

Bauhaus-Universität Weimar
Faculty of Media
Degree Program Computer Science and Media

Can't Touch This - A Prototype for Public Pointing Interaction

Master Thesis

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Date of Submission: 2nd December 2014

Abstract

Museums can be perceived as old fashioned. Potential audiences therefore often do not consider visiting one for themselves. Nevertheless, there are many modern and open minded ones, which are willing to experiment with new possibilities, to get rid of their dusted reputation and to evolve.

In order to increase interactive potential of exhibits behind glass, I implemented a novel information interaction system for a museum of pre- and protohistoric history. The challenge was not only to develop a working, intuitive prototype, but also consider low maintenance and robustness for everyday use. The system I developed employs the natural behavior of visitors by detecting potential users and enabling them to interact with the system via pointing gestures. Additionally, the museum personnel can easily set up and maintain the system themselves.

Interaction of the system is initiated automatically with a visitor walking up to the installation. No additional devices on the users side are required, they only need to point at one of the interactive exhibits inside the showcase. The system then determines which exhibit is addressed and displays corresponding information in the form of explanatory texts and detailed images on a screen.

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Abbreviations

| | |
|----------------|---------------------------------------|
| IMI | Interactive Museum Installation |
| MS | Microsoft |
| RFID | Radio-Frequency Identification |
| FSD | Functional Specification Document |
| MIT | Massachusetts Institute of Technology |
| SDMS | Spacial Data-Management System |
| WYSIWYG | ”What you see is what you get” |
| GUI | Graphical User Interface |
| SUI | Single-User Interface |
| MUI | Multi-User Interface |
| HCI | Human Computer-Interaction |
| TUI | Tangible User Interface |
| VR | Virtual Reality |
| 3D | three-dimensional |
| HMD | head-mounted display |
| DOF | degrees of freedom |
| AR | Augmented Reality |
| SDK | Software Development Kit |
| CAVE | Cave Automatic Virtual Environment |

| | |
|-------------|----------------------------------|
| 2D | two-dimensional |
| BCI | Brain-Computer Interface |
| MVT | Museumsverband Thüringen |
| HDD | Hard Disk Drive |
| PDLC | Polymer Dispersed Liquid Crystal |
| IR | infra-red |
| FUBI | Full Body Interaction |
| UI | User Interface |
| wpm | words per minute |
| cpm | characters per minute |
| IV | Independent Variable |
| SD | Standard Deviation |
| ID | Identificator |
| AOA | Area of Affinity |
| LOS | Length of Stay |
| n/s | not specified |
| SUS | Standard Usability Scale |

1 Partnering process

The very first step after having the idea of introducing a new way for information to be retrieved in public places was to find a partner to realize it with. In order to find the most promising and suitable cooperation, appropriate properties would have to be defined and considered for each institution before partnering with any of them. Afterward, a suitable exhibit and an agreement on a design for the installation would be found.

1.1 Requirement analysis

To determine an ideal partner for a cooperation, a mutual beneficial system of needs and demands had to be established. Therefore, each party's needs and offerings were identified. As Table 1.1 shows, three major criteria were determined. Possible cooperations would be based on those criteria. In addition, special characteristics would be considered as well.

| | Museum | Me |
|-----------|--------------------------|---|
| Needs | Improvement / Innovation | Access to a public space with exhibits and visitors |
| | New group of visitors | Authentic content |
| | Publicity / Awareness | Potential test subjects |
| Offerings | A public space | Technological expertise |
| | Factual expertise | Development and testing |
| | Resources | Motivation |

Table 1.1: Needs and Demand.

Museums want to get people interested in their respective topics. Thus, reaching more people and raising awareness is one of their main interests. A good way to attract new groups of visitors is to offer something unique and innovative. Although there are

companies offering services like guide- or information-systems, they are either cosmetic, expensive or high-maintenance. On the other hand, a museum has valuable offerings. Usually, they have a budget for renovation and improvements. The staff is highly skilled and experienced concerning the exhibits and visitors' behavior around them. Finally, a museum offers a public space, where a system can be tested under natural conditions. The Bauhaus-Universität and specifically the chair for Human Computer-Interaction (HCI) as well as myself wanted the final system to work in a real-life environment, but not as a lab-study alone. Hence, we needed access to a public place in order to reach a broad variety of people. Those would be unbiased toward the nature of interaction and content as well. Meanwhile, we could provide our knowledge of interaction design and the suitability of contemplable technologies. And lastly, I was highly motivated to develop a working system.

After finding a cooperation partner, a Functional Specification Document (FSD) would be made, which includes the system's properties ordered by necessity. In addition, a contract between all parties would be drawn up to register each party's contributions and obligations.

1.2 Potential partner museums

According to Museumsverband Thüringen (MVT) [1] there are more than 50 museums in Weimar within a few kilometers distance from the town. Table 1.2 only shows museums registered at the MVT and the three towns with the most of them. Other towns have between one and six registered museums. Further, it is most likely that there are more museums than those in this list. It provides a good starting point, though.

| Town | Museums |
|-------------|----------------|
| Weimar | 26 |
| Erfurt | 12 |
| Jena | 12 |

Table 1.2: Museums in and around Weimar.

Regarding the high amount of museums in Weimar alone, it seemed promising to start looking for a suitable cooperation partner right here. Since 26 museums are too many

to investigate thoroughly, a preselection had to be made. In the first step, the focus was on flexibility. This meant, only a small administrative apparatus could guarantee fast decisions and less organizational meetings with boards and other decision makers. Hence, all the *Klassikstiftung*'s museums were crossed of the list, narrowing it down to only 10 remaining candidates. Next, and after some further research, museums with less interesting topics or inconvenient concepts were withdrawn. This included the tiny *umbrella museum* and *Weimar Haus*, a place gluttoned with animatronics. Afterward, the list of candidates was down to five (see Table 1.3). A personal visit to each of these museums was indispensable now.

Museum

Deutsches Bienenmuseum
 Kirms-Krakow-Haus
 Museum für Ur- und Frühgeschichte Thüringens
 Palais Schardt
 Pavillon Presse

Table 1.3: Remaining cooperation candidates.

Gathering impressions in person was a process of three stages. In the first stage, I would visit a museum and noted its technical and pedagogical equipment. This was directly followed by the next stage, an informal introduction to some of the staff containing a chat about my plans and the respective person's attitude towards them. The final stage was a formal introduction-meeting between my professor, me and the administrative staff of each museum, that had expressed serious interest. This serious interest wasn't shown by the Kirms-Krakow-Haus and the Pavillon Presse. Hence, the aforementioned meeting only took place at the Deutsche Bienenmuseum, Museum für Ur- und Frühgeschichte Thüringens and Palais Schardt. We introduced ourselves at each venue, because a discussion about what might be done was more efficient directly on site.

1.3 Decision for a partner museum

A formal introduction-meeting went as follows: First, I explained some of my previous projects, related installations in other museums and the general intent of the professor's chair. Next, the staff explained their museum's concept and which subject area they

would like to emphasize. After that, we discussed potential concepts. Those ranged from augmentations of existing exhibits to completely new installations.

Deutsches Bienenmuseum The museum is run by the beekeepers association of Thuringia. The staff we encountered was very skilled with the craft of beekeeping, but less professional concerning museum education and design. A part of the exhibition of the museum is shown in Figure 1.1. They listened to my remarks and we had an inspiring discussion about potential topics and their feasibility. Unfortunately, the association's chairman and we could not agree on a specific project. Also, because bees hibernate, visitor attendances are seasonal and also fluctuant. Hence, the Deutsche Bienenmuseum was out of the picture.



Figure 1.1: Impressions of the Deutsche Bienenmuseum.

Palais Schardt The venue is owned by a family, which exhibits multiple collections of art and crafts as well as the building itself. In addition, they operate a cafe and use the adjacent hall for events. The husband is a restorer by trade and gives talks about the building and its historic significance, while his wife handles planning and the cafe. The Goethepavillon shown in Figure 1.2 is the highlight of the venue.



Figure 1.2: Impressions of the Goethepavillon at Palais Schardt.

Further, events at the ball room are regular, and the cafe supplies the venue with casual customers and visitors. Both owners were very interested in a cooperation and had some ideas for installations. But monument protection of the building and minor financial issues complicated the feasibility. Therefore, Palais Schardt also had to go.

Museum für Ur- und Frühgeschichte Thüringens Since the state office for preservation of historical monuments and archeology of Thuringia is the bearer of the museum, all personnel is very competent at their field of work. In addition, the museum employs special staff, that maintains the exhibition, gives tours and is present for arising topical questions during opening hours. Classes of 5th and 6th grade visit regularly for field trips as well as visitors from all age groups. The exhibition was already altered by several media installations. Moreover, the director was very enthusiastic from the first meeting on and had several ideas, of which exhibits to emphasize.



Figure 1.3: Impressions of the Museum für Ur- und Frühgeschichte Thüringens.

Summarizing, the Deutsche Bienenmuseum and Palais Schardt were deemed less interesting and lacking feasibility. The Museum für Ur- und Frühgeschichte Thüringens was chosen as the cooperation partner, because it checked the most boxes of the previous Requirement Analysis (see Chapter 1.1), while the others lacked at least once in the *Needs- or Offerings*-category. It was the most professional and ambitious candidate with promising resources and conditions.

Bibliography

- [1] Thüringer Museumsverband. Liste der Museen in Thüringen. <http://www.museumsverband-thueringen.de/museumsverband/museen/orte.html>, August 2014.