# Motivating Cultural Heritage Artifacts Presentation Using Persuasive Technology

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*We have developed an information system in the scope of a project for the preservation and popularization of architectural heritage. The system aims at promoting archaeological tourism and contains a mobile application and an interactive on-line application. The mobile application guides the user on a pre-prepared learning paths and draw attention to the points of interest in the vicinity. At each point of interest it proposes to the user a choice of the level of information, he wants to learn. The user is motivated using persuasive technologies. The backbone of the system is a web server which serves as a main entry point for adding paths into the system and as a feeder of the data for both the mobile and online application.*

*Povzetek: V sklopu projekta za ohranitev in popularizacijo arhitekturne dediščine smo razvili informacijski sistem. Sistem, namenjen spodbujanju arheloškega turizma, vsebuje mobilno in spletno aplikacijo. Mobilna aplikacija vodi uporabnika po v naprej pripravljenih učnih poteh in ga opozarja na arheološki točki v bližini. Na vsaki točki, aplikacija ponudi uporabniku izbiro, koliko informacij želi o posamezni točki izvedeti. Uporabnik je motiviran k obiskovanju predstavljenih točk s prepričljivimi tehnologijami (persuasive technologies). Hrbtenica sistema je spletni strežnik, ki služi kot glavna vstopna točka za dodajanje poti v sistem in kot pošiljatelj podatkov tako mobilni in spletni aplikaciji.*

## 1 Introduction

In the area of the Roman maritime villa and its background there is an extensive web of specimens of cultural and natural heritage of immense value nationwide. The archaeological site of "Simonov zaliv" (The Bay of St. Simon) was first mentioned in the 16th century. In the past years some activities were conducted for the valorisation and promotion of the site; since 2010 the University of Primorska, specifically the Institute for the Mediterranean Heritage of the Science and Research Centre is responsible for the management of this monument (owned by the Municipality of Izola). The Project AS – Projekt Arheologija za Vse, Project Archaeology for All[1] – tries to establish a modern archaeological park through these steps:

1. restoration, conservation in protection of the archaeological site Simonov zaliv;
2. education and training in the field of archaeological didactics and enhancing public awareness on the meaning of archaeological heritage;
3. enhancing and improving the accessibility of the monument;
4. planning tourist itineraries connecting archaeological sites of the Slovene coast, thus enhancing the appeal of this particular area in the segment of archaeological tourism.

The last two steps propose, among other activities, creation of an interactive on-line and mobile platform that enhances archaeological awareness and supports archaeological tourism. This paper presents the latter. A mobile application that guides the user through prepared archaeological paths with the accompanying server framework that enables input of paths and materials for each site. The server framework serves the mobile applications with new data on demand.

The paper is organized as follows: motivation is presented in Section 3 followed by the description of the methodology used in design and implementation of the presented system described in Section 4. Section 5 summarizes the achieved goals and presents a typical use-case. Section 6 discusses the results and presents the future work.

[1]Project Archaeology for All: `https://www.project-as.eu/sl/`

# 2 State of the art

Persuasive technologies [1] and Gamification [2] in particular was used to

A critical review of the gamification trend in tourism, the concept of gaming and gamification, intrinsic and extrinsic motivation of gamification elements and benefits of gamification are presented in [3]. A set of best practices of the application of games and gamification concepts, to create innovative products and services for the travel and tourism industry is presented in [4] and in [5]. A similar approach using gamification with geographical maps is the Geocaching initiative with a big community [6].

# 3 Motivation

The application will guide the user through existing and new walking and cycling routes, which are established in the Municipality of Izola and surroundings. User's attention will be focused to the fascinating natural and cultural points of interest along the way, with an emphasis on culture. The app will offer a good addition to the existing cycling and walking infrastructure trails (a few such tracks are described on the web and printed leaflets), and form the basis for possible further development of the entire network of trails. The application will alert the user to the point of interest and offer a choice of three levels of information enabling information presentation according to user's interest. Textual information will be supplemented with visual and video materials. The application will be distributed via the Internet or in the park – the starting point of the archaeological site. Three routes are currently prepared:

- circular walkway San Simon – Strunjan (a combination of P13 and P14 routes from the Slovenian net of hiking rotes),
- circular cycling route San Simon – Korte – Baredi (K16 - cycling route),
- route visiting Izola's cultural monuments (walk around the city).

# 4 Methodology

## 4.1 Requirements

These were the requirements at the start of the project:

- Mobile application that supports the two most used mobile platforms:
  - Android,
  - iOS;
- Ability to get new paths with no installation process;
- Seamless updates;
- Simple installation process;
- Simple, yet powerful object administration, possibly using on-line applications;

## 4.2 Point of interest

The points of interest (POI) were selected by te experts (historians and tourist guides), multimedia and text materials were gathered for each POI. We opted for a three-layer textual description accompanied by a gallery of images and an optional gallery of videos.

## 4.3 System architecture

The architecture of the whole system is presented in Figure 1 with the web page (web server) as the integrating part. Mobile application is installed from the web page or from the application store (Google PlayStore[2] or the Apple store[3]). The mobile application "AS" retrieves new paths from the web server. The paths with the accompanying objects are prepared and monitored from the Heritage Information Catalogue – HIC [7] and all changes are automatically propagated to the web server and the mobile apps.

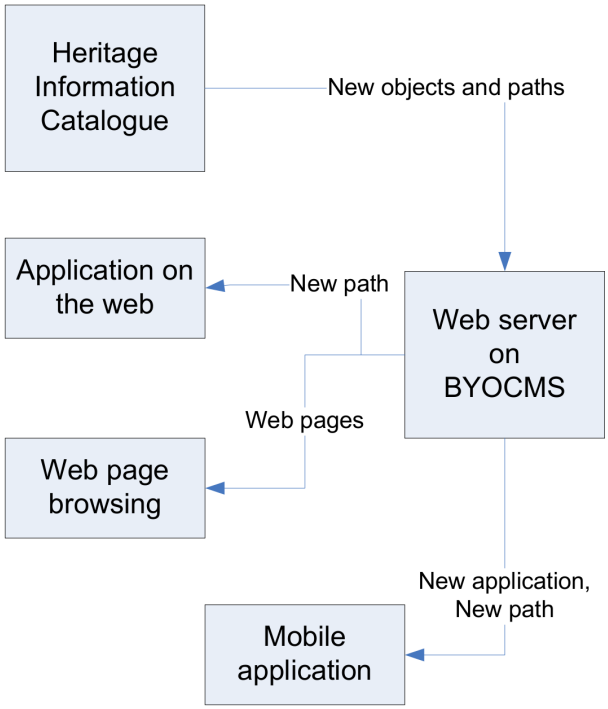


Figure 1: The architecture of the whole system with the web page as the integrating part.

## 4.4 Interfaces

The communication between system entities relies on an open REST API[8]. The answers to the API requests are in

[2]Google Play store: `https://play.google.com/store`
[3]Apple App store: `https://www.appstore.com/`

JSON[9] format. An example API call with the resulting reply is shown in Figure 2.

```
API request:

https://www.project-as.eu/api/path/get_paths

Reply:
[
{
"name":"Prva izolska pot",
"id":0
},
{
"name":"Druga izolska pot",
"id":1
}
]
```

Figure 2: An example API call with the resulting reply.

The paths with all data describing the archaeological sites (the images and videos are linked as urls linking to the Project AS web page) are encoded in standard GEOJson[10] and can be exchanged with other services. The first implementation of such service is our web page that displays the same data as the mobile applications. Part of such path is presented in Figure 3.

```
{
"type":"FeatureCollection",
"features":[
{
"type":"Feature",
"properties":
{
"name":"Izola 2",
"time":"2016-09-09T12:35:51Z"
},
"geometry":
{
"type":"LineString",
"coordinates":[[13.647916316986,45.533476766486], ...
```

Figure 3: Part of an actual GEOJson encoded path.

## 4.5 Heritage Information Catalogue

One of the goals of the HIC project was the construction of a publicly accessible multipurpose platform for storage, management and sharing of natural and cultural heritage artifacts. The system was populated with more than 4000 objects. A new interface for path definition and a new set of API calls for path management added to the existing infrastructure for the purposes of the Project AS. An example usage can be observed on Figure 4.

## 4.6 Web page

The web page is based on a proprietary Content Management System – CMS[11] Build Your Own CMS – BYOCMS[4], developed by the CORA Centre at the University of Primorska. It relies on open source technologies: AngularJS[12] for the single page app web development, CodeIgniter[13] for the backoffice development; MySQL[14] for the storage and Apache[15] as the web server. An example web page is presented in Figure 5.

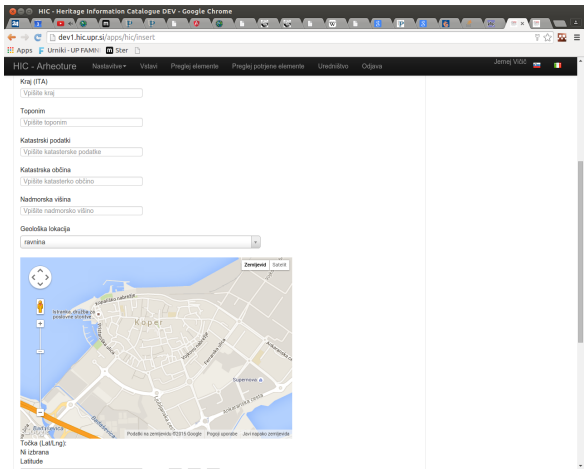


Figure 4: An example usage of the HIC platform for the input of heritage artifacts.

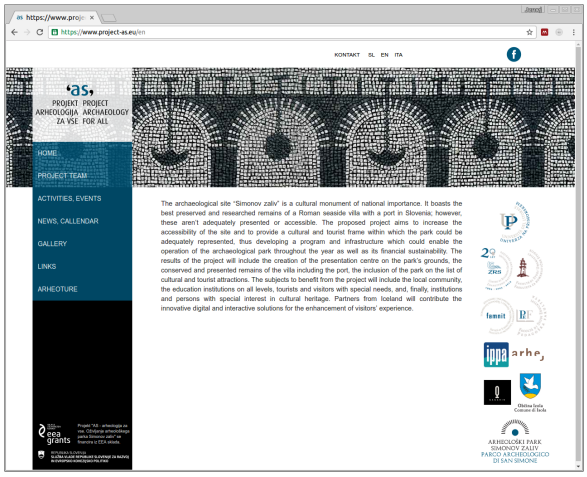


Figure 5: An example web page for the AS project.

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## 4.7 Mobile application

Seamlessly download new paths and inform the user of new possibilities. We opted for a non aggressive approach meaning that the paths are downloaded only at the application start and at a user intervention – by clicking of the appropriate button. Scores are synchronized in the event of a path correction, the path statistics is also updated at that event. All technology for mobile application is based on JavaScript language and Node.js library, more specifically on the module npm from Node.js library that allows the

[4]BYOCMS: http://cora.iam.upr.si/en/byocms

developer an easy setup of the initial development environment on any (UNIX) operating system. We prepared the final version of the development environment, based on the Ionic environment [**?**] that is based on libraries Cordova[**?**] and AngularJS. Such an environment enables applications implementation for the two most widespread mobile platforms. The same code was used to set up the application on the website. The code is the same, but the functionality is limited partly because the web application is not intended as an on-field tools. It is designed to offer rapid overview of the offered paths that can be later visited by the mobile application.

### 4.8 Motivation using persuasive technology

The technology has been used in many tasks to persuade people and motivating them toward various individually and collectively beneficial behaviors. There are two dominant conceptual paradigms: persuasive technology [1] and the more recent gamification[2]. For the purposes of this paper we will use persuasive technologies and rely on studies such as [2] despite these differing titles, the conceptual core of both paradigms incorporates the use of technology that is aimed at affecting people's/users'. The concept of gamification is defined as the use of game design elements and game thinking in a non-gaming context [16]. Motivation is a central topic in gamification as gamified systems are implemented to change behavior for wanted and desirable activities, in our case the user involvement into historic artifacts discovery. Extrinsic motivation focuses on applying game elements into a non-gaming context to stimulate external motivation. Second, game thinking and motivational design has a positive influence on intrinsic motivation as it is done because of an internal desire to play [**?**]. The main goal of the mobile application is to engage the user into active discovery of the architectural heritage of the presented area. Three paths were prepared in the scope of the project till now and a few are still in the progress of development. The user is involved into active discovery through persuasive technology [1]. The user is collecting virtual rewards (treasures) by visiting the predefined sites along the path. The application is keeping score of the found (visited) sites and produces reports about the progress of the journey. The final objective of the application is to collect as many as possible objects from the path resulting in visiting all the sites presented by the path.

## 5 Results

The platform presented in 4 with the accompanying applications and the multimedia materials were made as one of the actions of the Project AS. The platform was created with the upgradability and updating as one the most important criteria. Three paths with the accompanying objects were prepared at the moment of writing this paper and new objects are already prepared. The system as presented in 4.3 is deployed and being used on a regular basis. The paths with the accompanying objects are prepared and monitored from the "Heritage Information Catalogue". The mobile app will be available for download from the project web page or installed from the Google Play Store and the Apple App Store.

### 5.1 Typical use case

A typical use case would involve a visitor intrigued by the invitation from the web page, installing the mobile application. The application presents a map that guides the user along the path. The user follows the path on the application from an artifact to the next and earns involvement points. The application also follows basic statistics such as the percentage of the visited path, the percentage of found artifacts along the path. A non-completed path viewed from the mobile application is presented in Figure 6, new entries are being added to the path in the time of writing of this paper.


Figure 6: A non-finished path from mobile application, additional elements will be added later.

## 6 Discussion

Persuasive technologies and gamification have been used quite frequently in tourism applications the last few years. Massive communities have formed around gamification systems such as Geocaching. A mobile application implementing gamification techniques has been developed following these findings. The application is still in testing

phase, the local testers (project members) were very interested in the usage and happily finished the presented tasks (receiving virtual presents - gaming points). The presented system is already deployed and first test installations were already done. The starting programming and interface errors have been addressed and the application with the underlaying platform will be made available to public in the next months. Three paths have been constructed at the moment and test users have already used the application through the paths (they managed to collect all the virtual treasures). All three tracks are fully accessible, no obstacles have been found on the test runs. The mobile app is being registered to the application stores. The whole framework can be used for new applications, the input system was designed to describe all natural and cultural heritage artifacts, the open APIs and standard interfaces allow easy data sharing, the mobile application can be upgraded with new paths with no need for additional installation.

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