PickARock: A Multi-User Tangible Installation Designed To Foster Tourism

Massimo Deriu
CRS4
Science and Technology Park of Sardinia, Pula CA, Italy
mderiu@crs4.it

Samuel Iacolina
CRS4
Science and Technology Park of Sardinia, Pula CA, Italy
samuel@crs4.it

Abstract
This paper discusses design issues in the development of interactive installations for the promotion of Tourism. The objectives are to encourage marketing activities as well as creating a playful and social experience in a promotional space. Our research is focused on the design and evaluation of a multi-user tangible interface called PickARock, combining touch, sight and hearing in a unique sensing experience. It offers a glimpse of how an interactive exhibit becomes useful tools to promote contents, as it is based on a natural physical interface, suitable for typical marketing scenarios. The installation has been used in three phases: the prototype was tested during a fair in Copenhagen then the final version, devised for a permanent exhibition, was evaluated during an exposition in Berlin and finally it has been moved in an educational laboratory for heritage restoration in Cagliari.

Author Keywords
Tangible UIs; User Experience Design; User Interface Design; Multi-modal interfaces; Input and Interaction Technologies; Cultural Heritage; Tourism.

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

Introduction
According with Aitchison that in [1] argues that, tourism needs to be considered not just as a type of business or industry, but as a powerful cultural arena and process that both shapes and is shaped by gendered presentations of places, people, nations and cultures, the basic concept of PickARock was developed after an initial work of understanding where interactive exhibit could support the promotion of tourism. In many situations promotional videos are excellent marketing tools, however they not always represent the most proper method to promote contents. The watching

User Interaction

The interaction we proposed is very simple. When idle, the display shows static images like a screensaver. When the user picks a rock, the associated video starts playing on the monitor. Visitors can weight a stone, stroke it and see the video in detail and listen to music. When the stone is put down a video transition takes the system back to idle state. Given that the installation has only a normal size single display, the user can only see one video at the time. Each video is 90" long so that the installation can offer an exhaustive but synthetic description of each area and that the contents display doesn't get stuck. If the user lift up an object while is holding another one, the application shows a message that invite to put it down, and keep showing the video associated to the previous object.

experience is interactivity-free in itself and it usually does not stimulate social relations. People tend to isolate when they are watching a video and rarely interact because it sounds annoying and distracting

from the plot. On the contrary in an exposition or a fair relations are stimulated and supported by many forms of communication and proving real objects and exhibit usually attract visitors attention more than audiovisual contents. The main goal of PickARock is to overcome these limits, taking advantage of the qualities of both systems, combining touch, sight and hearing and supporting social interaction and collaboration. People have an incredible ability in perceiving the external world through the senses, thats why tangible interfaces

Figure 1. The table, devised for permanent exhibitions in Berlin

are particularly useful in those apps where physicality is a prevailing trait, like in exhibitions and fairs where we find displays and information points, or museums, applications linked to cultural heritage and tourism. Our installation, falls into this context giving the user a suggestive interactive experience through the use of three senses: touch, sight and hearing. It is made of an interactive table on which some autochthonous rocks and minerals are laid: limestone from Cagliari, granite from Ogliastra and sand from IsArutas . The moment a visitor picks one of the rocks, the sensors connected to the screen start playing videos and music that tell the story of area where the mineral came from, accompanying the visitor in a journey in the architecture, archaeology and culture of Sardinia.

Choosing the Appropriate Media Device

With regard to the development of tangible supports, we can be as creative as we like using materials and devices that are easily available [7, 8]. We can also say that the making is strictly connected to the type of application we are developing and the consumers we are targeting [9, 6]. The goal was to describe the story linked to a particular area. We divided the region of Sardinia in three different areas, north, centre and south, each one of these areas with its own geographical and historical identity. The narration ought to describe the various aspects that typify and differentiate these can change these different areas like architecture, archaeology, folklore, civic, religious and sports events, tourist attractions, handicrafts and geography. Obviously at the state of the art we have various supports for consulting tourist guides [4, 3]. Audio guides play a recorded excerpt and leave the user free to move around within the exhibition space. Multi touch devices [2] and interactive info points also deliver multimedia contents. However from an interactive point of view, these solutions are limited because the control of the user experience is embedded in the same peripheral. The 'augmented' book [10, 5] offers a more natural use of the multimedia contents moving it closer to the reading of a book. In this case we wanted to offer a more physical and exciting

Tangible Rocks

Rocks well represent the raw material of the different architectural, archaeological structures and landscapes, and they interpret the previously mentioned idea to give to the user the sensation to hold a piece of Sardinia.We started from the selection of 9 rocks and minerals, each representing a specific area of Sardinia, and then we asked the collaboration of a video maker with a great expertise in Sardinian documentary movies that edited for us 9 video clips with evocative music expressly composed for this project. Each video was devised to collect some useful information linked to a particular stone, hence to a particular area and tells a different story.They have been orchestrated by us, with the scope to create a relation between the stones and the images, a sort of fil rouge linking stones physical properties (brightness, opacity, roughness, porosity, etc.) to the promoted topics that include folkways, sports and ways of having fun.

experience than browsing the pages of a book. With PickARock we wanted to arouse in the user the sensation to touch a piece of Sardinia. We intentionally decided to take out from the digital world objects that the user could touch with his own hands and that would be linked at the same time to the contents to be displayed. In other words rocks, video and music have been chosen to distinguish the facets of each territory and involve the user in a deeper way, describing different aspects of a particular area. This connection is very important for the user experience: when a visitor holds a stone, she/he could appraise the differences in colour, weight and consistency,at the same time recognising these properties in the historical artefacts, monuments, views and so on.

Discussion and Evaluation

PickARock can be considered as an interactive information point where the menu is represented by objects laid on a sensored table. Picking up a rock equals to selecting the desired item to be explored. Once you pick up an object the system plays back the associated video. Althought in the current version any further manipulation of the rock/stone does not produce any effects with the video, the relation video-stone is very important for the user experience. Indeed it is important to point out that the installation would meet the interest of the visitors, using the expedient of the stones to attract their attention, giving more chances to a promotion a video to be watched and appreciated. The user interface essentially becomes invisible and it is possible interact with the application in a natural way. It is not necessary to start and stop the videos by clicking a button or select them sliding a menu, but just holding a stone is possible to see how it has been used in historical artefacts and monuments, or how it could be found in nature. The interactive appliance has been used in three different real scenarios: a fair in Copenhagen a Sardinian exposition in Berlin, and a educational laboratory in Cagliari. During these events, many people used the appliance. The feedback and comments received have been overall positive. What was widely appreciated is that the table is able to fascinate people and offers the possibility to control the appliance through manipulation of the real objects, familiar to the users. By using touch, hearing, and sight the appliance offers a greater involvement in experience. Indeed it is important to point out that the installation would meet the interest of the visitors, using the expedient of the stones to attract their attention, giving more chances to a promotional video to be watched and appreciated. The user interface essentially becomes invisible and it is possible interact with the application in a natural way. It is not necessary to start and stop the videos by clicking a button or select them sliding a menu, but just holding a stone is possible to see how it has been used in historical artefacts and monuments, or how it could be found in nature. The interactive appliance has been used in three different real scenarios: a fair in Copenhagen a Sardinian exposition in Berlin, and a educational laboratory in Cagliari. During these events, many people used the appliance. The feedback and comments received have been overall positive. What was widely appreciated is that the table is able to fascinate people and offers the possibility to control the appliance through manipulation of the real objects, familiar to the users. By using touch, hearing, and sight the appliance offers a greater involvement in the use; and the touch and feel experienced helps to better memorize and evoke the acquired information. PickARock was installed in its prototype version at the ”Sardinien for alle

From the Prototype to the Final Version

The prototype first version is just a 1,20m x 0,80m x 0,10m wooden box. The top side is drilled to allow fitting the sensors while the inside contains micro controller and cables. The LCD display and computer are external. This version was devised to simplify the transport and the installation of this appliance. Considering the ever-growing demand of interactive appliances we fit the sensors on a different structure, devised for a permanent exhibition. The table is 2,20m long, 1,20m wide and 0.12m thick (figure 1). The top surface is a 8mm thick sheet of steel, whereas the table core is made of solid wood, containing electronic circuits slots. This prototype includes a monitor and a computer, looking like as one piece, one structure. Obviously the remarkable weight of 160 Kg and its volume made the installation of components not easy, but the prototype makes it up by showing an excellent design.

sanser" for 8 days in Copenhagen in October 2013 and in its final version in Berlin from December 2013 to March 2014, where the installation was hosted within the photographic exhibition for the promotion of the Sardinia permanent exposition (figure 1). Finally it has been moved in an educational laboratory for heritage restoration in Cagliari from October 2014 to June 2015. The appliance was active for 158 days, during which time the visitors and students tried it out to learn about the Sardinian culture. In the first scenario the big question was how to make PickARock a useful, engaging, easy-to-use and emotionally satisfying tool for its users. In order to find the answer a questionnaire was designed and distributed during the fair in Copenhagen. A total of 118 responses were gathered and qualitatively evaluated. These investigations were focused on capturing how a such system could attract peoples attention and if it could be a good tool to promote tourism. A wide and heterogeneous kind of feedback (about the size of the stones, the reliability of the sensor, the quality of videos, the layout of the table, etc) was found and then putted back into the iterative development of the prototype. This process was then followed by more formal usability testing in lab where We evaluated the appliance both analyzing the user feedback and the interactions that were automatically recorded in a log file while using the application. Moreover semi-structured interview was designed based on the results. In the second scenario during the Berlin exposition we have conducted both a small scale interviews and an observational study on heterogeneous groups of people. The small scale interviews was conducted with 45 participants with the objective to explore some of the issued, raised in the first scenario, further depth. Instead the observational study was conducted on heterogeneous groups of people for a period of 4 days during the inauguration week in conjunction with the photographic exhibition, and sporadically for other 6 days during its staying in Berlin. Each group was able to easily interact and appeared confident approaching the system. This was confirmed in the interviews, in which the participants reported that the stones were representative, immediately understandable and easy to manipulate. Both groups and single users suggested that using the system would not require previous experience. Furthermore, all participants also appeared to be immersed throughout the session, suggesting that the system effectively supported collaboration within small groups. Once again, this assertion was supported by comments during the interviews, where 80watching their movements and expressions, sometimes the rocks passed from hand to hand, and often they brushed the surface of rocks. In summary, although the study was short and exploratory, its results are broadly positive. Its serves to validate some of the key concepts in PickARock: the suitability of an interactive exhibit to promote tourism; the ability of the system attract peoples attention in a fair context and to support collaborative activity. In the last scenario students were asked to interact with the system, and data were collected in a group setting, but participants worked individually. The study consisted of experimental sessions, where participants evaluated system applying both usabiity tasks and educational tasks they were assigned to. They had to find problems in the application, and to record them on a booklet which differed according to the experimental condition.

Conclusion and Future Works

PickARock offers a glimpse of how an interactive exhibit become useful tools to promote contents. The study

Multi-User Interaction

When two or many users pick up a stone, the application shows a video related to the picked up stones. If there is no video available, the fact are picking up a stone simultaneously generates a conflicting situation. With the aim of understand how users resolved a conflicting situations, our application recorded a log, reporting user activities, for instance which stones were lifted or the time stones were picked up or released. We can assert users automatically avoided and resolved the potential conflicting situations that would be the result of simultaneous lifting of more than one object.

reported in this paper has provided some answers about the effectiveness, efficiency and satisfaction of this system. The experiment confirms our general hypothesis of an increase of the overall quality of the user experience when users (visitors, tourists, students) are asked to watch a promotional video. Our work objective is to identify new strategy for video promotion in tourism. A further step will be to improve the system in order to arouse emotions in users offering a more immersive experience, for example manipulating the temperature of the rocks, heating or cooling them depending on the videos contents. We would also explore new topics promotions (like handicraft, food, etc) in order to deal with this problem, we are going to improve the concept of tangible interface, giving to the objects (the stones in this version) new ability for the management of the video contents. Our idea is to re-organize the scenario by regrouping the events/actions, happening in a same context and relating to each other as a chain of different interactions, into one same situation.

References

1. Aitchison, C. C. Theorizing other discourses of tourism, gender and culture: Can the subaltern speak (in tourism)? In *Tourist Studies, Vol.1 (2). 2001*, 133–147.
2. Brown,B.,andChalmers,M.Tourismandmobile technology. In *ECSCW 2003* SE - 18, K. Kuutti, E. Karsten, G. Fitzpatrick, P. Dourish, and K. Schmidt, Eds. Springer Netherlands, 2003, 335–354.
3. Buhalis,D.,andLaw,R.Progress in information technology and tourism management: 20 years on and 10 years after the InternetThe state of eTourism research. *Tourism Management 29, 4 (Aug. 2008)*, 609– 623.
4. Buhalis, D., and Licata, M. C. The future eTourism intermediaries. *Tourism Management 23, 3 (2002)*, 207– 220.
5. Dunser,A.,andHornecker,E.An Observational Study of Children Interacting with an Augmented Story Book. In *Technologies for E-Learning and Digital Entertainment SE* - 31, K.-c. Hui, Z. Pan, R.-k. Chung, C. Wang, X. Jin, S. G¨obel, and E.-L. Li, Eds., vol. 4469 of *Lecture Notes in Computer Science*. Springer Berlin Heidelberg, 2007, 305–315.
6. Horn,M.,Crouser,R.,andBers,M.Tangible interaction and learning: the case for a hybrid approach. *Personal and Ubiquitous Computing 16, 4 (2012)*, 379– 389.
7. Hornecker,E.,andBuur,J.Gettingagripontangible interaction: a framework on physical space and social interaction. In Proc *of the SIGCHI conference on Human Factors in computing systems, CHI '06*, ACM (New Y ork, NY , USA, 2006), 437–446.
8. Hwang,S.,Ahn,M.,andWohn,K.Magnetic Marionette: Magnetically Driven Elastic Controller on Mobile Device. In Proc. of the Companion *Publication of the 2013 International Conference on Intelligent User Interfaces Companion, IUI '13 Companion,* ACM (New York, NY, USA, 2013), 75–76.
9. Kaltenbrunner,M.,andBencina,R.reacTIVision:a computer-vision framework for table-based tangible interaction. In *TEI '07: Proc of the 1st international conference on Tangible and embedded interaction*, ACM (New York, NY, USA, 2007), 69–74.
10. Deriu, M, Uras, S., Ardu, D., and Paddeu, G. Do not judgeaninteractivebookbyitscover:afieldresearch. In *Proceedings of the 10th International Conference on Advances in Mobile Computing & Multimedia*, ACM (2012), 17–20.