Digital information provision on Gastronomic Tourism

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Abstract: In this paper we present the design and implementation of a multi-modal solution for the promotion of gastronomic tourism in the municipal area of Heraklion city. The provided solution is comprised of standalone information systems accompanied by a mobile app for the presentation of thematic routes. By facilitating a rich knowledge base and a collection of audiovisual material, the applications allow the visitor to explore dimensions of tangible and intangible cultural heritage connected to gastronomy and plan a personalised experience orchestrated by their mobile device while on the move in the municipal area.

1. Introduction

The concept of sustainable development can be perceived as a convergence between economic development and environmentalism [1]. It was officially illustrated at the Stockholm Conference on Humans and the Environment in 1972 promoting the concept of eco-development [2]. Recently, growing emphasis has been placed on tourism experiences, the culinary tradition of a destination and the existence of indigenous products that could support a gastronomic destination [3].

In this paper, we focus on the region of Crete which has remarkable natural, cultural, and historical resources [4,5]. The main motivation behind this work is that although Crete as a destination is rich in resources, the island attracts, almost entirely, package tourism [6,7]. For instance, in 2002 the three main activities of visitors to Greece were swimming/sunbathing, dining outside the accommodation establishment, shopping and visitating cultural sites [8].

In the domain of gastronomy and tourism, several works have underlined that a large number of destinations use gastronomy as a tourism marketing tool, and may also use tourism to promote gastronomy [9]. At the same time, this has been identified as a meaningful marketing tool that could contribute to a market segment on a destination [10].

In this paper, we are addressing the need for gastronomic experiences on the island of Crete and in particular the municipal area of Heraklion city and the villages nearby. To support the vision of seamless information provision, we start from standalone information points in key locations at the municipality complemented with a mobile app available on the go while exploring thematic routes and gastronomic destinations.

2. Background and related work

During the past two decades, there has been an increasing demand for presentation and interaction technologies that could reshape the way we understand and interact with various forms of cultural heritage [11-15]. In this context, interactive installations have been presented as a means of extending the services provided by city information points and museums through the exploitation of various pure digital and Mixed reality experiences. At the same time, digital technology for CH is extending its applicability to include interactive systems that model gastronomy [19] as a recognised form of intangible CH strongly connected with the land and place of its origin [16-18].

Today, Augmented Reality (AR) can be considered as a new medium for storytelling, as it can gracefully blend digital content with reality [20-23]. Additionally, recently several technologies for VR-based access to digital information have emerged, including hybrid AR-VR virtual experiences [24-28]. An advanced example supporting multiplatform and multimodal presentation modalities including web, AR, and VR is the Invisible Museum that comes with an authoring platform that supports web-based collaborative virtual-museum authoring [29].

Accessibility of digital information for culture and tourism is today considered by researchers [30-34] in order to expand the target base of such information systems and provide compliance with standards on digital accessibility that tend to become a prerequisite with the effect of new legislation [36].

3. System Overview

The system is comprised of an AR application and a standalone kiosk-based application implemented on top of the Unity Game Engine, thus making the solution available for windows based kiosks, android based devices and iOS-based devices.

3.1 AR Application

The goal of the AR application is the promotion and presentation of the gastronomic tradition of a tourism destination the digital augmentation of thematic routes by connecting tourist information with the products and the geographic locations of their production. The visitor, using the application, has the opportunity to discover themed routes, as well as POIs present in them and explore their surroundings with a mobile device. The application integrates the map of each thematic route and displays points of interest (POIs) that are included in that route. It automatically associates the user's

location with POIs and displays them dynamically, grouped or individually, depending on the user's choices and location. Through AR the camera of the mobile phone can be used to discover these POIs in the surrounding space. This means that the landscape seen by the user through the camera of their mobile device is digitally augmented with the appropriate marker elements that correspond to their location and orientation. By selecting any of these items, corresponding information is displayed. Such information contains text descriptions and rich multimedia material such as photos, videos, 360 degrees assets, etc.

Routes and POIs are "filtered" through the user's profile, which includes, among other things, interests, the radius within which to look for points of interest, and whether they are immediately accessible (e.g. open wineries, restaurants, museums, workshops, etc.).

To combine sightseeing activities with gastronomy, the user can create routes and preview POIs that are precisely tailored to their food and drink preferences. City routes can be combined with a stop at a restaurant or a tavern, at a mezes tavern, for fast food, or for coffee and dessert to round out the user experience. For each point of interest, the system offers recommendations for places to visit nearby. In addition, the presence of wineries and vineyards, traditional tastes (e.g., local products and recipes), and gathering places (e.g., traditional coffee shops) can shape the suggested inland routes.

3.2 Interactive kiosk-style information systems

To accompany the AR app kiosk style information systems are designed to be operated within the city. A key feature of these systems is the presentation of interactive thematic routes consisting of historical and recreational points of interest, which the user can follow to discover and gain unique experiences during their visit. A route is an interactive map of several locations; for each of which, a brief description is provided together with relevant POIs that are accompanied by a short description and additional multimedia material.

In addition, the kiosks focus on the communication and promotion of local gastronomic specialities to the wider public, combined with their intangible dimension as manifested in works of folk art, customs and traditions. In this respect, users can create a personalized route that incorporates POIs aligned with their gastronomy, culture, or/and nature sightseeing preferences. To further promote gastronomy, the system also embeds recipes in textual and video formats, directly associated with specific routes, thus bringing to visitors the culinary customs and habits of different areas of the island.

3.3. Use case

The use case of the system was implemented and deployed for the heraklion municipal area and the sourounding villages. To this end the AR app has been parameterised with cultural context of the specific destination. Furthermore, for the on-site presentation of key points of the municipal area of Heraklion, four interactive systems have been developed and permanently installed in three villages of the municipal

area and at the city centre of Heraklion outside the central Information Point of the Municipality.

3.3 Design & Implementation

To ensure the usability and user-friendliness of the application, the human-centred design approach was followed and all international standards related to software usability were considered (ISO/IEC 9241-xx, 250xx [36, 37]). The iterative design was conducted in the form of interactive prototypes to achieve high-quality user interfaces. The essence of iterative design lies in continuous improvements. Therefore, iterative design can be represented as a cycle with three main components: i) Design, (which also includes phases of defining problems, ideation, empathizing and requirements specifications), ii) prototyping (mock-ups) based on these specifications and iii) the expert-based evaluation [38-40]. From an aesthetic point of view, the appearance of the applications, as well as the arrangement of their elements, followed a common theme and arrangement to create a uniform UX.

The mobile design was based on the design standards, principles and rules of Mobile Friendly Design to work with complete compatibility and ease of use on any device (tablet pc, smartphone, etc.). The implementation was done with cross-platform compliance in mind (for Android and iOS operating systems). For this reason, parameters were considered to ensure the responsiveness of the application, in each resolution, dimension and orientation of the device, always presenting a uniform image. The basic techniques of Mobile Friendly Design include, among other things, the automatic change of the layout of the application depending on the device used by the user as well as the adaptation of the content to different screen sizes (mobile phones, tablets, etc.). Also, the navigation logic was designed to be as intuitive as possible. This implies that the individual elements that make up the page as a whole (e.g. navigation menu, texts, video images, etc.) have been visually optimized according to the device so that they can be fully used with a limited number of keys and with the use of only one hand. Audits with usability experts were conducted to ensure the quality and functionality of the application

For the design of the info-kiosk application, the efficient and easy interaction of users on a touch screen was targeted. The viewing and switching of digital content were framed by an attractive graphical environment without burdening the system's response and without imposing a limitation regarding the computing power of the system. At the same time, the user's interaction with the application has been enriched with the use of audio assistance and the support of multilingual content. Furthermore, info-kiosks were installed in special showcases designed for each specific point of installation to support both indoor and outdoor usage. The showcases were designed using approved materials and were installed elegantly, and fully in harmony with the environment. The construction materials were specially selected to protect the equipment from natural disasters and vandalism. For the outdoor case, a vitrine was used, embedding all equipment to be protected and vandal-proofed. The interaction was supported through the installation of a touch foil on the outer side of the vitrine. The final results are presented in figure 1.

The mobile application has been developed using the Unity 3D platform. It is a powerful cross-platform 3D game engine which gives developers the capability to create applications for mobile phones, desktop computers, the web, and consoles. For AR purposes, the AR+GPS Location package has been used. This package brings the ability to position 3D objects in real-world geographical locations via their GPS coordinates using Unity and AR. It works by mixing both GPS data and the AR tracking done by AR Foundation, a cross-platform framework that allows the developer to write augmented reality experiences. In addition, the application uses the Mapbox Maps SDK, a collection of tools for building Unity applications from real map data. This package was essential to spawning the required data on the map of Heraklion.

(a) (b)

Figure 1. (a) Design of the info-kiosk, (b) Design of the vitrine display.

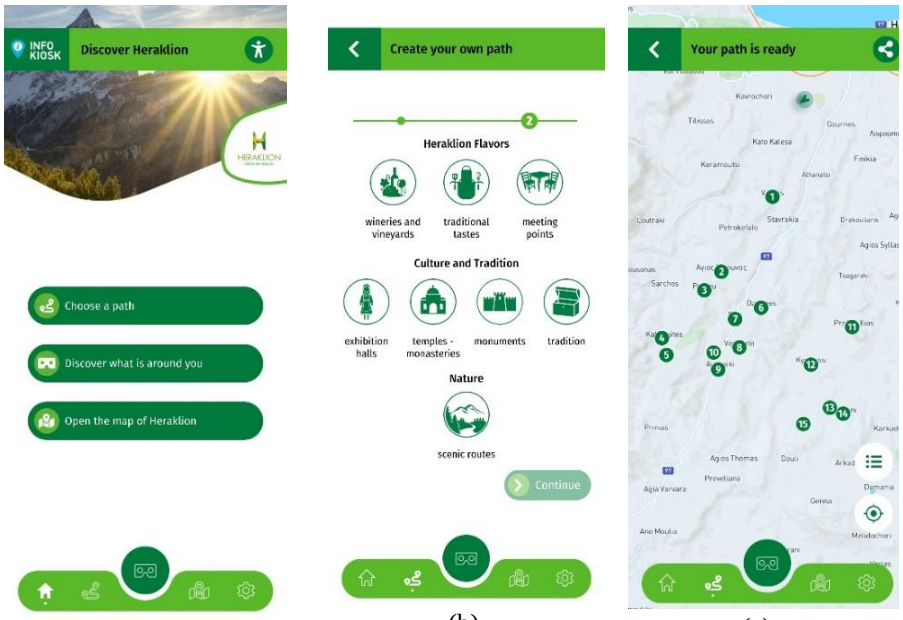
4. UI overview

Both the mobile and the standalone UI use the same look and feel to create a corporate look on the applications and support the same basic goals of accessing thematic routes and through them all the dimensions of gastronomy-related tangible and intangible CH. At the same time, they support the creation of personalised routes based on several criteria to allow visitors to create their travel plans through the supported destinations. The mobile app has the added functionality of map and AR-based visualisation of POIs and can be used while on the thematic route to visualise information within the landscape. Selected key features of these apps are presented in figure 2 and figure 3 respectively.

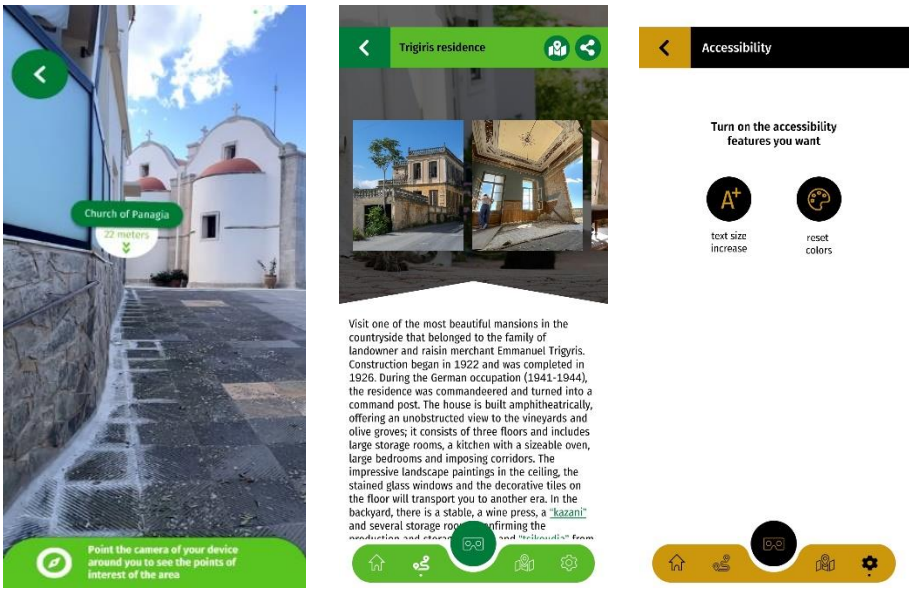
(a) (b)

(c) (d)

Figure 2. (a) info-kiosk home page, (b) Accessing a thematic route, (c) Information on a point of interest in the thematic route, (d) Creating a personalised route.



(a) (b) (c)



(d) (e) (f)

Figure 3. (a) Mobile App home page, (b) Create personalised route, (c) Preview the route on your mobile phone, (d) On-site AR information, (e) Information point details, (f) Accessibility options.

5. Evaluation

The AR and kiosk-based applications were evaluated using heuristic evaluation [43], which is an expert-based review method that is highly beneficial to eliminate usability problems before testing with representative end users [44, 45]. A small group of four evaluators examined the user interfaces to spot violations of established usability principles, commonly known as heuristics [46]. To find heuristic violations or other usability issues pertinent to the system, the evaluators performed multiple iterations. Each evaluator recorded the identified problems and specified the violated principles for each one. Then, all evaluation reports were combined into a single one, addressing each problem exactly once. To prioritize the problems, the evaluators reviewed the combined list and gave each problem a severity rating. The problems' final severity score was determined by averaging the results of each evaluator.

Results in each iteration highlighted usability problems that should be rectified, ordering them by severity. Given the multiple iterations, numerous problems were identified and corrected until a prototype was identified as usable. This section summarizes key lessons learned from the evaluation of the mobile AR application and the interactive info-kiosks.

When developing mobile AR applications, the following should be considered:

- When using the AR functionality, it is preferable to minimize the number of clicks required.

- Augmented elements indicating POIs should not be displayed too close to the ground to provide a better sense of distance.
- The timing of messages indicating the approaching of a point of interest should be carefully selected when multiple nearby points are present.
- A distance indicator is not useful, and in fact, it can even be disorienting when the user is at the point of interest or very close to it.
- It should be easy to return to the previous page and the back button should behave as expected when clicked.
- Text bubbles can be difficult to distinguish on mobile devices. It is better to use pop-ups.
- For optimal viewing experience of multimedia content, it is recommended to present videos and 360º assets in full-screen mode on mobile devices.
- To make page transitions smooth, common buttons should remain in a fixed position across different screens.
- When placing elements over images, a dark overlay should be used for optimal visibility.
- It is recommended to avoid large white spaces in frames and containers.

Likewise, the following factors should be taken into account when developing kiosk-based applications:

- Given the large screens, it is crucial to pay attention to the icons' resolution.
- Pop-up windows should close automatically when the user clicks outside of them.
- Putting buttons on the top area of the screen should be avoided because they may be difficult for some users to reach.
- For crucial actions, the user should receive confirmation. For example, when sending an email through a public system, they should always know if it has been sent.
- Personal user information should not be retained from screen to screen, unless necessary, taking into account the public nature of the system.
- A reasonable time of inactivity should be accounted for, after which the system will return to its home screen. This time depends on how information-heavy is the system and should be decided after trials with end users.
- Buttons relevant to a specific context, such as the next/previous buttons to move between POIs in a route, should be easily associated with the specific elements to which they are relevant, by placing them at an appropriate screen location.
- It is helpful to have a controller for 360º assets, considering that all interaction is touch-based.
- 360º assets should have a representative starting point, providing a meaningful first view to users.
- To prevent inadvertent activation of buttons, they should not be placed too close together.

6. Conclusion

In this paper, we have presented a multimodal approach to the provision of gastronomic information. We have developed two systems one mobile and and interactive kiosk-style information point. As a use case of these systems, we present the ones created for the municipal area of Heraklion city. In this case four standalone information systems we installed to organize and plan a thematic route while the mobile app targeted the provision of gastronomic information while on the go in the municipal area. Both applications are deployed in production and can be accessed within the city and from mobile app stores [41, 42].

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