Gamifying the visit to places with valuable landscapes

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Abstract

The landscape, in general, is full of meaning and has been studied over time by experts in different fields. In 1992, the landscape was considered a World Heritage Site with the designation of "Cultural Landscape". Despite this relevance, in many regions, there are places with valuable landscapes that are unknown to most of the population. This paper describes a mobile tool for finding and sharing places with valuable landscapes, which includes gamification components to motivate users to search for new places and share them. It is also presented an evaluation of the tool, in terms of user experience and including the assessment of gamification features. The tests were carried out in the Cultural Landscape of Sintra, considered world heritage since 1995

1. Introduction

The landscapes allow a better understanding of history, science, literature and other areas of study [1]. However, the value of a landscape is misunderstood, often being linked only to its visual aesthetic value, without being perceived of other important values associated with it, such as historical, social, ecological, cultural, economic and other values [2]. As a result of this relevance, in 1992, it was considered a world heritage site with the designation of "Cultural Landscape" [3].

Concerning museums or cultural sites with historical significance, there are several scientific works [4–7] and apps to guide and improve the experience of visiting these places. Most of the population know the museums and cultural sites of their region or at least knows where to look for them (e.g., google maps). We started this work by making three questions:

1. - Are museum or cultural site apps suitable for helping us find and share places with landscapes?

2. - Do we know all the places with attractive Landscapes in our region?

3. - Will gamification features help motivate users to search and share interesting places?

About the first question, we think there is space to built suitable tools for the cultural landscapes. The work described in this document is a proposal, which tries to answer all three questions.

This work consists of developing a mobile tools with gaming and social features, to support the visit of places with valuable landscapes. The application allows the user to access information about the location and ways to access the landscape site, a very brief description and the best conditions for visiting them, such as the time of the day and weather conditions. When a user is at a point of interest, they will have access to more detailed information about the landscape and calls of attention to important elements that increase their value.

This work was developed in the scope of a funding project in the context of the launch of the Landscape Museum in Lisbon.

The paper is structured as follows. Next section discusses the related work and the following section presents an overview of the mobile tool. Section 4 describes the user interface and the next section

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the gamification components. Section 5 presents and discusses the results obtained with the evaluation of the mobile application. The paper ends with the conclusions and future work.

2. Related Work

Gamification has been used in several areas. Recent reviews [8, 9] summarizes the main gaming techniques that has been used in many areas with positive impact. This paper uses gamification as a way of motivating people to find and to share beautiful places. In [10] is presented an experimental study that shows the effect of specific game design elements in motivation. Another approach to help/motivate users to find cultural heritage locations is proposed in [11]. It combines gamification with geo-tagged photos.

The work proposed in this paper also explores some features used in mobile guides [4, 5] and the use of games in cultural heritage sites [6, 7, 12], in the context of visiting places with interesting landscapes to assist the visitor in reading the several aspects of the landscape [3]. In [5] is proposed a mobile guide for cultural heritage sites based on pictures. It also includes augmented reality and sharing features that helps the visitor understand the place. One pioneer work including games in cultural heritage was proposed by Correia *et al.* [12]. This work had the goal of defining and implementing a platform for mobile storytelling, information access, and gaming activities. It was evaluated in a cultural heritage site in a tourism context.

Interesting state of the art reviews can be found in [6] for games in cultural heritage, and in [7] for serious games (educational objectives) for cultural heritage. Augmented reality [5, 13, 14] and mixed reality [15] are also essential features used to improve the user experience in cultural heritage points of interest. In [13] was proposed a work close to our proposal, focused on the relevance of the landscape and how technology can enhance the user understanding of its meaning. This work relates the climatic changes with the landscape changes and introduces a mobile app with some augmented reality features (audio and visual augmentation) to enrich the experience of the user. However, it does not use gamification feature.

There are many proposals for mobile guides or mobile applications in the context of visiting points of interest with gaming, social and augmented reality features. However, a landscape is not a museum and has a different meaning. For this reason, these proposals are not the most appropriate.

3. Mobile Application

To understand how gamification features can motivate the visit and the search for places with valuable
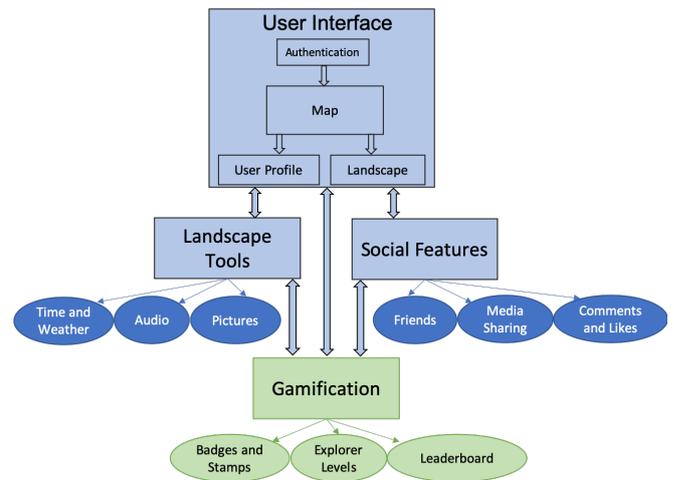

Figure 1. Mobile Application: Main modules.

landscapes, a mobile tool called **One More Place** was developed. Figure 1 presents the main modules of the application. It is composed of four main modules:

- **User interface** structured in four main panels:(1) authentication, (2) user profile, (3) map and (4) landscape;

- **Landscape tools** composed by a set of features based on several types of multimedia content to help to understand the landscape;

- **Social features** to help to share the places with interesting landscapes and relevant aspects related to the landscapes;

- **Gamification** components to motivate and encourage the user to discover and share unfamiliar landscapes.

Figure 1 summarizes the main features of each module which are described in the next sections. Social functionalities and the Landscape tools are described jointly with the user interface.

4. User Interface

In terms of navigation, after successfully authenticating, the user proceeds to the map panel, which is the main panel. From this panel, the user can access the user profile and the landscape panel.

4.1. Map

This panel consists of a map and markers that indicate, among other things, landscape locations, regions and the user's position (see Fig. 2a). The lower marker in Fig. 2a represents the position of the user on the map. The next marker (from the bottom up),
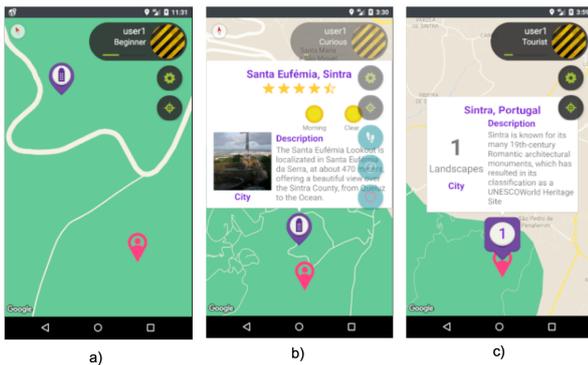
Figure 2. Map panel: a) general view, b) information window of the place, c) information window of the region.

Figure 3. Landscape Panel.

with a building drawn, represents a point of interest with a city landscape. When the user clicks on this bookmark, opens a window with information of the place (illustrated above the marker in Fig. 2b with the title Santa Eufémia, Sintra). At the top, on the right side of the panel is a clickable area with the user name, a user photo and the explorer level (gamification feature) of the player. If the user clicks on this area jumps to the user profile panel.

Zoom in/out operations can be performed using the interaction technique based on the two-finger movement. If the zoom is high, a less wide area on the map is seen. In this case, the markers represent points of interest (see Fig. 2b). If the zoom is low, a broader area on the map is viewed. The markers represent regions of places of interest (see Fig. 2c), to avoid too many visible information that could disturb the user experience.

Figure 2b shows an example of the information window for a point of interest. This window presents the title and region where it is inserted, better conditions for the visit, basic description, an image allusive to the landscape and the landscape type. On the right side, there are three main buttons (three lower buttons). These buttons are used to get directions to the point of interest, to access the landscape panel (if it has already been visited), and to add the landscape to the "wishlist" (landscape list that the user wants to visit). Figure 2c presents an example of the information window for a region.

In each position, the user can see the nearest places of interest defined by a circumference of 10km radius centred on the user's location. Areas of interest are represented by markers (regions or points). The visual appearance of the markers reflects the type of landscape they represent [**?**].

To guide the user to the nearest point of interest, when the user is close to (in our tests, less than 500 meters) a place receives a notification (see Fig. 2a). When the user is less than 100 meters the application
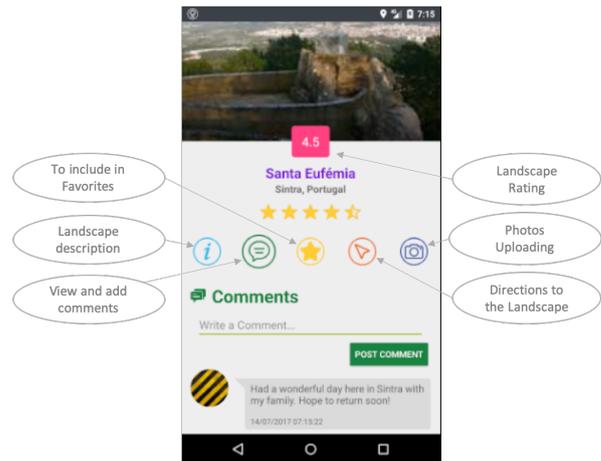
allows the user to have access to the information window of the place (see Fig. 2b). This window has orientation clues (direction arrows) to help the user finding the place.

4.2. Landscape

In the landscape panel, the user can access the contents of a given point of interest. Users can consult this information and add new content, such as comments, photographs and assign ratings. The layout of the landscape panel is shown in Fig. 3. Through a swipe gesture over the image at the top, it is possible to visualize an image set shared by users of the application. It is also possible to enlarge one image by pressing on it.

Below the image is a rectangle indicating the average landscape classification. The user can rate the landscape by assigning a score between 0 and 5, by filling in the stars below the landscape name. There is also a button set that allow the user to perform a series of actions. More details can be found in [**?**].

4.3. User Profile

This panel allows changing the user profile information, such as the profile image. Figure 4 illustrates the layout. At the top, two buttons are available for these actions. The button to the left of the profile image allows editing some of this information. The button to the right of the profile image allows to open the gallery of the mobile device and choose a new profile image. Under the user picture is a set of buttons, where the user can click to see different information and contents. More details can be found in [**?**].
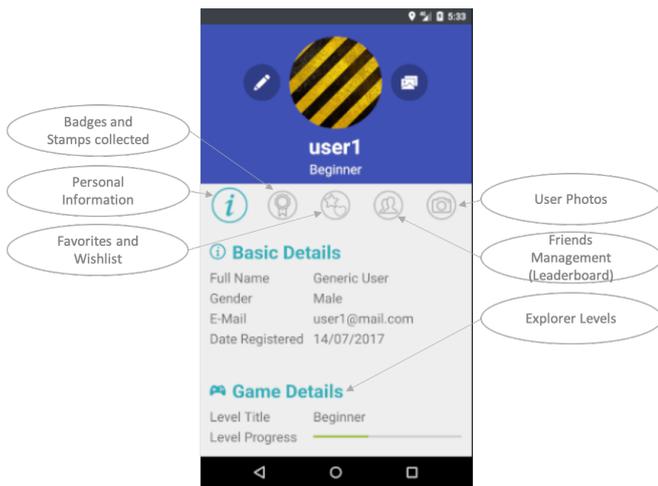
Figure 4. User profile layout.

Table 1. Scores awarded to the user actions.

Action	Scoring (points)
Visit a landscape	100
Add a photo	50
Make a comment	25
Rate a landscape	10

Table 2. Explorer levels – Maximum is equal to the maximum integer that can be represented with 32bits.

Level	Title	Minimum Score	Maximum Score
1	Beginner	0	499
2	Curious	500	1499
3	Tourist	1500	2999
4	Traveler	3000	4999
5	Adventurer	5000	7499
6	Explorer	7500	Maximum

Figure 5. Sintra Mountains: several types of landscapes

5. Gamification

The gaming features aim to improve the motivation and the engagement of the users in the search and sharing of places with beautiful landscapes using the mobile application. Following these objectives, four types of gamification techniques are implemented:

- **Scoring system** - to differentiate users and reward the users who most actively explore and use the application. To increase the score, the user has to perform a set of actions (see Table 1);

- **Explorer levels** - to users with the player's style of "Explorer", which are moved by curiosity and like to discover things that no one else knows. Table 2 presents the explorer levels implemented, which are based on the scoring system;

- **Badges and stamps** - to users with the player's style of "Collector" that like to collect everything. When visiting a place, the user receives a stamp representing it, and gets a badge for visiting all the landscapes of a region;

- **Leaderboard** - to users with the player's style of "Competitive" that like to compete with others and to be better than others. The user score are presented in a leaderboard with the score of his friends. Users score are obtained using the scoring system.

All these gaming features are used to encourage the search for new places. The scoring system, the explorer levels and the leaderboard are related to the social component. Therefore, they also are used to motivate the sharing of places with exciting landscapes. All the gaming components are available in the user profile panel. The user level is presented in all panels.

To further captivate the user, level progression becomes a harder task to higher levels (see Table 2). However, this level evolution can not be impossible because it can create frustration and lead users to give up. The rewards can not be too high either, because if the game component is too easy, users lose interest.

6. Evaluation and Discussion

To evaluate our proposal, several user tests were carried out in a real context, that is, in the area of Sintra region, Portugal, which has been considered a Cultural Landscape by UNESCO since 1995. Sintra is one of the richest areas of Portugal in terms of landscape diversity (see Fig. 5). It includes natural coastal landscapes, mountain, several historical monuments and mixed landscapes (urban and natural). The main objectives of these tests are focused on the user experience of the application, including the usability. At this stage, the gamification features are evaluated in this context. Future studies will focus on the long term impact of the game components.
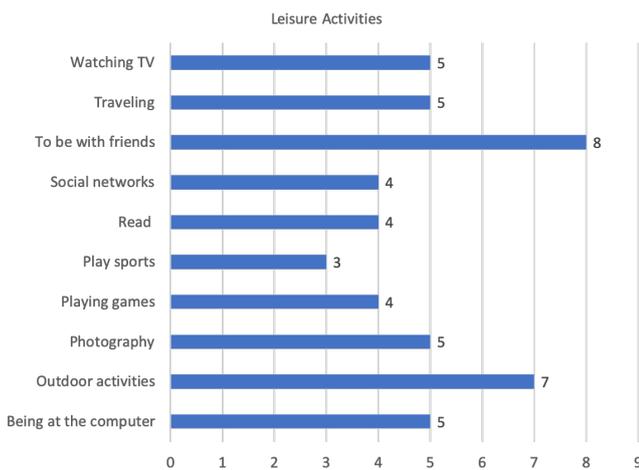
Figure 6. Participant answers to the question about leisure activities.

6.1. Methodology

The tests were accomplished individually by each participant, always using the same smartphone where the application was previously installed.

In the beginning, users were briefed about the objectives of the test. Then, they were guided by one of the facilitators that followed a set of tasks defined in the questionnaire. After completing the tasks, the participants answered the questionnaire.

Tests lasted for a minimum of 20 minutes and a maximum of 30 minutes each, depending on each user's curiosity and engagement in the test.

6.2. Participants

The tests were performed by 10 participants living in the Sintra area. The participants in this experiment ranged in age from 16 to 46 years old (20% of participants are over 30 years of age). Most of the participants claimed to use mobile applications on almost every day (70% of the participants). One of the users under 31 years and the two participants over 30 years of age are the users that rarely use mobile apps. To better characterize the participants it was asked what activities they like to do in their leisure time. Participants were asked to select from a list of ten, their leisure activities, without limitation on the number. Figure 6 shows the answers given by the respondents. The majority of the participants said they like to be with friends (80% of users) and to do outdoor activities (70% of the users). Only four users mentioned they used to play games in their leisure time.

All participants had their first contact with the application during the test and used it under similar conditions.

6.3. Questionnaire

The questionnaire is composed of three different parts:

- User characterization - composed of a set of questions to capture personal and demographic data;

- Tasks - this part guide users during the experience, explaining the tasks they should accomplish and obtaining their experimental feedback. Users should carry out three tasks : (1) map navigation, (2) landscape appreciation and (3) user profile exploration;

- Overall assessment of the application.

The majority of the questions are Likert-type scale questions. Open questions were also included but the context was not the best for the users to write elaborate answers.

6.4. Results

Concerning the first task, participants are asked to perform zoom operations, to identify the user marker on the map, to identify a point of interest marker on the map, near the place where they are physically, and to go to the physical site of the landscape defined on the map.

Participants answered a set of question-related to this task, and the opinions are positive in the majority of the questions. Most of the participants (80%) mentioned they had no difficulties in performing the task. Two usability problems were detected and corrected [?].

Following the previous task, participants headed for a point of interest identified on the map. Next, they are asked to appreciate the landscape and to use the application (landscape panel) to have a greater awareness of the beauty of the landscape (second task).Following this, the participants answered a set of questions related to their experience. In general, the results obtained are good. Most participants considered they had a positive experience when using the landscape panel at the physical place of the landscape.

The user profile panel was evaluated regarding its contribution to improving the experience of visiting a point of interest, including the assessment of the contribution of the social and gaming features. Participants are asked to explore the user profile panel, including to navigate to the leaderboard. A set of initial questions are asked regarding the user interface usability. In general, no participants reported difficulties navigating the panel. When asked about the gaming features, two users did not agree with the inclusion of them in the application.

Then, the participants answered several questions related to their experience. The main questions are listed below:

Table 3. Statistics obtained from the participants answers about the user profile panel.

Questions	Median	Mean	Standard Deviation
Q5	4.0	4.0	0.82
Q6	3.5	3.5	1.08
Q7	4.0	4.0	0.94
Q8	4.0	4.0	0.67
Q9	4.0	4.1	0.57

- Q5 - How do you rate the experience with the user profile panel?

- Q6 - Do you consider the functionality of the leaderboard suitable for the context?

- Q7 - As for adding friends, how do you rate the experience?

- Q8 - As for the search for a user, how do you rate the experience?

- Q9 - How do you rate the navigate experience on the friend requests page?

Table 3 presents statistical measures obtained with the participants' answers, using a 5-point scale, where 1 (one) means "bad" and 5 (five) means "excellent". Although the results are generally positive, questions Q6 and Q7 did not have consensual answers by the participants . Users are divided regarding the part of the gamification (Q6 question). Some participants think that it is unnecessary and that competitiveness is a negative aspect. Others consider a fundamental part in motivation, and that competitiveness is something positive.

After these questions, the participants had a space to write some suggestions or comments. Below, it is presented two of the sentences written by the participants with a negative opinion regarding the gamification features:

- *"I do not care much about the competition, I do not care much about the leaderboard."*;

- *"I do not think the existence of a leaderboard makes the game healthy."*.

The use of gaming features are not well accepted by 2 participants. Although it was only 2, this feedback was valuable. Based on these results, the gamification features have been put into the application more discreetly, and no user is required to use them. Thus, users who do not appreciate these features can continue to use the app.

Participants were asked to perform an overall evaluation of the user interface in what concerns design (aesthetic aspect), usefulness in terms of experience in visiting a landscape site, the relevance of the social

Table 4. Statistics obtained from the participants answers related to the overall evaluation of the application.

Questions	Mode	Mean	Standard Deviation
Q10	4.0	3.9	0.74
Q11	5.0	4.1	0.88
Q12	3.0	3.7	1.01
Q13	4.0	4.1	0.57

features and contribution of the gamification features. The most relevant questions are listed below:

- Q10 - How do you rate the user interface design?

- Q11 - How do you rate your overall experience?

- Q12 - What do you think about the game component of the application?

- Q13 - What do you think about the social component of the application?

Table 4 presents statistical measures obtained with the participants answers on a 5-point scale. In question Q10, 1 (one) means "bad" and 5 (five) means "excellent", in question Q11, 1 (one) means "frustrating" and 5 (five) means "gratifying" and in questions Q12 and Q13, 1 (one) means "boring" and 5 (five) "motivating".

As in previous results, the use of gamification features is the most controversial part. In terms of user experience, the most given answer was 5, which is an interesting result. Finally, the social component also receives positive feedback from the participants. These confirm the current common habit of the users in using social networks in all contexts.

When the participants are asked if the experience of visiting and enjoying a landscape was enriched by the use of the application, everyone responded positively. At the end of the questionnaire, the participants are asked if they wanted to add anything else. Again, the gamification characteristics were subject to contradictory comments.

7. Conclusions and Future Work

This work describes the One More Place application, which uses gamification components to motivate the search and sharing of places with interesting landscapes. It also presents the study conducted to evaluate the application in terms of user experience, including the use of gamification features.

In general, the main objectives of the process conducted to develop the application were achieved, since all the participants, in the tests, consider that they learned and realized things (related to the value of a landscape) with the application that would otherwise not understand.

The social features were better accepted by all but some participants are distracted by these components. The gamification characteristics accounted for the most controversial application. More competitive users gave positive feedback. Other participants who enjoy enjoying the beauty of the landscape did not like anything about this component.

Future work includes long term evaluation of the gaming features. From the observation of the behaviour of the users raises clues for the inclusion in the application of augmented reality features combined with the gamification components.

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