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Francisco Contreras & Fco. Javier Melero (Editors)

Learning, Access and MoBility in Cultural Heritage Education: Developments, Lessons and Findings from the Project

Uotila, K.[1], Huvila, I. [2], Paalassalo, J.-P.[3]

[1] Muuritutkimus company, Finland
[2] Department of ALM, Uppsala University, Sweden
[3] Turku University of Applied Sciences, Finland
kari.uotila@muuritutkimus.fi, isto.huvila@abm.uu.se, jari-pekka.paalassalo@turkuamk.fi

Abstract
Mobile technology has been seen as a major asset in on-site education for a decade, but until recently, many practical issues have reduced the functionality and usability of applications. Different applications use varying approaches and platforms from mobile phones to larger tablet and laptop computers. The paper discusses the present evolution version of the Pulu application developed in LAMB project and how the pedagogic premises of the project have been realised in the technical development process. The client has new functionalities for designing routes and implementation of a system question answering by moving in the environment. The system has also a new web based repository for sharing route data and other information.

Keywords: Mobile applications, cultural heritage.

1. Introduction

Mobile technology has been seen as a major asset in on-site education for a decade, but until recently, many practical issues have reduced the functionality and usability of applications. Different applications use varying approaches and platforms from mobile phones to larger tablet and laptop computers. The LAMB project (UOTILA et al. 2010) has developed a custom mobile platform based on small portable computers together with specially designed learning objects for participatory in-group on-site education since the early 2000's.

The paper discusses the present evolution version of the Pulu application developed in LAMB project and how the pedagogic premises of the project have been realised in the technical development process. The application has been developed further from the 2009 evolution version (UOTILA et al. 2010) by adding a functionality to solve learning tasks by moving to a correct location on site. This technique encourages users to move around the archaeological site and enables planning and implementation of simple game-like elements to the learning session.

2. Background

The aim of the LAMB project has been to develop a mobile digital guiding and learning platform. The work started in 2001 and first prototypes were tested in 2002-2003. The aim of the project has been to provide users an opportunity to visit cultural and natural heritage sites by using a portable device as a travel guide. The development of the current evolution version of the LAMB (PULU fi.) system has continued in cooperation with experts from Muuritutkimus company, Turku University of Applied Sciences, Åbo Akademi University/Uppsala University, University of Turku, Municipality of Eura and Town of Naantali. Project is support financially by The Finnish National Board of Education.

The aim of the present evolution version is to develop the features of the system to better support the specific pedagogical needs of elementary and grammar school students and by providing functionalities that would support the use of the platform in experiential and engaging learning (KOLB, 1984; KEARSLEY and SHNEIDERMAN, 1999; JONASSEN et al., 1999). Secondly, the aim is to provide a new set of intuitive tools for individual teachers so that they could themselves produce content for the system. The third aim is

to develop a common data repository and management system for reusable data for all participating actors where they could share their content and construct 'itineraries', i.e. sequences of visits to individual sights of interest (sight points).

The current versions of the client system have been built using Java Standard Edition. The platform was chosen because it is well established and available on most platforms including smart phones. Due to the portability requirements, the platform uses a minimal device specific interface for accessing GPS data. At the moment, the system is running on mini tablet PC and mini-laptop devices. The platforms provide usable screen size, workable interaction and performance for an affordable price..

3. Mobile learning in LAMB

The premise of the LAMB project was to take cultural heritage learning from classrooms out to the authentic heritage sites and to provide pupils and other users with enough general information and context for independent exploration of the sites. From the pedagogical point of view, the emphasis of the approach is on learning by exploration and engagement with the cultural heritage site and its environment. The approach builds on the ideas of Kolb (1984) on experiential learning with a focus on pupils and their own imagination in creating and staging their own experiments within a given context of a cultural heritage site. Another point of reference for the approach is the engagement theory of Kearsley and Shneiderman (1999). In LAMB, the role of technology is to facilitate all aspects of engagement in the cultural heritage site and its cultural relevance for the pupils. The approach to learn and at the same time construct a personal experience of cultural heritage is based on group work, collaboration and interaction in small groups of pupils. A cultural heritage site or a selection of smaller sites in a chosen area form a context and focus for the collaboration. Making sense of the site and developing an idea of its relevance on a personal level is a project with an empathetically authentic focus. To meet the pupils from their premises and capture their imagination, the project can be presented in form of a treasure hunt or by using a semi-fictional cover story. The focus is not on technology or in acquiring a predefined set of factual knowledge, but as Kearsley and Shneiderman (1999) underline, to emphasise the positive role of technology in enabling pupils to make sense and interact collaboratively with their environment from different perspectives such as the one of cultural heritage.

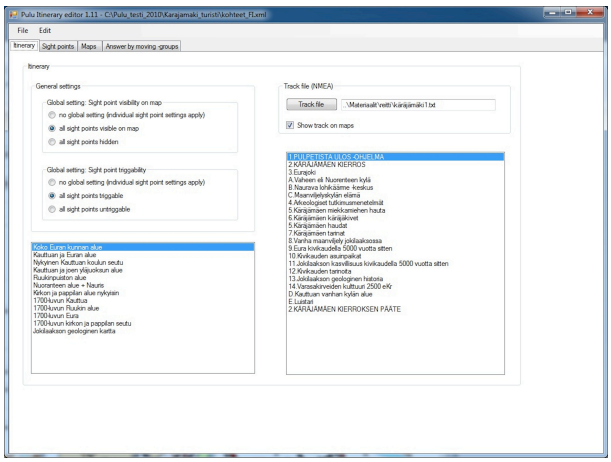
The mobile device is a tool that provides pupils with background information on the site they explore and guide exploration and discussions in the group to topics of pedagogical significance. The multimediality of the materials provides rich and multifaceted entries to the explored topics and help students with different types of digital literacies (Lankshear & Knobel 2008) to orient themselves. The system has also a functionality for creation and management of tasks and questions. The questions may be directly related to a particular environment and guide students to explore some specific aspects of that site. Depending on the chosen type of question, answers can be submitted in short written text, selecting an alternative from a list of possible choices (multiple-choice question) or by physically moving to a new location. It is also possible to use other types of tasks such as to ask pupils to collect something found in the environment, plan a short presentation or document something on site by taking a photograph or by recording audio.

The LAMB system is an information delivery platform, but it is also an assessment tool for teachers. The device collects data on the route the pupils move indicating their points of interest and possible challenges and problems with the routes that may be discussed together after the session. Data gathering can also be used in directly assessing the exercises. All answers to the questions presented during the walk are stored and are easy to collect from the client devices by using a USB memory stick.

4. Pulu client

During the previous design phase of the Pulu application it was decided that XML configuration is the easiest and most flexible way of defining the itinerary and corresponding links to multimedia data. A wide range of tools is available for XML manipulation and using XML interface facilitates also the iterative development of the program features. It was also assessed that an average itinerary developer (a teacher) would be capable of independently creating itineraries and defining new contents by using existing XML files as a reference.

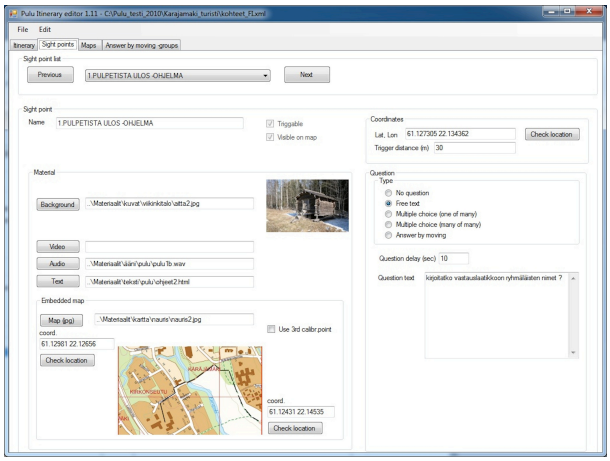
Figure 1: *Itinerary editor.*



However, the experiences from teachers using Pulu application have clearly shown that creating a working XML configuration for the program is a formidable task

for an average user, and it forms a psychological and practical obstacle for the efficient use of the program. Clearly, a simpler user interface for editing the itinerary configurations was needed.

Figure 2: *Sight point data editor.*



Although there are some primary schools committed to Linux operating system, the majority of schools use Windows OS and most teachers can use Windows-based applications fluently after a short introduction. Therefore the itinerary editor was developed with a standard Windows look-and-feel. The editor is capable of reading and writing configuration files in XML format, and it provides means for editing itinerary (Figure 1), map location and multimedia content (Figure 2) defined in configuration file. Special effort was put on editor features that would facilitate correct design of the most difficult steps in itinerary design: map calibration, locating targets on map coordinates (Figure 3) and managing the design of "answer-by-moving" questions (Figure 4). In the last mentioned type of question, the Pulu program poses a question to pupils that are expected to 'answer' it by moving to a location that corresponds their answer. The program must identify from GPS coordinates the right answer, possibly some expected wrong answers and an unexpected wrong answer.

Map calibration is implemented using affine transform from coordinates to display pixels. For calibration of north-oriented map two (corner) points are required, and for rotated maps three points. In map calibration display, the map image is shown and by clicking "Check coordinates" another window is opened showing the selected corner coordinates on base map in Finnish national map service (www.karttapaikka.fi), and the may thus easily check that map corners are correctly positioned.

Using a previously calibrated map, the user can locate and relocate target points by mouse clicks on map. Existing target points are displayed on map. It is also possible to check the location of any point on displayed map from www.karttapaikka.fi as in map calibration, making it easier to work for example on historical maps.

Figure 3: *Sight point on map.*

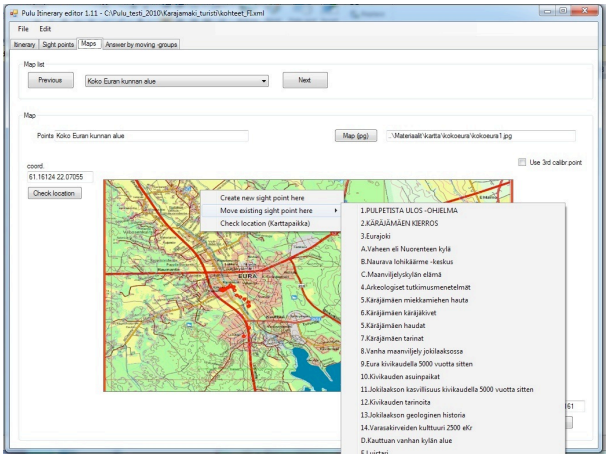
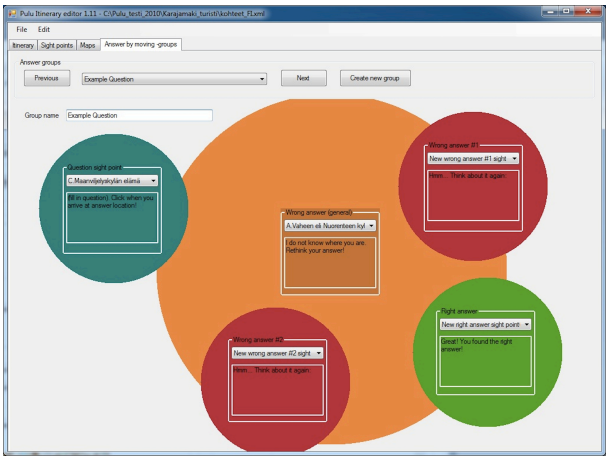


Figure 4: *Editor view for Answer by moving –questions.*



For editing "answer-by-moving" questions (Figure 4), a specific view is opened. Question structure is limited to the case with one question, one right answer, two wrong answers and a general wrong answer. The editor allows creating a completely new group of these roles or allocating existing target points to any of the roles. Each of target points given a role can then be separately edited to have individually defined video, audio or text content.

5. Web repository

The first version of the data repository for sharing location data, questions and student tasks was based on a manual wiki. Teachers were provided an opportunity to cut and paste and upload their materials to wiki and download material provided by others for their own projects. Because of the steep learning curve of wiki-based systems especially in tasks that require coordination and file management, it was decided that the repository needs to provide more functionality and semi-automated routines for handling the management of data and composition of routes.

Besides location data, the repository can be used for storing and sharing related material on locations, mobile

pedagogy and, for instance, best practices on the use of the platform and its integration into curricula. The approach for sharing data and managing the repository is based on the principles of a participatory archive (HUVILA 2008). The flexibility of the repository and possibility to combine, modify and use pre-existing data makes it possible to avoid some of the pitfalls related to static learning objects (FRIESEN 2004). The aim of the repository is not to provide ready-made packages, but rather to share building blocks and ideas for designing new itineraries.

Figure 5: *Web repository in route creation mode.*

The new version of repository is based on Mediawiki software (www.mediawiki.org), Semantic Mediawiki (www.semanticmediawiki.org), Semantic Forms (www.mediawiki.org/wiki/Extension:Semantic_forms) and Collection extensions (www.mediawiki.org/wiki/Extension:Collection) and a custom made extraction and export routine for collection i.e. itinerary data in XML format. User can upload their own material to wikipages by using easy to use web forms and create new itineraries based on deposited material by selecting a set of sight points and exporting the set in LAMB XML-format (Figure 5). Like the client program, the web repository and with all source code will be freely available after the initial tests of the system have been completed.

6. Conclusions and future work

The LAMB/Pulu platform has proven to be a versatile framework for designing and realising learning sessions with a specific focus on student experience and engagement with their environment and its various human dimensions. The variety of functionalities in the client provides means to develop rich interaction with cultural heritage sites for individual teachers and groups. The web repository provides a flexible collaborative platform for sharing locations and tasks and reusing existing data.

The new features of the system will be tested during the summer of 2010 in the setting of the medieval city of Turku, in Finland. The initial tests have provided interesting data about the use and usability of not only the particular tool, but also more generally about the mobile learning practices of students and users during an intensive evaluation of the application and observation of actual learner behaviour. The current version of the application will be finished in autumn 2010 and will be freely available to the public later the same year.

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