monitor is at their hand reach. • Mobile phones should be used for far hand reach and big screens or projection wall. • Because of amount of less people, very less glances were observed and no one has interacted with advertisement.
19 th Feb	<p>Observations:</p> <ul style="list-style-type: none"> • 10:00: Monitor positioned back to its original position. • A woman noticed the screen, and read the information text on the screen, but could not interact because she had an old Nokia phone, which was not compatible to operate. She was one of the guide tour who had seen the body interaction too. • 14:00: I interacted with the advertisement many times to drag people attention and the usage and give them some sort of encouragement. • 14:35: I played once again while 4 people were standing behind me. <p>Comments:</p> <ul style="list-style-type: none"> • Mobile phone takes longer time to operate. • Less glances made to the screen, maybe because of the access information text rendered on top, which blocks full silhouette representation. • In tourist information people tend to get information as quick as possible; to restrict the advertisement with mobile phone, which consumes time, would not be a good choice. • Mobile interaction is very private to one person and does not drive others attention toward the people interacting.
20 th Feb	<p>Observations:</p> <ul style="list-style-type: none"> • 10:05: A boy noticed and took his phone out and scanned the QR-Code but his mother called him and left. • 10:25: A girl and a boy are seeing their body and having fun many times, just playing with their silhouette. Which drove their mothers attention too. • 10:45: I played in crowd and some of the people around noticed, but no interaction happened. • 11:00: Many children are playing with the screen using body and jumping up and down. • 11:35: A man waved on to the screen and came near to the screen, after reading the information text he left. • 13:15: Two people discuss on the application, they are curious about it. <p>Comments</p> <ul style="list-style-type: none"> • Do a survey for mobile usage in public displays in places like tourist information center.
21 th Feb	<p>Observations</p> <ul style="list-style-type: none"> • 10:00: The screen height got reduced and the screen and Kinect is facing diagonal. • 10:46: A man saw the screen for 3 seconds but did not play. • 10:48: Another man also noticed but did not approached to play. <p>Comments</p> <ul style="list-style-type: none"> • The diagonal setup of the monitor suites where people see things facing down on the table.

A.19 New body interactive study

A.20 Enhanced Interactive advertisement Glance count

Date	Timings	Glance counts	Total																																
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A.21 Enhanced Interactive observation notes

Date	Notes
8 th April Sunny /cloudy	<p>Observations:</p> <ul style="list-style-type: none"> • 9:56: A man tried to trigger the game, he really liked the system and he played two times, and he later explained to other of his friends. • 10:00: A woman is playing, and her husband is standing behind to see her playing. • 10:31: A man triggered the game, and played the game. • 11:08: The man triggered the game and when advertisement came, he left. • 11:11: A man accidentally triggered the game. • 11:13: Two girls noticed the screen and are playing together, they were having fun and stop seeing ad. • 11:33: Two couples noticed themselves from the corner and then started the game and played. • 11:48: Man triggered the game and is now playing, after that his wife came to interact too. • 14:19: A man saw and triggered the game. • 14:26: Old people ignored the screen the woman saw herself and then ignored the screen. • 14:45: Two groups started the game, but could not play because they were very near and they started touching the screen. • 14:48: Two people played, the woman cloud not but the man did play two or three tasks, he came again when ad finished to play it was interesting for him and then he came for the third time. • 14:55: The woman saw from the information desk. • 15:08: A man played and after sometimes, he realized that all his friends have left. He was so immersed. <p>Comments:</p> <ul style="list-style-type: none"> • If people are more targeted to a direction or work, then there is very little glance, but if they are looking around in the center then there is possibility of glancing toward the screen. • Most young audience interacts with the screen. • The interaction is memorable, a girl who had already interacted with the system came again and saw the screen and did another interaction. • Participants come very near and cannot see their silhouette. • People tend to bend to navigate back and they learn after they move a bit.
9 th April Sunny	<p>Observations:</p> <ul style="list-style-type: none"> • 10:17: A woman triggered the game while a man standing beside the screen. • 10:21: A man played with the game, but left it after a while. • 10:28: A boy noticed and brought his parents to play. • 10:30: The boy is playing and while standing a man noticed himself. • 11:32: The man called his wife to see the screen. • 10:34: A couple was waiting and saw themselves. • 10:36: A woman saw herself from far and then ignored the screen. • 10:51: A man triggered the game and he was standing very near, and he starting to touch the screen and he felt bad. • 11:03: A man triggered the game and called his friends too, they left when they saw the advertisement.
19 th April Sunny	<p>Observations</p> <ul style="list-style-type: none"> • The man is looking a lot now he started the game and he is not moving to play the game. <p>Comments</p> <ul style="list-style-type: none"> • Some participants only stare the screen and not doing any physical activity like moving even the silhouette is projected on the screen. They think a lot and when nothing happens suddenly the move away and do not see the screen afterward. • I guess the people that stand still and think could actually reading the map contents.

A.22 Hi-Fi

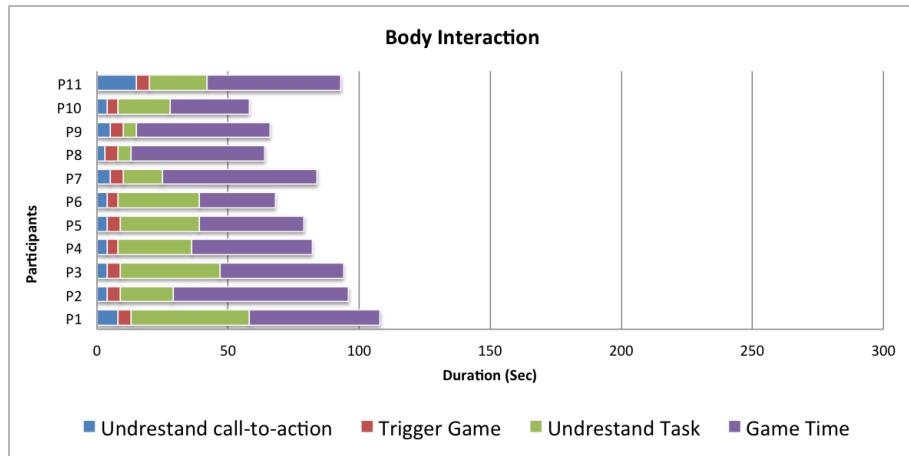


FIGURE A.1: Pariticipant's body performance

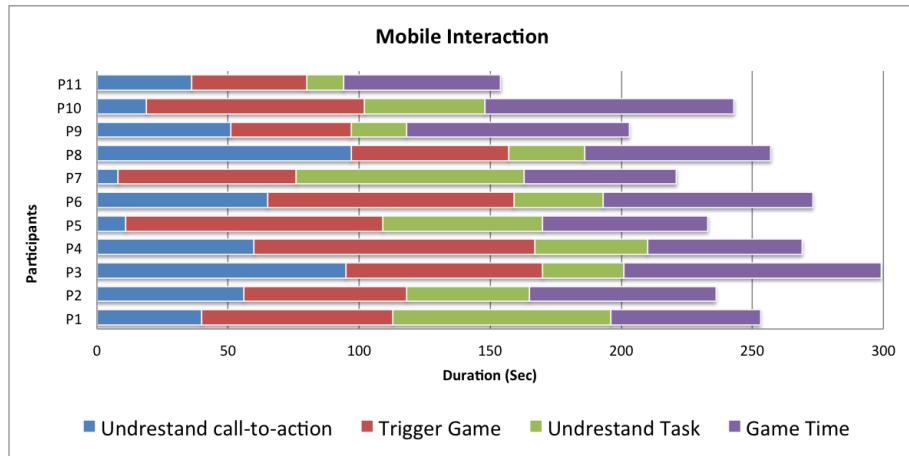


FIGURE A.2: Pariticipant's mobile performance