

# Guiding visitors in museums with calm interactions

Stéphanie Rey

Univ. Bordeaux, ESTIA Institute of Technology, LaBRI, UMR 5800, Berger-Levrault, Toulouse, France,  
stephanie.rey@berger-levrault.com

Anke M. Brock

ENAC, University Toulouse, France, anke.brock@enac.fr

Christophe Bortolaso, Mustapha Derras

Berger-Levrault, Toulouse, France, FirstName.LastName@berger-levrault.com

Nadine Couture

Univ. Bordeaux, ESTIA Institute of Technology, LaBRI, UMR 5800, Bidart, France, n.couture@estia.fr

## ABSTRACT

We present two design solutions and an experimental platform that highlight the benefits of tangible interfaces in guiding visitors in museums while ensuring a better distribution of their attention between the exhibition and the guidance. We explore the use of the interaction-attention continuum of Bakker et al. to design interfaces that allow the visitor to regulate his attention at different times of the visit. The Visiting Stick draws on the walking habits and the Marauder's Brochure extends the use of a recurring museum object, the visit brochure, by augmenting it with a dynamic display and various tactile and kinesthetic modalities. We have thus designed and built a physical experimental platform using several sensory channels: visual, audio and haptic (using heat, vibration and change of shape) to guide visitors. This platform will allow us in future work to compare the different modalities and their combination for guiding in the museum.

## CCS CONCEPTS

• **Human-centered computing~Interface design prototyping** • *Human-centered computing~Interaction devices* • *Applied computing~Arts and humanities*

## KEYWORDS

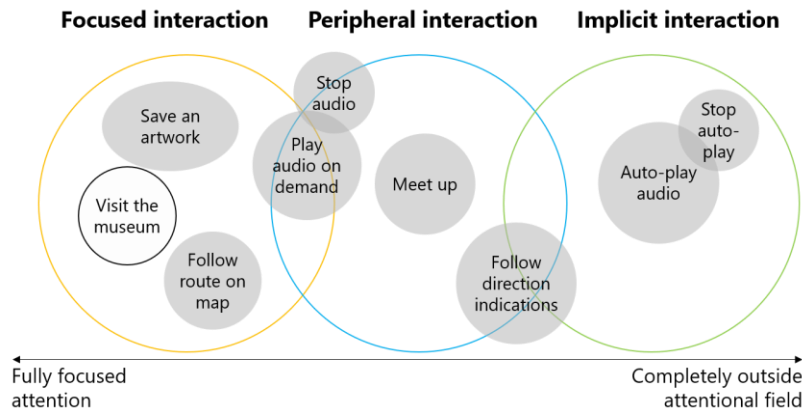
Tangible Interaction; Calm technology; Interaction-Attention continuum; Museum; Guiding

## 1 Introduction and State of the Art Analysis

How to guide a visitor or a group of visitors during a visit to a museum without overriding their sensory experience of the museum and diverting their attention from the exhibits? The challenge is to complete the physical space of the museum and to superimpose information on the existing without occulting the artworks or the architecture of the space. Mobile technologies such as smartphone applications or multimedia guides distract the attention from the environment and cut visitors off from the content presented [7]. This is in line with Weiser and Brown's reflections on "calm technology" and the need for ubiquitous computing to blend into everyday life by operating at the periphery of attention [15]. Calm technology enables a simple shift from central to peripheral attention and vice versa and enriches the periphery with informative details that lower the user's cognitive load [15]. TUIs are particularly appropriate for peripheral interactions since tangible elements are usually directly accessible (unlike a smartphone that needs to be unlocked), require less visual attention, and allow for consistent interactions along the *interaction-attention* continuum [2]. We therefore explore the contributions of tangible interactions for guiding visitors in museums.

Since the 80s, museums have been offering digital mobile tools to guide visitors and provide them cultural interpretation content besides traditional guided tours. These tools have evolved from simple audio content to rich interactive multimedia applications that can provide location-based information. Visitors can thus be guided in real time according to the narrative flow [9] or use an interactive map to self-orientate [10]. We

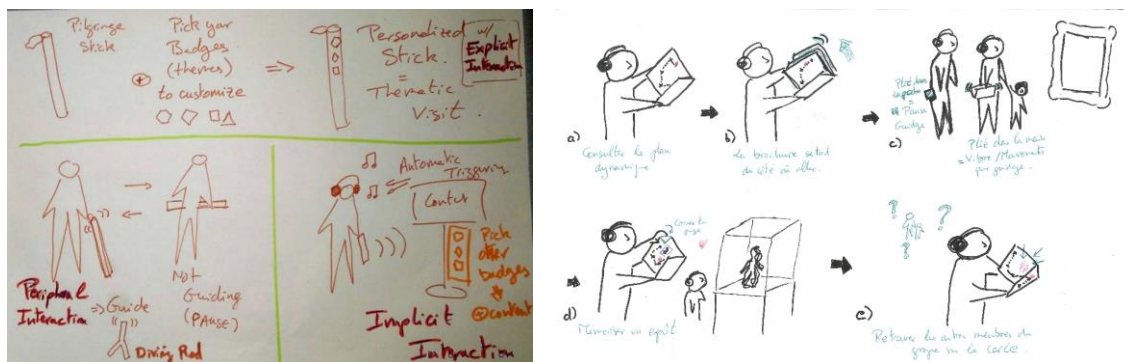
have classified the different features of a guiding tool, identified from the related work, according to the *interaction-attention* continuum<sup>1</sup> [2] depending on the level of attention required and the precision of the associated interactions (Figure 1). We chose to also include a very general need to “visit the museum” in the focused interactions, in order to keep in mind that the visiting experience is paramount.



**Figure 1: Distribution of a guiding tool features along the interaction-attention continuum of Baker et al.**

We have also identified a set of constraints and requirements to consider when designing guiding tools, in addition to visitor attention management. Thus, the visiting device must not hinder the visitor in his interaction with the museum's devices or be too heavy [11]. Social interaction is also essential in a museum visit [6], the design of a visitor support system should therefore take into account group interactions, in order to avoid isolating the visitor [14]. The devices should also allow visitors to separate and rejoin according to their wishes and the times of the visit [3]. In recent years, the widespread adoption of tablets and smartphones has led museums to adopt the "Bring Your Own Device" policy. However, Petrelli et al. have shown that visitors might prefer a museum-specific device, a tangible interface designed specifically for the exhibition [8]. We therefore explored tangible design solutions to guide visitors through the museum based on the requirements and needs listed above. We have studied two metaphors to guide visitors. The first one explores the walking, while the second one focuses on the museum context and the tour brochures.

## 2 Visiting Stick and Marauder’s Brochure



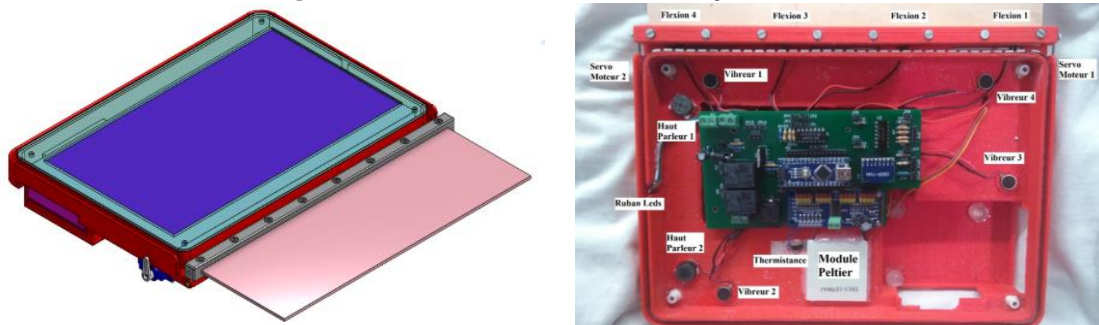
**Figure 2: Two solutions to guide museum visitors. Left the Visiting Stick and right the Marauder’s Brochure.**

**Visiting stick:** When arriving at the museum, the visitor is equipped with a Visiting Stick and headphones and chooses (*explicit interaction*) to attach badges corresponding to his visiting preferences (Figure 2). As he walks through the museum, the stick vibrates to show him the direction to follow, like a divining rod.

<sup>1</sup> Bakker and Niemantsverdriet extend the notion of peripheral interaction to take into account the entire interaction-attention continuum from focused to peripheral to implicit interactions.[2].

Depending on the way he holds the stick, it is active (vertical, end in the hand) or in pause (horizontal, held by the middle). Changing between modes is thus done through a *peripheral interaction* that does not capture the visitor's attention. When approaching a point of interest, multimedia content customized according to the badges on his stick is automatically triggered (*implicit interaction*). The visitor can add badges on his stick at each kiosk to deepen a subject or choose another theme. This first design solution harnesses interactions known to all walkers with an object that enables the whole interaction-attention continuum to be explored. However, the social aspect is not addressed, since the solution was designed for a single visitor. The stick fills one hand but can reduce visitor fatigue by allowing him to lean on it.

**The Marauder's Brochure:** For this second design, we were inspired by an already existing object to guide visitors: the brochure distributed at the reception desk. It allows visitors to understand the museum's organization, to find objects of interest and has several advantages: it is compact, several people can look at it together and it folds up to be stored in a pocket. In order to extend the functionality of this object to meet the needs, we were inspired by a popular culture artifact that “magically enhances” a paper map: the Harry Potter's “Marauder's Map”™. When visitors arrive at the museum, they pick up paired Marauder Brochures that contain the visit. The Brochure provides an overview of the itinerary (*explicit interaction*). Visitors can then follow the visit by consulting the map dynamically updated with their position. Each user can fold the Brochure to hold it in his hand, which then bends in the direction to follow. He can also place it in his pocket, which pauses the guidance. Switching between these different modes – precise center-of-attention guidance, imprecise peripheral guidance, and pausing without attention – is achieved through simple *peripheral interactions* consistent with the metaphor of a paper sheet. When arriving in front of a point of interest, the audio content is automatically triggered (*implicit interaction*) and the visitor can bookmark the artwork by cornering the Brochure (*explicit interaction*). If the group splits up, each visitor can see where the others are on the unfolded Brochure (*explicit interaction*) to decide whether to join them or take their time.



**Figure 3: Experimental platform for the Marauder's Brochure.**

From a technological point of view, this prototype is inspired by work on flexible, deformable and foldable electronic ink screens [13] and shape-changing surfaces [5]. We have built an experimental platform that uses as output the visual channel (precisely via a screen and more loosely with light signals) the haptic channel with vibrations, movements and temperature changes, and the auditory channel with sound signals. In input it detects the surface deformation, as well as the movements and changes of orientation of the user. For cost reasons and simplicity of integration, this first version was made from a touch tablet incorporated in a 3D printed box, where only a part is flexible and mobile (Figure 3).

### 3 Prospect

In the next steps, we plan to consolidate the experimental platform and to experiment between the different modes of interaction envisioned. This first prototype will thus allow us to compare different guiding modes: by temperature (“hot/cold” game), vibration (patterns or localization), interface deformation, light, screen and sound (the two latter being rather control conditions, the visual and auditory channel are already used for the museum visit, interpretation contents and social interactions). Thermal feedback has been little studied so far in HCI compared to tactile feedback [4]. Shape-shifting interfaces have also been little explored for

guiding [12]. These first tracks seem encouraging for experimenting with guiding visitors in museums using less explored sensory modalities such as heat or shape changing interface.

## ACKNOWLEDGMENTS

This work was initiated during a workshop on the Internet Of Tangible Thing at TEI'18 [1] in team with Mikko Kytö et Tanja Döring. The platform was built during a project with ESTIA Institute of Technology students Raphaël Ollando, Thibault Martin and Cédric Barbin.

## REFERENCES

- [1] Leonardo Angelini, Elena Mugellini, Omar Abou Khaled, Nadine Couture, Elise Van Den Hoven, and Saskia Bakker. 2018. Internet of tangibles: Exploring the interaction-attention continuum. In *TEI 2018 - Proceedings of the 12th International Conference on Tangible, Embedded, and Embodied Interaction*, 740–743. <http://doi.org/10.1145/3173225.3173334>
- [2] Saskia Bakker and Karin Niemantsverdriet. 2016. The Interaction-Attention Continuum: Considering Various Levels of Human Attention in Interaction Design. *International Journal of Design* 10, 2.
- [3] Lesley Fosh, Steve Benford, Stuart Reeves, Boriana Koleva, and Patrick Brundell. 2013. See Me, Feel Me, Touch Me, Hear Me: Trajectories and Interpretation in a Sculpture Garden. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '13)*, 149–158. <http://doi.org/10.1145/2470654.2470675>
- [4] Euan Freeman, Graham Wilson, Dong-Bach Vo, Alex Ng, Ioannis Politis, and Stephen Brewster. 2017. Multimodal feedback in HCI: haptics, non-speech audio, and their applications. In *The Handbook of Multimodal-Multisensor Interfaces: Foundations, User Modeling, and Common Modality Combinations - Volume 1*. ACM, 277–317. <http://doi.org/10.1145/3015783.3015792>
- [5] Felix Heibeck, Basheer Tome, Clark Della Silva, and Hiroshi Ishii. 2015. Unimorph: Fabricating Thin Film Composites for Shape-Changing Interfaces. In *UIST 2015 - Proceedings of the 28th Annual ACM Symposium on User Interface Software and Technology*, 233–242. <http://doi.org/10.1145/2807442.2807472>
- [6] Dirk Vom Lehn and Christian Heath. 2003. Displacing the object: mobile technologies and interpretive resources. *Archives & Museum Informatics* 2.
- [7] Daniela Petrelli, Luigina Ciolfi, Dick van Dijk, Eva Hornecker, Elena Not, and Albrecht Schmidt. 2013. Integrating Material and Digital: A New Way for Cultural Heritage. *Interactions* 20, 4: 58–63. <http://doi.org/10.1145/2486227.2486239>
- [8] Daniela Petrelli and Sinead O'Brien. 2018. Phone vs. Tangible in Museums: A Comparative Study. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems - CHI '18*, 1–12. <http://doi.org/10.1145/3173574.3173686>
- [9] Maria Roussou and Akrivi Katifori. 2018. Flow, Staging, Wayfinding, Personalization: Evaluating User Experience with Mobile Museum Narratives. *Multimodal Technologies and Interaction* 2, 2: 32. <http://doi.org/10.3390/mti2020032>
- [10] Irene Rubino, Jetmir Xhembulla, Andrea Martina, Andrea Bottino, and Giovanni Malnati. 2013. Musa: Using indoor positioning and navigation to enhance cultural experiences in a museum. *Sensors (Switzerland)* 13, 12. <http://doi.org/10.3390/s131217445>
- [11] Robert Semper and Mirjana Spasojevic. 2002. The Electronic Guidebook: Using Portable Devices and a Wireless Web-based Network to Extend the Museum Experience. In *Museums and the Web 2002*.
- [12] Adam J. Spiers and Aaron M. Dollar. 2016. Outdoor pedestrian navigation assistance with a shape-changing haptic interface and comparison with a vibrotactile device. In *IEEE Haptics Symposium, HAPTICS*, 34–40. <http://doi.org/10.1109/HAPTICS.2016.7463152>
- [13] Aneesh Tarun, Peng Wang, Paul Strohmeier, Audrey Girouard, Derek Reilly, and Roel Vertegaal. 2013. PaperTab: tablets as thin and flexible as paper. In *CHI'13 Extended Abstracts on Human Factors in Computing Systems.*, 2881–2882. <http://doi.org/10.1145/2468356.2479559>
- [14] Peter Tolmie, Steve Benford, Chris Greenhalgh, Tom Rodden, and Stuart Reeves. 2014. Supporting Group Interactions in Museum Visiting. In *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing (CSCW '14)*, 1049–1059. <http://doi.org/10.1145/2531602.2531619>
- [15] Mark Weiser and John Seely Brown. 1997. The Coming Age of Calm Technology. In *Beyond Calculation*. Springer, New York, NY, 75–85. [http://doi.org/10.1007/978-1-4612-0685-9\\_6](http://doi.org/10.1007/978-1-4612-0685-9_6)