How Can Personalization Shape Social Action in Cultural Spaces?

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Abstract
Museums and other cultural heritage spaces are social. Personalization, while accommodating diversity, tends to isolate because it focuses on the content delivered more than the sensorial experience of being in a place with others. We deconstruct the concept of personalization separating the content from the context to introduce social engagement through tangible interaction. We discuss the implications of designing for social interaction in cultural heritage, namely: shaping the stories, the interaction and the ethics involved.

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Cultural heritage, personalization, tangible interaction, smart exhibits.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous. J.m. Computer applications: Miscellaneous.

Introduction
Personalization in cultural heritage is mostly synonymous of content adaptation, i.e. dynamically changing the amount or type of information conveyed to the single visitor to fit what the person likes and knows [2]. From mobiles [8] to the most recent augmented reality [3] the interaction is designed for the single individual. Personalization misses out on the fundamental fact that the context affects the experience more than the visitor's cognitive and psychological status. A visit to a cultural heritage site is intrinsically social. Most likely people visit in a self-organized group (family, group of friends, class, couple) or a casual group (guided visits, treasure hunts), but even when visiting alone, in autonomy, individuals share/compete for the exhibition resources.

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Attempts to bring together personalization with the social have taken advantage of projection facilities or situated public displays ([9], [4]). The potential of the social dimension has not been exploited in cultural heritage and it is still extremely limited, i.e. interacting with a multi-touch table [10].

A second observation is the nature of the interaction. Using a mobile application does not really engage people with the place and other people around them ([11][6]) and examples of personalization in spaces are still limited ([1][7]).

Exhibitions designed to engage the visitors into shared interactions have proved very effective even between strangers that just happened to be close to the same piece at the same time ([5][11]). These interactive pieces build upon the surprise triggered by the unexpected and the physical engagement that follows when trying to understand what happens. However, most of the time these are individual artistic expressions not intended to bring the visitors closer to and engaged with the heritage and its stories. They are limited to the performance.

A personally meaningful, sensorily rich, and socially expanded visitor experience with digital content can bridge the gap between digital collections and the specific social and material contexts in which heritage comes to matter. This is the purpose of our research.

We propose to use techniques developed in personalization to foster social interaction through direct engagement with smart exhibits, i.e. exhibits augmented with tangible interaction capabilities through sensors and actuators. The vision is that of a group of visitors that have to work together to unlock digital content embedded in tangibles. For example in a war museum a visitor can unlock the battlefield map on their diary only if they find the visitor that carries the enemy's diary, or a projection starts only if enough visitors are all marching with the same rhythm. The composition of the group and what they have to do varies dynamically on the bases of the context, e.g. where the interaction takes place, who is involved, when this happens and how. Personalization techniques provide the smart exhibits with autonomous behaviour controlled by a system of rules. The desired effect, however, must be planned through the design of some form of behaviour descriptors. This leads us to a critical question:

- How can designers plan and craft the interaction between group members or strangers that is implemented autonomously by the tangibles in place at a later stage?

Below we discuss the model we are developing in the meSch project (Fig. 1). The design of the experience is split into storytelling and interaction, and sequences the planning by the curator/designer with the program execution within the smart objects. We present two examples that illustrate the potential of this proposal and conclude with the open challenges to achieve such a delivery of content in cultural heritage with technology as an active agent among an active group.

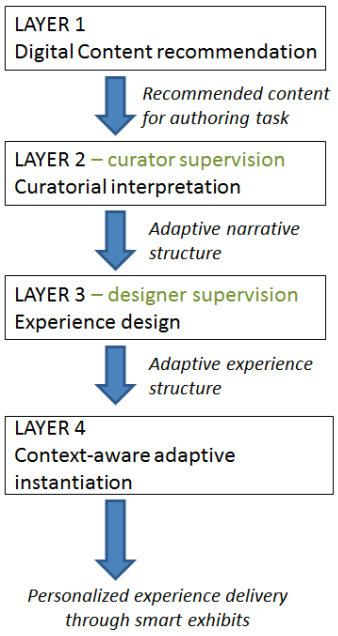

Figure 1. Preparing a personalization structure: selecting (layer 1) and composing (layer 2) the story; defining (layer 3) and executing (layer 4)

Orchestrating Tasks for Curators, Designers and the System

Personalization research has so far bypassed the curators and directly supported the users by dynamically changing their visits [2]. In meSch we

revisit this process to include human-supervised steps in the composition of the adaptive structures (Fig. 1). The inclusion of the curators and designers in defining the story and the interaction respectively can improve the quality of the visitor's experience. The role of the computer becomes that of supporting the curator/designer in creating a good story/interaction and executing the performance as specified when the visitors interact with it.

System-Assisted Content Selection
While a curator is deciding on which story to tell the visitors, a recommender system can effectively support them by quickly filtering information from repositories and suggesting relevant material (Fig. 1, Layer 1). The recommender can discover new content to enrich the story under construction while facilitating the curator in learning about the content of the repositories.

Scripting Adaptive Content
For many, the expertise of the curator is what makes the experience of cultural heritage memorable. Curators must be free to compose their stories within the limit of what a personalization system can deliver. An authoring environment (Fig. 1 Layer 2) offering templates of effective stories gives curators the ability to define adaptive data structures; these are uploaded into the smart exhibits and automatically executed to deliver the story when the visitor interacts with the objects (Fig. 1, Layer 4).

Through pre-defined structures (or templates) that describe content adaptivity, curators author the content by drag-and-drop (Layer 2). Possible examples of adaptive narratives are: templates for coherent stories that dynamically adjust to multiple interaction, or narratives that use storytelling to connect different places (or points in space).

Scripting Social Interactions Grounded in Context
As meSch brings personalization into smart objects, how the smart objects react and adapt to the context of use is subject to author's supervision (Layer 3). Authors explicitly connect points in the narrative threads with single-user or multi-user actions and situations that can occur at use time. Pre-defined templates for adaptive experience, as well as specific interaction rules, will be made available to authors. For example templates for fostering social situations (e.g., ten people to march synchronously), or object manipulation (e.g., wind up the radio to play the war bulletins), or object search (e.g. find your enemy to unlock the full story of the battle). The personalization to the context is complementary to the personalization of the content: an author can use multiple alternative narrative templates with the same context template and vice versa, the same narrative template is applied to multiple context templates. This distinction allows accommodating different physical abilities for the same story, e.g. energetic children will have to work harder on the objects to release the content than older visitors. While the narrative structure will be the same for younger and older, the experience structure will not.

Object Intelligence
The two combined "content" and "interaction" structures are then connected to specific input and output capabilities and loaded onto smart exhibits that will trigger automatic contextual personalization when used (Fig.1, Layer 4). The smart objects have a certain degree of autonomy to automatically resolve conflicts when alternative behaviors are possible, e.g. four

people following each a different story simultaneously reach a point, the decision on what will follow is based on content mediation with respect to the narrative threads currently followed by the four people.

A scenario

One of the three sites meSch will experiment with is a WWI fort that was dug starting from 1909 in the Alps. With a network of local museums and remains of the Great War in the Trentino area (Italy), the fort is part of the Italian National Museum of War, visited by over 40,000 people a year. The museum has specific educational programs adapted to the different learning, experiential, remembrance goals that are currently at the hearth of the educational agenda of curators. Four visitors groups are currently distinguished: children (7-10), junior (11-13) and senior school (14-17) as well as groups of elderly people and families.

In the meSch scenario young children will receive a map and a basket to "treasure hunt" smart exhibits in the shape of historical artifacts; Older children will receive a soldier's pack, i.e. a replica of WWI bag, already filled with smart exhibits; Teenagers will receive a sensor-enriched tablet disguised as a captain diary; The elderly will receive a walking stick containing sensors, actuators and loudspeakers. The basket, the pack, the diary, and the stick monitor the movement of the visitor during the walk from the visitor's center to the fort and inside it and deliver their content at different points. When inside the Forte the diary automatically initiates a quest for the hints or places that activate a piece of content in the diary; the walking stick has a movement and sound sensors that control the play of the reading of a soldier's diary pages when the stick is still and the voice level is low as to not interrupt conversations. The soldiers' pack needs more people to be unlocked: the members of the group have received a soldier's tag each. As they walk all together in line inside the tunnels in the fort, as marching troops, images of soldiers in the trenches are projected on the walls, with men falling one by one. If they stop and sit in the middle quietly, they will be able to hear stories of the many how died in the tranches.

Challenges for interaction design

Besides the technical challenges this project poses, there are interaction design considerations that we need to address.

We need to identify a set of narrative structures effective in telling compelling stories but generic enough to cover multiple situations to allow the flexibility that personalization needs, e.g. develop in time and space by means of distinct snippets. Examples can be a structure suitable for families or classes where part of the content is missing and delivered by the parent or the teacher while the system complements additional information. An evocative template based on noise and sound aiming at rising emotion instead of learning, or a narrative structure that requires the visitor to input, for example, the answer to a quiz. The system should also be equipped with the mediation rules required when multiple narrative threads merge.

The second challenge is to define the vocabulary of actions to be used as building blocks for more complex interactions and how these map to the narrative structure. The marching line or the treasure hunt are examples of actions that trigger content. Designers should also consider the need for rules of progressive

release, e.g. after two failures the content is released anyway, to avoid frustrating the visitors.

A further reflection related to ethics and the implication of forcing people to do things. There are positive cases of strangers willingly collaborating to make the exhibit work ([11][5]), however it is quite a different matter to force visitors to do so. Similarly, if the structure assumes the visitor adopts a character, e.g. the captain's diary, we must be aware of the possible emotional implications as not everyone likes to be "the bad guy". How acceptable this is is a matter for research.

Finally as the goal is to create compelling stories in cultural heritage settings via personalization and engagement we need to clarify what is the implication of a system that has a degree of autonomy and decisional power. How much this is acceptable to both the curators (the exhaustive control of the content as delivered may not be possible) and the visitors (an object telling them what to do next) may vary and needs assessment in real settings.

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