Interactive City Information Point: Your Guide to Heraklion City

Nikolaos Partarakis[1(✉)], George Margetis[1], Emmanouil Zidianakis[1], Michalis Sifakis[1], Giannis Drossis[1], Chryssi Birliraki[1], Antonis Chatziantoniou[1], Vassiliki Neroutsou[1], Spiros Paparoulis[1], Thanasis Toutountzis[1], Panagiotis Koutlemanis[1], Xenophon Zabulis[1], Stavroula Ntoa[1], Dimitris Grammenos[1], Emmanouil Apostolakis[1], Emmanouil Stamatakis[1], Margherita Antona[1], and Constantine Stephanidis[1,2]

[1] Foundation for Research and Technology – Hellas (FORTH), Institute of Computer Science, N. Plastira 100, Vassilika Vouton, 700 13 Heraklion, Crete, Greece
{partarak,gmarget,zidian,misi,drossis,birlirak,hatjiant,vaner, spirosp,atout,koutle,zabulis,stant,gramenos,apostolak, stamatakis,antona,cs}@ics.forth.gr

[2] Department of Computer Science, University of Crete, Heraklion, Greece

Abstract. The Tourism Office of the city of Heraklion is a truly original facility that provides visitors with novel ways to access information through the use of modern technologies and innovative interactive systems developed by ICS-FORTH. This paper presents the innovative technologies employed at the tourist information office in order to enhance the information provision capacity of this type of facility in conjunction with traditional approaches, such as printed information material and human operated information provision. The info-point of Heraklion deploys a mixture of systems that augment the visiting experience while providing information through kinaesthetic interaction, Mixed Reality and play.

Keywords: Information visualization · Interactive systems · Mixed reality Augmented artefacts · Interaction with printed matter · Hand gestures Skeletal interaction

1 Introduction

Public spaces have a social impact on people by involving necessary, optional and social activities [1], and by hosting exhibits that provide public information. The latter include for example advertising stands and bus-routes, as well as tourist information such as weather forecast data, shop and sightseeing opening hours, shop offers, and city news and events. To improve the quality of the information provided, researchers propose to encourage user-interaction with the data in an aesthetic manner, instead of statically displaying them on stands or screens. Modern information visualization techniques can help towards conveying information without overwhelming users, and playful interaction can help towards arousing user interest and attracting the public. Especially in the

C. Stephanidis (Ed.): HCII Posters 2018, CCIS 852, pp. 204–212, 2018.
https://doi.org/10.1007/978-3-319-92285-0_29

domain of tourist information, public information points have traditionally played an important role in delivering information to citizens regarding city attractions.

2 Background and Related Work

This work is rooted in the domain of interactive installations in public spaces and moves beyond into examining the process of applying such techniques into public information points. Interactive installations in public spaces have specific requirements in terms of interaction and setup. The installations need to adapt to fit to the space available, provide content which interests both experts and non-expert users, and also present thorough information on demand [2]. At the same time, the system design should provide information immediately and support straightforward interaction techniques. Multi-user interaction with public displays is an open issue and constitutes an active area of research. Once people approach the interactive display, they decide their actions with regard to the system. Especially in the context of MR applications, the initiation of interaction with a public display involves transitioning from implicit to explicit interaction [3] as the users become engaged to the pervasive display.

Tangible interaction is a form of interaction with mixed reality installations in which physical items act as mediators between the users and the environment. One aspect of tangible interaction refers to the augmentation of physical objects so as to become information displays. For instance, physical paper is employed as a portable display, augmenting maps or glass-protected models [4]. Interactive Maps [5] is a mixed reality application, where printed maps are augmented with additional multimedia information. Furthermore, tangible interaction can involve objects which have meaningful substance with a semantic meaning, such as smart objects (i.e. physical items equipped with sensors such as RFID tags) [6].

In this paper the concept of interactive installation for public information spaces is presented through a prototypical installation at the Heraklion Info Point. In this context a mixture of interaction techniques (augmented artefact, interaction with printed matter, hand gestures, body based interaction) are employed by different systems to communicate different types of information to visitors. All these different forms of interaction are combined together to offer an engaging, educational and fun experience.

3 The Heraklion Info Point

The Heraklion info-point promotes the island of Crete and provides visitors with novel ways to access information through the use of modern technologies and innovative interactive systems developed by ICS-FORTH. The seven (7) systems that have been deployed are:

- **Infocloud**, a colourful mosaic of photographs and other multimedia material showcasing the civilization and landmarks of Crete “flows” across a large touch screen.

- **Be There Now!** Photographs of many different locations and landmarks of Crete are projected one at a time on a wall. When visitors stand in front of an image they see themselves projected within it and they can e-mail themselves a souvenir photograph.
- **Paper View** presents a map of the entire island printed on a large table-top, which comes to life once the visitor places a piece of cardboard on the surface of the table.
- **Interactive Documents**: On a plain table surface visitors may place the printed map of the historical centre of Heraklion which is freely distributed by info-point. The system electronically augments the printed map with multimedia information in several languages and the user is able to interact through touch with the map in order to extract further information.
- **Media Gallery** presents an extensive collection of photographs and other multimedia materials about the flora and fauna of Crete that can be navigated by gesture.
- **Stater 360^2** comprises a revolving disk which seems made of clay and on this surface the Phaistos Disk is projected in different states.
- **A Game Table** is a game kiosk that includes a multi-touch screen which can be used by one or more players and offers two educative and entertaining games that present images and information about Crete through playing.

There is one more system, which presents a synthesis of technology with art not only inside the info-point, but also at the window to the historic pedestrian way in front of the building. This is an interactive sculpture, where innovative technologies are combined with visual arts. Set in the main window, it draws inspiration from the myth of the Labyrinth, works of Nikos Kazantzakis and other elements of Crete's long cultural tradition to form a complex double-sided relief that welcomes visitors to explore it by touch. Visitors are invited to touch the mechanical devices embedded in the sculpture so as to reveal the scripture and set the ancient device back to life (see Fig. 1).

Fig. 1. Interactive sculpture inspired by the history of the city of Heraklion

3.1 Interaction with Information Flows

Infocloud comprises a collection of keywords, images and video thumbnails displayed on a very large touch screen. When a word is selected, an information window opens,

which may contain an image or video accompanied by a short textual description. The keywords, images and video thumbnails constantly flow (e.g., from right to left), while (optionally) the background flows to the opposite direction. Items are positioned at multiple layers, each of which has different attributes (size, speed, dimness) (Fig. 2).

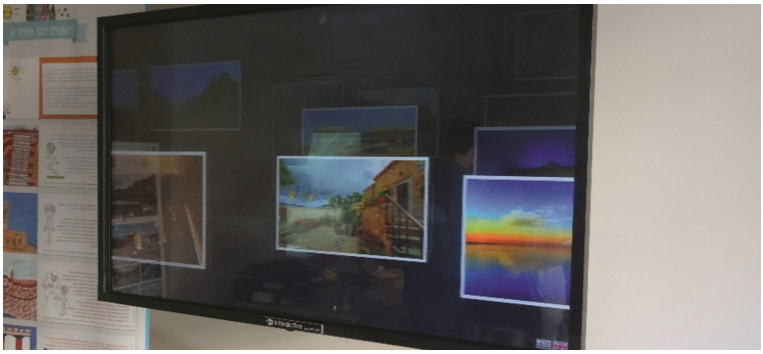

Fig. 2. Infocloud "Heraklion info-point"

3.2 Immersing Users to Landscapes to Create Digital Cartes Postales

Be There Now! is an interactive system that allows the exploration of different sceneries and immerses users in various landscapes, by depicting the visitors standing before it within the landscapes and the vistas projected, as if they were at that place (Fig. 3).

Fig. 3. Be there now! "Heraklion info-point

3.3 Alternative Forms of Interaction with Terrain-Based Information

PaperView is a **tabletop augmented reality** system that supports the exploration of **terrain-based information** (e.g., areas of interest on a 2D map, or a 3D scale model) using rectangular pieces of **plain cardboard**. The system allows users to view information and interactive multimedia using the cardboards as individual interactive screens; these cardboard screens can be lifted and held at various angles. Multiple users

can concurrently use the table [7]. When a user places a cardboard piece over the table surface, an image is projected on it, adding details to the surface image. Furthermore, a pointer (i.e., a magnifying glass) is projected on the paper's centre, which assists the user in exploring the surface, guiding her/him to the information hotspots available. When a hotspot is selected, a multimedia slideshow starts. The slideshow comprises a series of pages, each of which may contain any combination of text, images, and videos. At the bottom area of the slideshow, a toolbar is projected containing an indication of the current page and the total number of pages available, as well as buttons for moving to the next/previous page (Fig. 4).

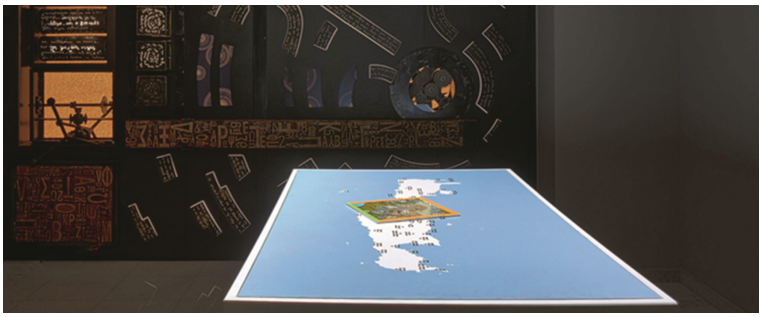

Fig. 4. Paper view at "Heraklion info-point"

3.4 Interacting with Printed Maps

The **interactive documents** system augments printed documents that are placed upon a surface (e.g., a plain table) with multimedia content and interactive applications. Such content is dynamically displayed in augmentation to the currently open page of the document, and is aligned in real-time with its 2D orientation upon the table surface. At the Heraklion Info Point visitors may interact with the printed map of the historical centre of Heraklion which is freely distributed. The system electronically augments the printed map with multimedia information in several languages and the user is able to interact through touch with the map in order to extract further information (Fig. 5).

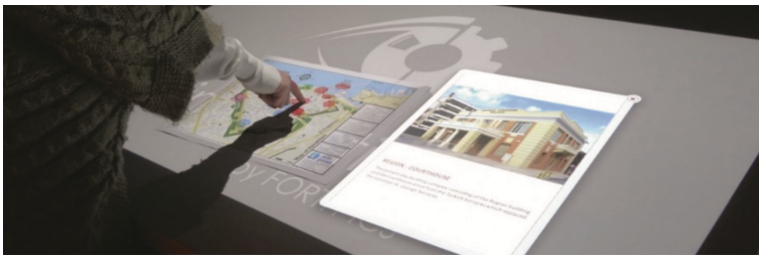

Fig. 5. Interactive documents at the "Heraklion info-point"

3.5 Children Discover Crete Through Beautiful Pictures

Media Gallery is a system that allows browsing and exploring large collections of multimedia information using touchless remote interaction, by employing computer vision technologies. At the info point this system is targeted to attract the attention of visitors to a collage of landscapes, people, animals and plants of the island (Fig. 6).

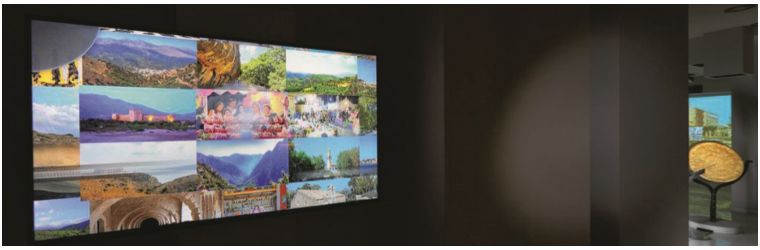

Fig. 6. Media gallery at the "Heraklion info-point"

3.6 Physical and Multitouch Interaction with a Double Rotating Gimbal

Stater 360^2 comprises a revolving disk which seems made of clay and on this surface different views of the Phaistos Disk are projected. Visitors may turn the disk over in order to see both sides, while they can find out information about this legendary discovery of Minoan archaeology by touching the surface. The available information includes details of the Disk's discovery and a brief presentation of the latest findings of hieroglyphics, as well as attempts at understanding what the mysterious writing is about (Fig. 7).

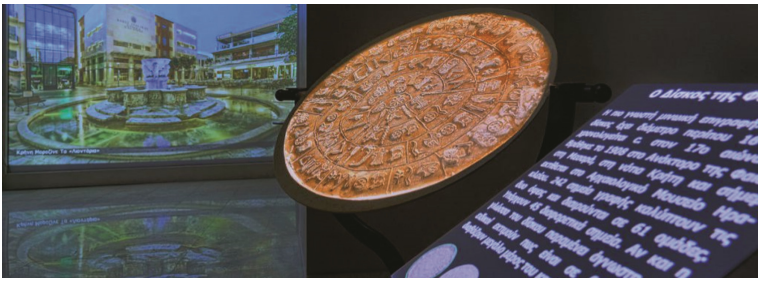

Fig. 7. Stater 360^2 at "Heraklion info-point"

3.7 Game Table

The Game Table is a game kiosk that includes a multi-touch screen which can be used by one or more players and offers two educative and entertaining games that present images and information about Crete through playing:

1. Jigsaw Puzzle. Players are invited to complete a puzzle. They can select the difficulty level and image of their preference. As the puzzle is successfully completed, users can explore information related to that image,
2. Cryptolexon. Words are hidden within a grid of random letters, which users are called to detect. As the words are successfully selected, multimedia content with descriptive text is provided on the screen.

4 Evaluation

The info-point systems have been evaluated in-situ with actual visitors. In situ studies facilitate the exploration of the actual usage of a system in its real environment [8] and have the potential to reveal how the environment itself influences user experience [9], while they can result in revealing more usability problems than laboratory evaluations [10]. The evaluation employed observations, semi-structured interviews with users and employees, as well as questionnaires that were handed to the info-point visitors. In particular with regard to observations, since there was no audio or video recording, detailed observation notes were kept by the evaluation observers in custom observation sheets.

Upon entering the info-point, visitors were informed about the evaluation aims, objectives and procedures. Those who orally agreed to be observed during their interaction with the systems were given an informed consent form to sign. Then, they were asked to continue their visit as they normally would, and only once they had completed their interaction with the info-point systems and/or with the staff for retrieving information, they were given the questionnaires to fill-in (one for each system they had interacted with) and finally they were interviewed.

Given that visitors were allowed to navigate in the info-point premises according to their own preferences and were not explicitly instructed to use all the systems, each of the systems was eventually evaluated by a different number and ensemble of users. A preliminary analysis of the results indicates that users found the systems fun to interact with and innovative, while they have suggested that in some cases additional useful information could be provided by the systems. Yet, it is interesting that despite the innovativeness of the employed interaction techniques, the majority of users easily identified how to interact and used the system without facing any significant obstacles or requiring assistance from the info-point employees.

The detailed analysis of the results from the evaluation of each one of the systems is an ongoing process and will be reported elsewhere, exploring three main hypotheses: (i) that the systems are easy to use with minimum guidance, (ii) that the interaction techniques employed by each system are natural to the users, and (iii) that each system yields a positive user experience [11].

5 Conclusion

This paper has presented the technologically enhanced City Information Point of Heraklion (Crete). In this context, eight interactive systems have been deployed that

provide a complementary view of the tourism opportunities, history and culture of Heraklion and Crete through a mixture of novel information visualization techniques, Mixed Reality interaction with augmented artefacts and playful interaction. The info-point is up and running since August 2014 and has been visited so far by more than 40.000 tourists. The info-point has been evaluated in situ in terms of usability and user experience. Preliminary findings justify the initial hypothesis that novel forms of interaction can enhance information provision capacity and increase the interest of users by providing more immersive and memorable experiences.

Acknowledgements. The installation at the Tourism Office of the city of Heraklion was funded under the action L 313-1, priority 4, of the Programme «Rural Development of Greece 2007–2013» - (LEADER). The development of the interactive systems presented by this research work was supported by the FORTH-ICS internal RTD Programme 'Ambient Intelligence and Smart Environments'[1].

References

1. Brignull, H., Rogers, Y.: Enticing people to interact with large public displays in public spaces. In: INTERACT 2003, pp. 17–24 (2003)
2. Mortara, M., Catalano, C.E., Bellotti, F., Fiucci, G., Houry-Panchetti, M., Petridis, P.: Learning cultural heritage by serious games. J. Cult. Heritage **15**(3), 318–325 (2014)
3. Vogel, D., Balakrishnan, R.: Interactive public ambient displays: transitioning from implicit to explicit, public to personal, interaction with multiple users. In: Proceedings of the 17th Annual ACM Symposium on User Interface Software and Technology, pp. 137–146. ACM, October 2004
4. Grammenos, D., Michel, D., Zabulis, X., Argyros, A.A.: PaperView: augmenting physical surfaces with location-aware digital information. In: Proceedings of the Fifth International Conference on Tangible, Embedded, and Embodied Interaction, pp. 57–60. ACM, January 2011)
5. Margetis, G., Ntoa, S., Antona, M., Stephanidis, C.: Interacting with augmented paper maps: a user experience study. In: 12th Biannual Conference of the Italian SIGCHI Chapter (CHITALY 2017). 18th–20th September 2017, Cagliari, Italy (2017)
6. Petrelli, D., Dulake, N., Marshall, M. T., Pisetti, A., Not, E.: Voices from the war: design as a means of understanding the experience of visiting heritage. In: Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems, pp. 1033–1044. ACM, May 2016
7. Grammenos, D., Michel, D., Zabulis, X., Argyros, A.: PaperView: augmenting physical surfaces with location-aware digital information. In: The Proceedings of the 5th International Conference on Tangible, Embedded, and Embodied Interaction (TEI 2011), Funchal, Portugal, 23–26 January 2011, pp. 57–60. ACM Press, New York (2011)
8. Fields, B., Amaldi, P., Wong, W., Gill, S.: In use, in situ: extending field research methods. Int. J. Hum. Comput. Interact. **22**, 1–6 (2007)
9. Rogers, Y., Connelly, K., Tedesco, L., Hazlewood, W., Kurtz, A., Hall, R.E., Hursey, J., Toscos, T.: Why it's worth the hassle: the value of in-situ studies when designing ubicomp. In: Krumm, J., Abowd, G.D., Seneviratne, A., Strang, T. (eds.) UbiComp 2007. LNCS, vol. 4717, pp. 336–353. Springer, Heidelberg (2007). https://doi.org/10.1007/978-3-540-74853-3_20

[1] FORTH-ICS AmI Programme: http://www.ics.forth.gr/index_main.php?l=e&c=4.

10. Nielsen, C.M., Overgaard, M., Pedersen, M.B., Stage, J., Stenild, S.: It's worth the hassle!: the added value of evaluating the usability of mobile systems in the field. In: Proceedings of the 4th Nordic Conference on Human-Computer Interaction: Changing Roles, pp. 272–280. ACM, October 2006
11. Margetis, G., Ntoa, S., Antona, M., Stephanidis, C.: Interacting with augmented paper maps: a user experience study. In: Proceedings of the 12th Biannual Conference on Italian SIGCHI Chapter, p. 18. ACM, September 2017