The Protected Urban Planet App "PUP Sight Guide": Amsterdam as Case Study

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Abstract

In this paper we present a prototype of a mobile guide called *"PUP Sight Guide"* that can help the visitors of the cultural heritage sites to discover them in a personalized way. PUP stands for *Protected Urban Planet*. As a case study we take *Amsterdam*, a *World Heritage City*, i.e. a city that includes urban areas designated as World Heritage (WH). We base our example scenario on (1) the knowledge gained within the CHIP project (Cultural Heritage Information Personalization/Presentation) and the CHIP software originally developed for the museum environment, and (2) on the data about *the Seventeenth-century canal ring area of Amsterdam inside the Singelgracht* (Amsterdam, the Netherlands) gathered by master students of the department of Built Environment in Eindhoven University of Technology, the Netherlands.

1 Introduction

The paper is part of a series of papers that result from a very fruitful cooperation between researchers from the department of the Built Environment and the Department of Mathematics and Computer Science at Eindhoven University of Technology, the Netherlands. It proposes an innovative city guide application for World Heritage (WH) cities.

Many people prefer to explore cultural places such as cities, museums on their own rather than following a tour guide with a (large) group of people. For some, an individual (human) tour guide is a better option but not everyone can afford that. Furthermore with the wide spread of smartphones, mobile audio tour guides are gaining much popularity. The focus of

this work is on *city* guides that can be used by locals and tourists to find out more about a UNESCO WH property located in or at the outskirts of an urban area, in this case about "The Seventeenth-century canal ring area of Amsterdam inside the Singelgracht" in Amsterdam, The Netherlands[1].

Many GPS-enabled mobile city guides can be found by now e.g. TripAdvisor[2] who is even cooperating with UNESCO to raise awareness and provide feedback on WH Properties but also mTrip[3], Pocket Guide[4], Layar[5], etc.. When the visitor approaches the point of interest (POI) in the city the guide automatically starts telling a story about it based on the current visitor's geographical location. The city can be made visual in a mobile city guide application in many different ways [Lewi2011]. PocketGuide e.g. provides a 3D visualisation of the static predefined tours and apps such as Layar add augmented reality onto the real-world. In the presented application however, we do not plan to implement advanced visualisation features - we consider that while following the tour the visitor should spend more time looking at the POI while listening to the story and interact less with the device unless (s)he wants to give ratings to POIs or to topics describing them such as architects, architectural styles, etc.. The focus is more on discovering users interests e.g. through collecting feedback in terms of ratings, quizzes and applying this knowledge for creating personalized tour(s) through the city as well as for feedback on the visitor perception and/or the state-of-conservation of the WH property itself.

In most existing city guides downloadable from app stores the way cultural artefacts, facts and places are presented, is often predefined, in static routes. The data is presented to every visitor in the same way. The application does not take into account visitor's preferences, interests (e.g. general visitors versus visitors interested in certain topics), information about visits to other cities (what the visitor liked and disliked in those cities) and neither does it involve contextual data - weather, time of the day, year, or public transport options. On the other hand, *adaptive systems* provide personalized access to various kinds of information. Examples of adaptive mobile city guides can be found in [Cheverst 2002], [OHare2003]. They store information about the user in the so-called *user models* and apply it for adapting *navigation*

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1 " http://whc.unesco.org/en/list/1349

2 http://whc.unesco.org/en/news/561/

3 http://www.mtrip.com/

4 http://pocketguideapp.com/en/city/map

5 http://www.layar.com/what-is-layar/

(links structure), *content* (e.g. fragments of text can be conditionally included/excluded) and *presentation* (layout) [Knutov2012]. It does not mean however that innovation and integration is no longer possible or needed in the field.

The architecture of the app will be built based on the knowledge and experience in developing tour guides for indoor environments gained within the CHIP project[6] (CHIP stands for Cultural Heritage Information Personalization). Within this project a prototype of a personalized museum guide was developed for the Rijksmuseum in Amsterdam.

1.1 Amsterdam as a case study

At the moment the UNESCO WH List includes 962 heritage properties, 745 cultural, 188 natural and 29 mixed properties. This list is growing steadily, adding about 25 properties annually. Nearly half of the current properties are located in urban contexts. Currently there are already over a thousand urban settlements that have protected areas, inscribed on the UNESCO WH List, located in or at the outskirts of their urban areas [PereiraRoders2010], and a database of them is being built up on Protected Urban Planet website[7].

For this paper the 17th-century canal ring area of WH city Amsterdam is used as a case study. Many WH cities increasingly gather large groups of people, either local or foreign, that are interested in discovering more about that heritage of international cultural significance [Dallen2011]. Such significance is considered of outstanding interest for the whole of mankind [UNESCO1972] and it is described in official texts provided on the UNESCO website such as the Decision File (DF) the Nomination File (NF) and the Advisory Body Evaluation (ABE). It is however often not easy to locate this cultural significance, without prior knowledge, when one is on site. The proposed PUP Sight Guide would bridge this gap by locating this cultural significance within an urban context and as such show visitors where those most special heritage assets can be found, and explain why they are so outstanding.

2 World Heritage Cities

A WH Property is listed for it being of Outstanding Universal Values (OUV). OUV is considered the broadest level of cultural significance, to be preserved as part of the WH by

[6] http://www.chip-project.org
[7] http://protectedurbanplanet.net

mankind as a whole [UNESCO1972]. OUV are conveyed by attributes. The reasons why a WH Property is culturally significant are often called cultural values [PereiraRoders2011]. The "qualities and characteristics seen in things - in particular the positive characteristics" [Mason2002] – embodying cultural values are defined as at- tributes, of which two types have been defined: tangible and intangible. The tangible attributes regard the legacy of physical artifacts such as "form and design, and materials and substance". The intangible attributes regard non-physical aspects related to the cultural heritage properties, such as "use and function, traditions, techniques; location and setting, language, and spirit and feeling" [UNESCO2011]. Every WH Property has such attributes and values, and those will be presented in the application as the most oustanding universal characteristics of the city.

This article takes the WH city as point of departure, instead of the specific site e.g. the city of Amsterdam instead of only the Canal Ring Area. This allows for a different ways of organizing the setup of the application, related to the city and not the site. It is expected that for a city guide application it would be more user-friendly to start from the perspective of the city. For example: a city can include multiple WH properties (e.g. e.g. Tower of London, Maritime Greenwich, and the Royal Botanic Gardens, in London, UK), and this way all properties, as well as, their context (e.g. indicated key views, buffer zones, related conservation areas) are included. Such urban view also allows the user to have the overview on the spread or concentration of sites, and specific attributes and values across the city. Last, the application could in the future be upgraded to integrate attributes and values that are listed at the national or local levels.

A research seminar (8 weeks) was taught to a group of ten MSc students in Architecture, Building and Planning (Department of the Built Environment). They built a small database of attributes that could be used to design a 1.0 version of the personalized and innovative city guide, that distributes and uses data on the attributes that convey the OUV of a WH property, using the Amsterdam Canals as a case study. By revealing, mapping and categorizing a selection of these elements of OUV the understanding of what is of value is converted into the easily accessible application.

2.1 Mapping attributes

The cultural significance of OUV conveyed by the Amsterdam Canal District can be found described in the Decision File, the Nomination File and the Advisory Body Evaluation[8]. The attributes and values are normally not literally summed up in the documents that underpin an inscription on the WH list. Therefore, the attributes and values first need to be revealed by text analysis. The method used to reveal such list of attributes and respective values is the cultural values survey [PereiraRoders2007], [Tarrafa2012]. Comprehensive analysis using the cultural values survey [Swart2012] reveals a list of over 400 attributes in the city of Amsterdam. For testing the app, a small number of attributes was selected to be mapped to build up a database on the canal zone that would be comprehensive enough to use for a case study, though compact enough to allow a group of ten students to map those attributes in the city by means of fieldwork.

The ABE and NF for the Canal Ring Area often reference to the visual appearance of the property formed by the collective composition and the individual characteristics of facades (attribute) in the streetscape e.g. "The rows of unbroken façades create a rhythmic impression, due to the repetition of their widths, the similarity of their arrangement and the variety provided by their decorative detailing, materials and colors and the restrained diversity of their gables" [ICOMOS2010:103]. Previous research [Swart2012] showed that variety of gables, as they came into being along the 17th century, but definitely also along later centuries, is very relevant to the appearance of the Canal Ring Area. This is very interesting for the aesthetic value itself This is interesting for the aesthetic value itself, thought another approach for the user might be tracing the evolution on the architecture and style of the gables., or to explore narratives that relate to decorations or symbols on those gables. In addition, this attribute can be mapped with little prior knowledge of the students by means of a fieldwork form. As such, the attribute "gabled facades" was selected.

Attributes, or their tangible results or representations, can be mapped along the urban context to reveal the actual presence of the cultural significance within its urban context. This way an overview of what is of value (attributes) and why they are outstanding (values) can be constructed per city, including an overview on the spread or concentration of attributes and values across the city. To map this attribute of "gabled facades", fieldwork was conducted to reveal (1) the gable style and (2) material of the individual street facing facades, and (3) the presence of decoration or symbols. Fieldwork was done by means of taking pictures of all the facades, as well as registering specific features (e.g. on the type of

[8] http://whc.unesco.org/en/list/1349/documents/

gable, material and color, presence of decoration and symbols) in a fieldwork form. This fieldwork for consisted of a check lists such as presented in Fig. 1. This particular part of the checklist (Fig. 1) was used to differentiate between the types of top-gables.

The images and mapped features of the inventoried buildings have been linked as Geographical Information System (GIS) data to the geometry of the city to locate them on site. In addition, existing Geographical Information System (GIS) data on for example the monument status, building construction year and architect could later easily be added by using existing open source data[9]. At this level, the Silk Roads CHRIS Geospatial Content Management System [Vileikis2012] is also exemplary.

Fig. 1: Top gable styles, adapted from [Swart2012]

3 Walkthrough PUP Sight Guide

As the first step towards an app in [Stash2013] we explored the usability of the existing CHIP software in a different domain - city rather than museum. Personalised tours can be prepared

[9] http://www.cultureelerfgoed.nl/Monumenten/Erfgoedoverzicht%20monumenten/Gegevensbestanden%20rijksmonumenten/Rijksmonumenten%20datasets and
http://www.oscity.nl/story/?theme=commons&center=574059,6838129&zoom=9

in advance using *Recommender* and *Amsterdam Tourguide* tools. The tools were developed for the use on somewhat larger screen – at least the screen size of an iPad or Android tablet. The idea is that while in the city the tour(s) prepared in advance can be followed on a mobile device such as iPhone using *PUP Sight Guide* tool discussed further.

We focus on the scenario when the first time user of CHIP tools wants to use PUP Sight Guide on the spot. Thus the tool has to gather necessary information about the visitor to quickly generate a tour. This option is applicable e.g for business travel scenario when the person has no time to read about the city in advance and prepare for the visit. First of all we had to keep in mind that the app should be easy to use, and not ask too many questions especially to the first time user of the App to discover what (s)he might find interesting. Complexity and time consuming options' selection, answering questions may scare people away and they will decide not to use an App. First of all we had to define the following three categories:

- *Differentiator*, or what makes the app different from others. We propose a travel buddy for walking city tours, no bikes - to avoid accidents while exploring the city with an audio guide, especially for first time city visitors.
- *Primary task* – sightseeing - the guide is meant for sightseeing, exploring a WH Property and thus is not really a recommender for restaurants, hotels, etc.. Although adding these types of recommendations is possible, our focus is on exploring and raising awareness for cultural heritage and its cultural significance, thus telling the visitor about the city, culture, traditions, etc., thus engaging content is most important.
- *Target audience* – our app is being developed for people who like using smartphones.

In Figure 2 we present the screenshots of the app[10].

[10] http://www.chip-project.org/cityguide/sightguide

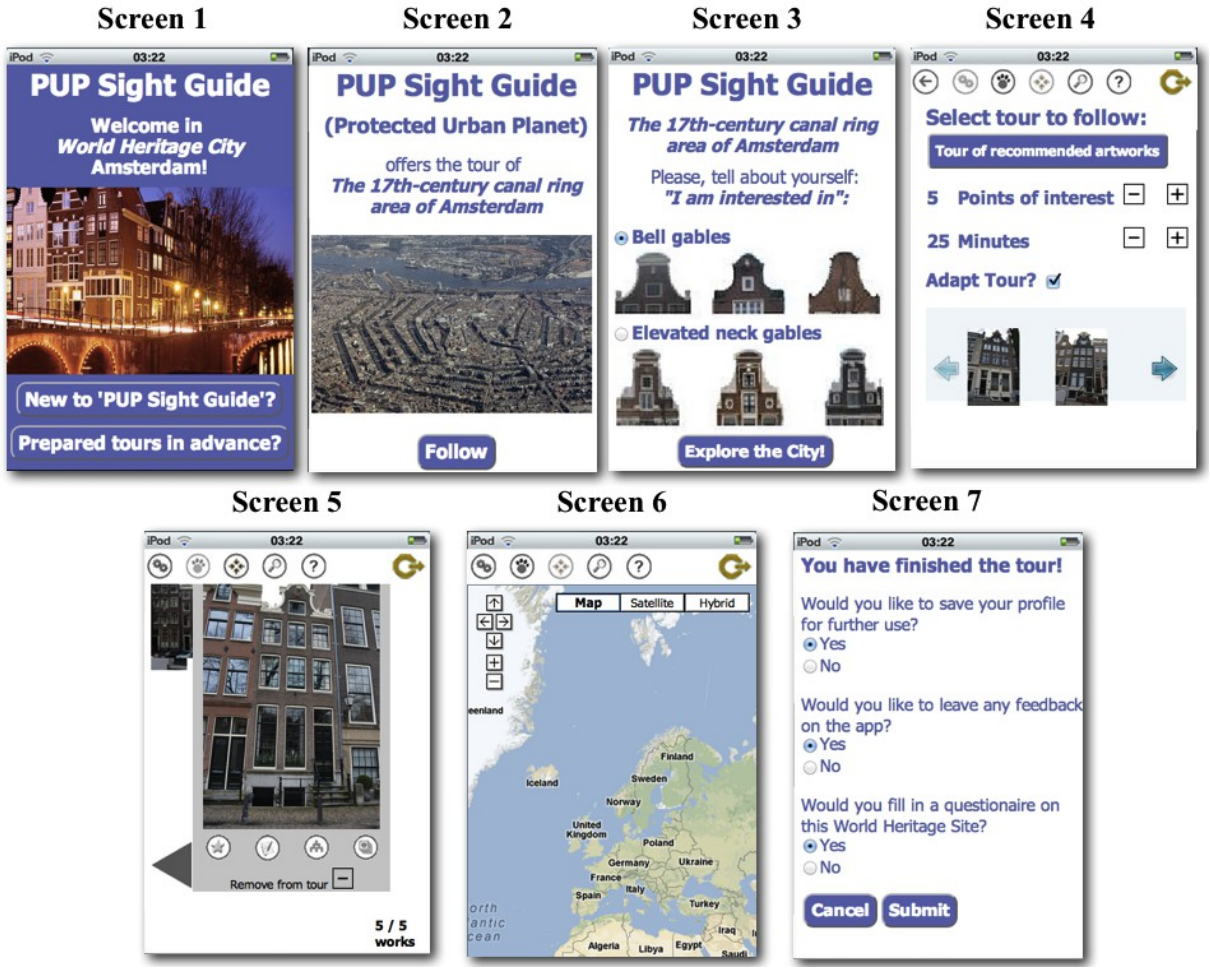

Fig. 2: PUP Sight Guide

Screen 1 shows a welcome page (later on it could be generated based on the geolocation feature.) Our first time visitor chooses *New to 'PUP Sight Guide'?* option.

In this scenario as shown in Screen 2 PUP Sight Guide offers the visitor to follow the tour of *the Seventeenth-century canal ring area of Amsterdam.*

Screen 3 shows a simple questionnaire for the scenario that maps user's answers to POIs. The visitor is asked to indicate whether (s)he is interested in a specific type of gables – *Bell gables* or *Elevated neck gables*. After that the list of POIs is filtered out to leave the points that are of interest for the visitor.

Screen 4 shows a preview of the tour generated based on the preferences the visitor has set on the previous screen. Adjustments can be made in terms of POIs to see, the time it takes to visit them and whether the visitor wants the tour to be adapted based on his/her ratings while following the tour. At the moment the walking time is not being calculated based on the

distance. As part of the future work we will use the Google Distance Matrix API[11] for that. Currently as in the CHIP *Mobile Museum Guide* it is calculated as the number of artefacts in the tour multiplied by 5 min (5 min to be spent per artefact). Ratings can be given using 5 star rating system where the meaning of the stars from 1 through 5 stars is *I hate it, I do not like it, it is OK, I like it, I like it very much*. The same type of screen shows up if the user logs in with an existing CHIP account and (s)he sees the tours prepared in advance.

Screen 5 shows the tour in a carrousel. You can view all POIs in the tour, see their photos, read the description, rate POI or related topics describing that POI such as *architectural style*, *architect*, *material*, etc., search for related POIs. The content author should provide audio files (s)he wants the visitors to hear when they approach the POI. Depending on his/her vision of the city tour the content author can let the visitor go back in time - add photos showing how the building looked before, add local stories, etc..

Screen 6 visualizes the tour on Google maps. As was explained before, at the moment Google maps view only displays a set of POIS but not the route between them.

Screen 7 shows that after the tour has finished the PUP Sight Guide offers the visitor to store his/her profile in case (s)he would like to use PUP Sight Guide and other CHIP tools later.

4 Implementation and Usage

CHIP software is open-source Web-based application written in Java, using Java Servlets, Java Servlet pages, HTML5, CSS, JavaScript, etc.. It can be used by content developers such as art experts or city tour guides for designing their applications. Since it is an open-source tool the code can be adjusted to the specific needs of that museum or city.

Our next step is to make it *GPS-enabled*. As a Web-based solution PUP Sight Guide has the advantages of being platform-independent, independent from App stores, it allows for easier and cheaper updates of a Web site rather than of a native App. The disadvantages are: the use of mobile network, roaming costs can be expensive, the connection can be slow, etc.. On the other hand, there are native Apps developed for different operating systems, e.g. Android OS running on Android mobile devices, iOS running on Apple products, etc.. These are therefore platform-dependent solutions. Native apps are targeting the specific limitations and abilities of the device in a much better way than a Web app can while running inside a browser. In order to

[11] https://developers.google.com/maps/documentation/distancematrix/#RequestParameters

combine the advantages of both types of mobile apps we are planning to look into the existing frameworks for conversion of HTML5-based apps into native apps such as PhoneGap[12]. Typically the resulting apps are slower than the apps originally being developed as native. Also they won't make 100% use of the device features in the way the native apps do. Since we might not need to use native features extensively we are nevertheless going to try it to see what kind of quality native app can be produce from our Web-based mobile app and whether this quality is sufficient.

In [Stash2013] we also discussed the possibility of crossovers between the city and museum environments through reuse of the same profile information. E.g. if a person visiting the city indicates that (s)he likes *Baroque* style (of the buildings) we could also recommend him/her visiting a museum that offers a lot of artefacts in Baroques style. And vice vera if in the museum environment the visitor indicates that (s)he likes artworks in Baroque style then the guide can recommend seeing buildings in Baroque style during the city tour. Also we could reuse this information for visiting other cities as well. In this way the whole package of various museum and city tours could be offered through one tool. This can also be relevant for raising awareness among visitors for the more intangible attributes related to prior historic events e.g. Maritime Trade or Calvinist Reformation which could be illustrated by certain artefacts and narratives in the museum environment (Het Grachtenhuis, Biblical Museum, Scheepvaart Museum).

As explained in [Stash2013], if an art expert or city tour guide, let's call them *content creators* or *authors*, want to use the CHIP software for entering museum or city data and providing the visitors with the possibility of creating personalised tours based on that data they have to prepare the following information:

- RDF model describing the POIs/artworks in the city/museum,
- list of POIs' URLs that appear in the carrousel in the Recommender,
- set up a quiz page with the questions that relate to topics in the city/museums and cultural heritage artefacts. This quiz is meant to quickly discover what the visitor might find interesting in the city/museum. In the example on Figure 3, screen 3, selecting an option *Bell gable* is the same as rating this topic with 5 starts in the Recommender tool or other tools of the demonstrator. Depending on the needs, his/her vision of the personalized tour the author might want to define questions like *What is you age? Are you interested in finding places related to where you are from? Are you interested in places of historic or aesthetic value?*

[12] http://phonegap.com/

Template for possible quizzes is provided by the CHIP software. The content creators should think of some funny/engaging questionnaire to know who the visitor is. Only in that event people are eager to spend time on it.

5 Conclusion and Future Work

In [Stash2013] we discussed the ideas for further improvement of PUP Sight Guide. Here we would like to discuss few more extensions as follows.

The developed mobile application is to share, collect and link information on attributes that convey outstanding universal value in an innovative way, so it does not only show what is outstanding and why it is so, it also enables community monitoring and valuation by visitors. This could be done by giving feedback on the state of conservation, or by a rating the level of significance of attributes by the public, e.g. by means of returning pictures to the database and/or filling in short questionnaires. By using a city guide application to not only share, but also collect information, it can become a tool to promote heritage properties as well as better understand how heritage is valued and perceived, and even to map and monitor the WH properties with the help of the public.

As such, a challenge is integrating feedback into the App in such a way that it combines smart recommendations for users with the possibility to build up a database of images and short questionnaires on the attributes on site which will be integrated in to the PUP website. Another challenge is building up a substantial database to begin with. The fieldwork could be extended in the future to include more attributes, and in addition available open source data could be added. Also, an ontology is needed on cultural heritage to further categorize the attributes. This could be used to cross-reference recommendations between cities and between levels of significance.

There are technological innovations that will help making the app more accessible and usable such as platform-independent solutions and integrating geo-referencing of data to regions (e.g. building plots, squares, conservation area's) as well as points (e.g. functions, sculptures, details). The application will allow to georeference data from different scales and sources including data from field recording methods and combine it with historical and heritage features documented through various means such as textual descriptions, documents, photographs, video's and audio.

We should foresee offline availability of the app. In the future we also plan to perform user studies on the usability of the (improved) version of the PUP Sight Guide.

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