Submitted on: 06/06/2014

MOBILEARN : Augmented reality in the service of informal learning

Elhadi Djebbari
Service technologies de l'information, UNIVERSCIENCE, (Cité des sciences et de l'industrie), Paris, France
elhadi.djebbari@universcience.fr

Anca Ailincai
Service technologies de l'information, UNIVERSCIENCE, (Cité des sciences et de l'industrie), Paris, France
anca.ailincai@universcience.fr

Xavier Boissarie
ORBE, Paris, France
x.boissarie@gmail.com

Abstract:

Museums and Libraries are unique places of transmission of culture and knowledge. Faced with the ubiquity of the web and digitization of data and spaces, they offer a tangible inscription of knowledge in places, thematic areas, documents and objects. These cultural, territorial true knowledge, offer a privileged context for informal learning.

Many of these institutions are looking for ways to capitalize on their strengths by implementing tools to facilitate navigation and access to collections available, and the establishment of relationships between the site and its visitors.

And in particular the mobile smartphone allows access to web in any context. Mobilearn relies on the widespread use of mobile to support access to knowledge in the areas of informal learning. Mobilearn web adds another dimension to collections and cultural spaces to facilitate their adoption by the public. This hybridization is realized through augmented reality interface. Mobilearn adapts to different contexts, notably through the following choices:
- the use of open source formats and applications (xml, Json, x3D)
- the use of RFID tags or barcodes.

A collaborative component powerful was set up and it allows both:
- Sharing of comments and annotations

- Cross metadata with DPpedia
- Conversation between users.

Keywords: Mobilearn - Library - Museum - Learning - Mobile – Metadata – Tag

---

1. Contexte

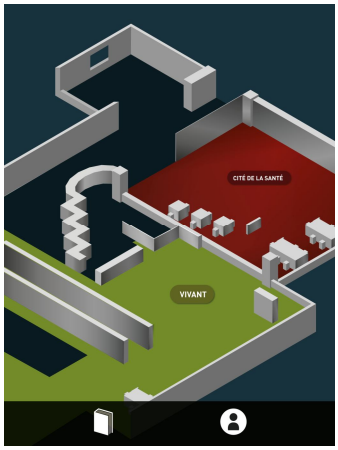
Museums and Libraries are unique places of transmission of culture and knowledge. Faced with the ubiquity of web and digitization of data and spaces, they offer a tangible entry of knowledge in places, thematic areas, documents and objects. These cultural places, true frontiers of knowledge, offer a privileged context for informal learning.
Many of these institutions are looking for ways to develop on their offers strenghts by implementing tools to facilitate navigation and access to collections, and the establishment of special relations between the place and its visitors.

Mobile device and in particular the smartphone allow access to web in any context. Mobilearn become an access for the knowledge in the areas of informal learning. Mobilearn adds a dimension to web collections and cultural spaces to facilitate their adoption by the public. This hybridization is realized through augmented reality interface.

The implementation of this type of device in a cultural place raises several problems in which we propose solutions:

- The risk of augmented reality is to focus on the visitor's attention to the screen: we propose an innovative interface that empowers the user gradually.
- Smartphones are they accessible to all audiences? Mobilearn based in an intuitive interface that does not require prior experience
- The indoor localization necessary for augmented reality is a complex issue; According to a comprehensive study we opt for an approach based entirely on existing infrastructure and therefore meet the criteria of sustainable development.
- Mobile mediation’s tools put the visitor in a position of consumer; Mobilearn confers an activ role for the visitor by his comments, suggestions and collaborations with other visitors.

2. Mobilearn a new service inspired from needs and expectations of users.



New technologies, the use of mobile and social web have strengthened the link between the user and the library.

The user has changed, he became producer of information. Today he participates in the production chain and has an important role in knowledge sharing.

In addition, the library has continued to grow within the society. It is considered as "a third place" (not home, not at work). Place of culture, study, relaxation, recreation, sharing and learning. Mobilearn offers a solution in line with current practice.

Mobilearn can give a new dimension to museums and cultural centers. With this device, the visitor interrogates the memory of the objects and participates in enrichment of device. He prepares his visit and explores the exhibitions with a fun and participatory way.

3. An innovative project

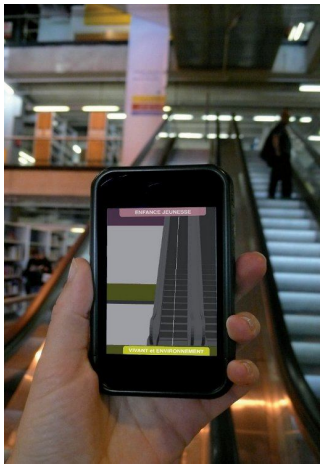
3.1 An intuitive 3D interface combining map view and the augmented reality

The interface provides an overview of the library with an extended view using augmented reality. The transition from one mode to another is done by tilting the device. This approach addresses two fundamental needs for the visitor: the location and the identification of the resources nearby.

The "schematic" design approach combines good readability and a strong analogy with sensory experience, which facilitates the parallel of perception and representation. The user, at any time and instantly, can pass his real vision to a comprehensive vision with a deep immersion in the collections.

3.2 Augmented Reality: The hybridization of digital and tangible

What is the value of a library, a museum in the digital age? Libraries, museums and cultural centers offer a space exploration of culture and knowledge. Mobilearn may accompany the visitor in its access to knowledge by combining spatial tracking and mental tracking. The methods applied to achieve this goal are:



- A clear sign for accessibility to everyone.
- The organization of the knowledge: A path by step around a theme illuminated by an expert, a scientific, a mediator, an artist)
- Facilitate the digitization of documents: the guide has a type scanner intelligent tool with text recognition (OCR[1]), allowing visitors to collect extracts it deems interesting.

3.3 The visitor as a resource

Museums, libraries and media center have a rich and diverse offer: collections, human mediation, convenient services, exhibitions, ...

Besides this offer, we can consider the visitor as a potential resource.

Each has indeed knowledge and experience in various areas to be shared. The development of trade and interaction between members of the community's visitors borrow the following areas:

- The contribution of the visitor to the collections: the visitor can comment the books, evaluates a publication and notes the interesting passages. This information can be shared with other visitors. The cross-evaluation documents can be exploited as a collaborative metadata. Each item may host a discussion an "exchange" allowing visitors to share it, and to enrich it without limit.

[1] OCR : Optical Character Recognition

- The forum of discussion: each visitor can propose a topic or a "service" request through the mapping interface. Layers located on the map at the user location offer expertise on a topic or a help on a specific search.
- The collaborative approach: involves linking people with similar needs or similar resource (references, documents ...).

3.4 Responsible and sustainable approach

Mobilearn relies on existing infrastructure in order to minimize investment costs and potential health problems related to the emission of electromagnetic waves. The device exploits the local Wi-Fi connection without adding extra terminals, as well as barcodes equipping documents for their management.

Mobilearn based on a system with an “open” protocols and formats (HTML5, JSON ...) with the aim of scalability and interoperability in different contexts.

4. Challenges for BSI

4.1 Support the learning process

BSI wants to offer to the visitor a tool that supports every step of access to knowledge.

- **Search** the information, a document, a service
- **“Isolate”** the sought element
- **Read** the document and access to the associated data
- **Save** references, the associated data
- **Share** the knowledge via a collective workspace

BSI offers an open area in scientific fields. The anchoring of knowledge in thematic areas and structures offers a privileged context for informal learning. Now this territory represents a virgin forest for many visitors who are lost in the indexing, the data description and the acronyms.

This situation causes frustration and call for the implementation of a mediation tool to helping users and visitors in their approach of access to knowledge.

As technologies develop quickly and became obsolete we must be caution to this fact and invest in a long term. However, the discrete location, based on QR[2] codes / NFC[3] has an undeniable opportunity in the context of BSI, the NFC chip pretending a bright future on smartphones.

4.2 An innovative service

Universcience is a major cultural center witch works for the dissemination of the scientific knowledge and the Library is a part of it. Since its inception, the library experimented new forms of mediation by the exploitation of new technologies. Mobilearn is part of this evolution. It is based in part on the smartphone, the synthesis of multiple technologies and secondly on the maturity of various localization techniques: Wi-Fi, RFID[4]...

- Firstly, the goal is touching the wider public and secondly to provide a real experience in the library spaces with Mobilearn. The service aims for Smartphones, Android and IPhone.

[2] QR code : Quick Response code
[3] NFC : Near Field Communication
[4] RFID : Radio Frequency Identification

- The smartphone industry is experiencing a constant and regular technological evolution. With the objective of sustainability and interoperability of the service, the use of open formats and cross platform technologies is needed.

4.3 Accessible and convenient service

The service should be available to the wider public. The interface of the guide should not ask specific learning. Mobilearn must operate in addition to the perception of the environment, the visitor consultant guide only occasionally. Mobilearn must be accessible for people with visual or hearing impairments.

4.4 The user at the center of the device

During a web browsing, the user has the sensation of being in the center. Medias like Facebook, Twitter or services such as Amazon, Deezer and etc, reorganizes the navigation area around the user. This approach frees the user from any acquisition of a spatial or semantic repository.

4.5 Valorize the visitor as a resource for the BSI

BSI has a rich and varied offer: the documentary funds, mediation, convenient services ... Besides this offer, we can consider the visitors as a potential resource. Each has indeed knowledge and experience in various areas to be shared. The objective is to realize this potential through services and features offered by Mobilearn.

4.6 To study practices and usages to better understand the public

Mobilearn, allows the collection of rich and diverse data. This anonymous data can be centralized on a server for analysis. The data concern:

- The practice of space, the paths, the use of workspaces.
- Consultation of funds accompanied by a qualitative return: rating, comments.
- The use of guide services: options and preferred features.

5. Enhancement of cultural heritage

Mobilearn is a vehicle toward to areas of knowledge that are the collections of libraries and museums. The objective is to valorize with the help of the augmented reality, the tangible enrollment of knowledges in objects, documents and spaces. The participation of the body in learning by deambulation, manipulation, exploration, allows indeed a deeper knowledge. Mobilearn hybrid digital and tangible and thus adds a layer of familiar interface on complex spaces.

5.1 Mobilearn is a social innovation vector through its support for informal learning

Museums and libraries are places of informal learning. They allow everyone to explore new frontiers of knowledge. Mobilearn accompanies this process of individual learning during the visit in cultural places and after the visit. The visitor constructed its territory of knowledge that gradually was formalized on a map. It can deepen or expand territory and plan new conquests.

5.2 Mobilearn contributes to ecological and solidarity dimensions

Mobilearn adapts to existing infrastructure and equipment to limit its environmental impact.

Mobilearn promotes the development of a community of visitors based on knowledge sharing and mutual aid. Mobilearn team, composed of equal numbers of members of Orbe and BSI, wishes to become an expert for transmit to other cultural sites through publications, workshops, or for a transposition of the application.

6. Functional and technical description

6.1 Type of application and / or services concerned

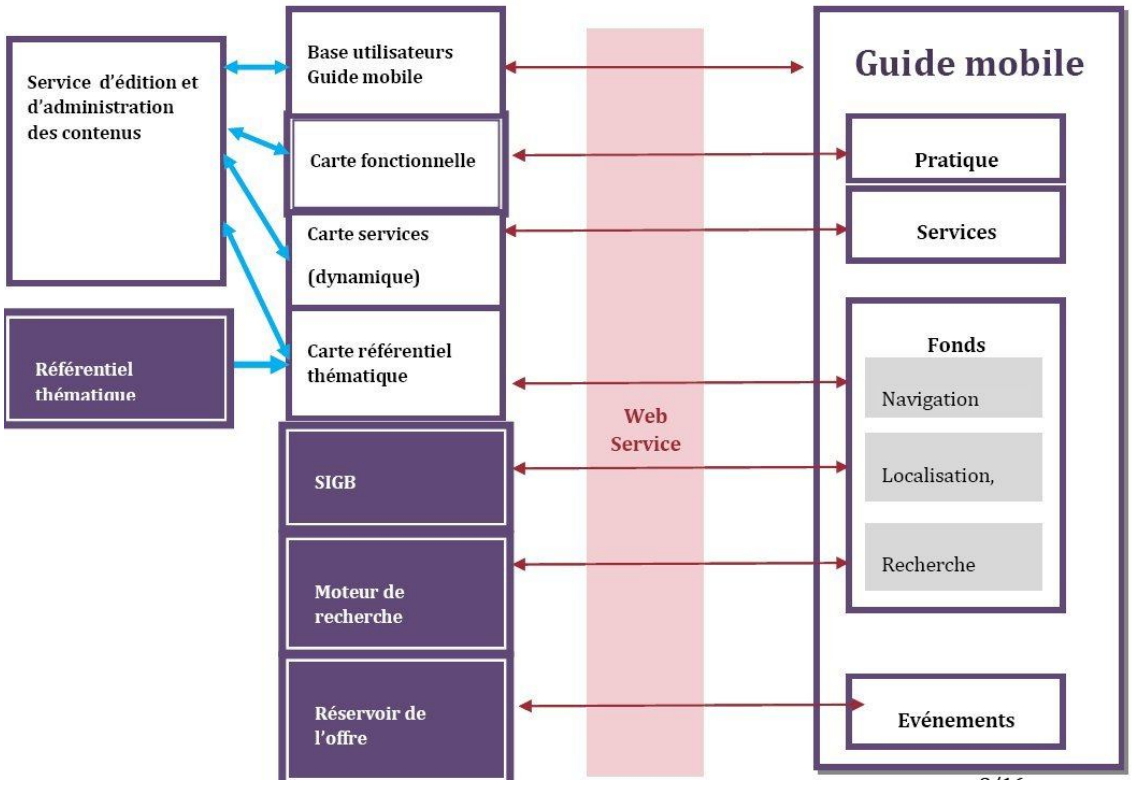
The type of application in question is a mobile guide for Smartphones, enabling visitors to be located through the resources and services of a cultural place, according to three dimensions: space guidance - access and contribution to the metadata - Community aspects.

6.2 Technology and platforms (s) of use

Mobilearn will target platforms Android and Iphone / Ipad at first. The main interface in realtime 3D is suitable for smartphones, it requires the use of a high-performance mobile 3D solution. Unity can fill these needs, this solution is currently the most commonly used to manage 3D real-time on the Smartphone.

The general technical platform will benefit from interoperability to adapt to many situations.

Schema of Mobilearn integration



The prototype Mobilearn will interface with the items listed below.

The Repository

Thematic repository (about 9600 descriptors). This reference reflects the richness of the offer Universcience proposes at a variety of audiences and for multiple uses.

It focuses on the science and technology but takes into account the original approach of the institution, which is to connect science and technology to the problems of society and the world of arts.

The SIGB (the catalogue)

Catalogue about 125000 resources in science and technology. All metadata associated with these resources are exploited and enriched in this project.

The search engine (website)

Thanks to this tool, which is integrated in the mobile guide, users will have the opportunity to interrogate all the resources available on the web Universcience

The offer's Universcience

The practical component that will be developed will be based on this database that lists all the cultural events taking place at Universcience.

7. Elements of the platform of the guide

The platform consists of five layers:

- **The information layer**, based on the thematic repository of the cultural institution: it results in a plan where the themes and sub -themes, are spread across different levels of the space.
- **The functional layer** with the path of movement, the access, the convenient services ; it traces the path to reach a selected topic ...
- **The service layer**: with the current state of offers and demand for services within the library or museum (mediation, counseling and support ...). It is supplied in real time by the mobile terminals.
- "**User " layer** that can locate other users present at the same time in the library and interact with them ;
- **The editing layer** and administration for editing features mentioned above; it also helps to moderate the content created by users.

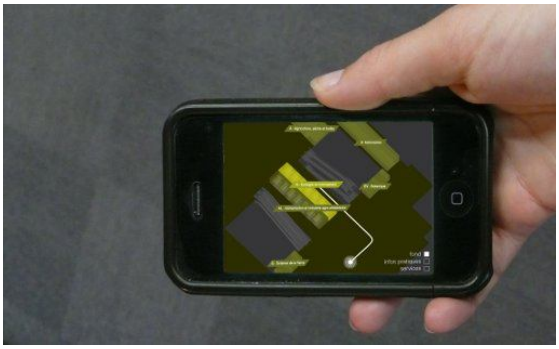
8. Description of functionality implemented

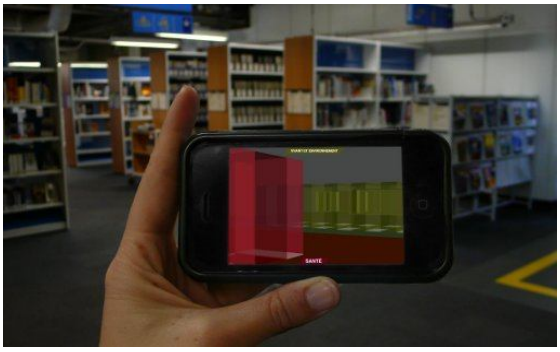
The guide is based on an infrastructure of optical and RFID tags distributed throughout the library. These tags allow both to locate and retrieve related the content. RFID tags are read by mobile featuring an NFC chip. This reading provides a high fluidity of using the device for the visitor. The optical tags are QR-code or bar code. They are decoded by any phone with a camera.

The library materials are tagged; they also equip the work tables as well as some areas of circulation.

The main interface, an interactive 3D map

This plan is dynamically oriented like the building, which facilitates navigation. The visitor manages the zoom level and the level of detail displayed by tilting the screen.





The user switches the "map" view to "first person" view

Visitors can view their location on the map by scanning a tag. Each tag is indeed associated with a geographic position during the scan; the phone retrieves the position and operates to center the map and position a visitor avatar on it.

In augmented reality's mode, the azimuthal navigation is to indicate the direction of the goal and the way to achieve it. The user is at the center of the spatial reference, the benchmarks are distributed around him such a viewpoint.

The search function allows displaying the results on the map. When selecting an item on the map a route is offered to the visitor He can visualize this route in a "plan" mode or in an "augmented reality" mode.

The interface "map" is completed with an interface "list". The "list" interface presents the information in a hierarchical principle. A search function displays a list of results ranked according to criteria of relevance. Each result is locatable on the map.

The guide is customizable. To access this customization, the user must fill in his profile and accept the charter use. It can then be connected to social networks. Multiple users can come together to form a group and share information. Users can also share information on the most of the social networks.

The user can activate different layers of information or "filters", or both - on the map and on the list.

Collections: access to documents and to their metadata

The guidance function provides access to a document.
An itinerary is displayed on the map to allow the user to build his route.

The scan function
Provides access to metadata related to the document: description, comments and testimonials from readers and a list of suggestions in relation to the document.

The contribution function
Allows the reader to add his comment on the document or respond to an existing comment.

The visitor evaluates a document on a predefined scale, leaves a comment and lists interesting passages. This information may be shared with other visitors. The evaluation of the documents can be exploited as a criterion in a new query. Each document can host a discussion allowing visitors to discuss the contents of the publication.

Photo function
It allows take photos and indexes them.
A function of text recognition is associated and allows visitors to collect the extracts.

My areas of knowledge are a customized version of the 3D map on which appears the works consulted and territories of knowledge of the user. Over the course of its consultations, the visitor builds its own library. This library draws the territories which were investigated, areas of expertise, unknown territories, works consulted or advised, catches and extracts from documents...

Practice
This layer provides the access (entry / exit), equipment (copiers, terminals, toilets ...)

Services
This layer shows the human dimension of the guide with the location and the skills of home and its personal mediation and other applications and service offerings visitors.

1. The visitor accesses the service proposals by "list" mode or by "map" mode. He may even edit a proposal or request on the map or from the list. The bubbles located on the map at the location of their authors offer expertise on a topic or ask a precision on a specific search.

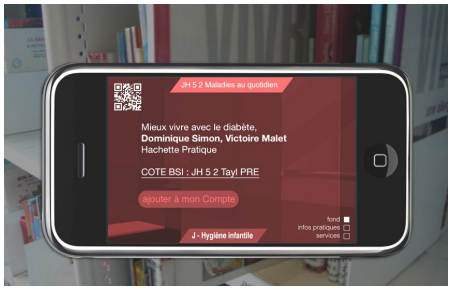
2. The collaborative approach: It involves connecting people with similar approaches or resource sharing on the mobile guide (references, documents ...). The users group have a common workspace through which they can share references, documents, screenshots.

Activities

This includes movie screenings, workshops, events and exhibitions. In "map" mode, this information is located. The automatic alerts are sent to user's devices.

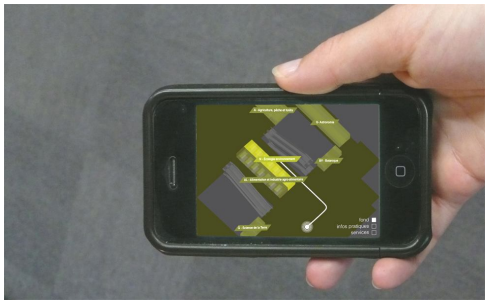
Vision in augmented reality

Research and Interoperability

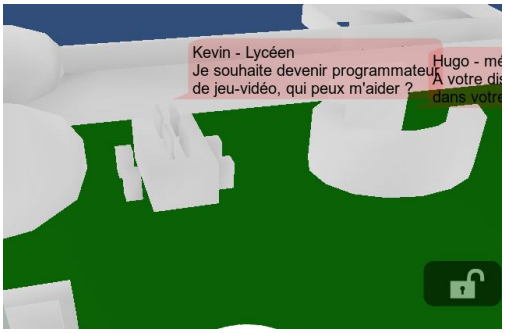


Backward compatible solution

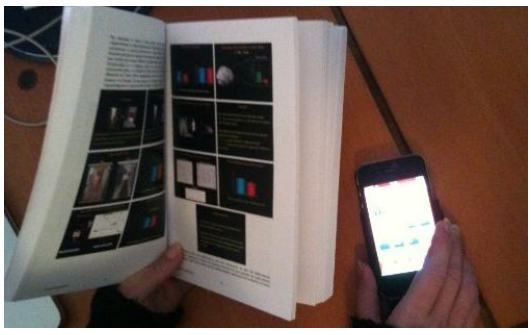
Guide in 3D



Participatory tool



Collaborative tool



References

- Servet, Mathilde. *Les bibliothèques troisième lieu.* Bulletin des bibliothèques de France [en ligne], n° 4, 2010 [consulté le 09 mai 2014]. Disponible sur le Web http://bbf.enssib.fr/consulter/bbf-2010-04-0057-001. ISSN 1292-8399.

- *International Journal of Education and Development using Information and Communication Technology* (IJEDICT), 2010, Vol. 6, Issue 1, pp. 117-127.