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D7.2 Museum Demonstrator version 2.0

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<i>Abstract</i>	This report accompanies the release of the second and final version of the PuppyIR Museon Demonstrator. The release notes provide an overview of the features of the demonstrator, the pre-requirements and installation guide.

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Executive Summary

This report accompanies the release of the first version of the PuppyIR Museum Demonstrator. The release notes provide an overview of the concept development status, the features that the demonstrator currently supports, the requirements and installation guide, known issues, and an outline for the development activities ahead of the second version of the demonstrator.

1 Introduction

The Museum Demonstrator creates an interactive museum visit using advanced technologies such as multitouch tables and marker tracking, creating the basis for additional data retrieval and filtering using the PuppyIR framework. Up to four users can use a multitouch table simultaneously to browse through the different exhibition subjects and to determine together the contents of an interactive quest.

Subsequently in a trail through the exhibition users/players answer questions related to the chosen topics. Throughout the Museum various touchscreens equipped with scanners for reading and identifying the players are installed. When triggered, the screens present the questions and provide feedback to answers.

After having answered all questions the multitouch table provides further information about the visited exhibits.

2 User scenario

A school class with children in the ages of 10 and 11 years arrives at the Museon for a new educational activity called “Expedition Museon”. This lesson starts at a multitouch table, where the children in groups of four select subjects for an interactive quest through Museon’s permanent exhibition. They already know that, back in school again they will have to produce a short paper about one of the museum’s subjects.



Figure 1. Children select the contents for their Expedition (concept of the screen design).

Each child takes a marker and puts it on the table, after which the possible themes of the museum visit are displayed. Together the children select subjects by dragging images to the middle of the table (figure 1). As soon as they agree about the selection, they move towards the exhibition area to start the actual quest.

In the exhibition dozens of terminals with barcode readers are installed. The markers that the children got consist of two different parts: on one side there is the tag to be used for the table, on the other side there is a traditional barcode that can be used to activate the terminals in the exhibition area. Each team member moves towards a terminal, where they scan the barcode and get the first assignment. They head towards the relevant part of the exhibition and try to find the answer. As soon as they found it, they go to a terminal again, scan their barcode and enter their answer. Through immediate feedback they can see whether their answer is correct or not, and why this is the case.

Since all team members get assignments about the same exhibits, collaboration is promoted; often they discuss the answer to a specific question.



Figure 2. The children select the subjects that they want to dig deeper into after the museum visit.

As soon as each team member answered twelve questions and the actual quest is finished, the children return to the multitouch table to prepare the work that they will do as soon as they will be back at school. On the table items related to the subjects of the quest are displayed, and from these items each child makes his own selection of topics that he or she finds most interesting (Figure 2).

As soon as the whole class has finished this task, the children return to school for lessons about other topics (figure 3).

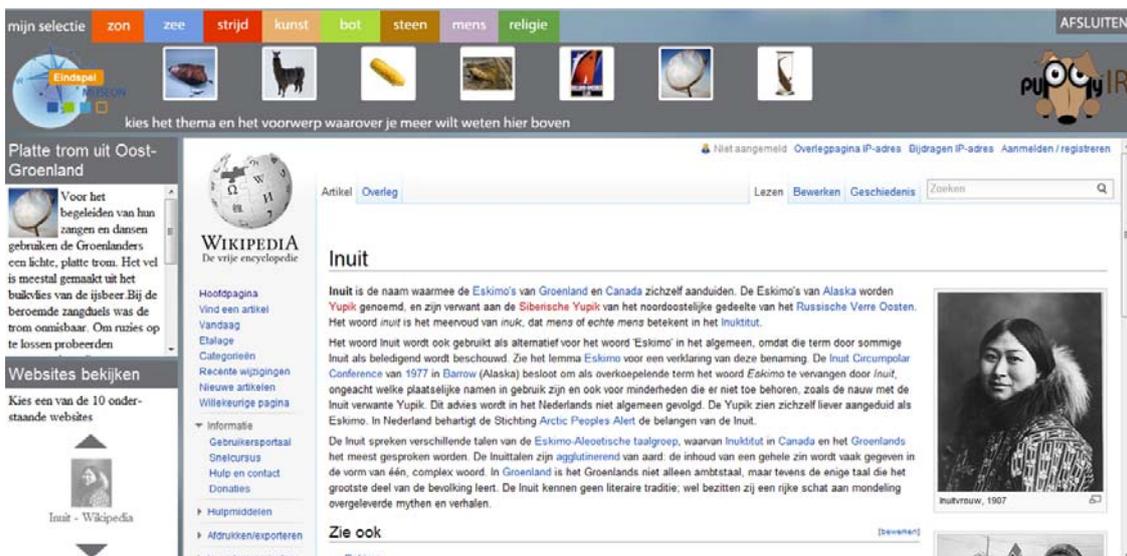


Figure 3. The post-visit website.

The next day at school the children do research for their paper. For this purpose they use a special website, which is created using the PuppyIR framework. They log on to this website using the number that is printed on the barcode card that they used in Museon, and fill in the date of their visit.

One of the children is very much interested in the Inuit of Greenland. In Museon she selected a number of items that are related to this subject, and in school she digs deeper into the subject by searching the web using the search functionality provided by the PuppyIR website. She uses the found information to write a small paper.

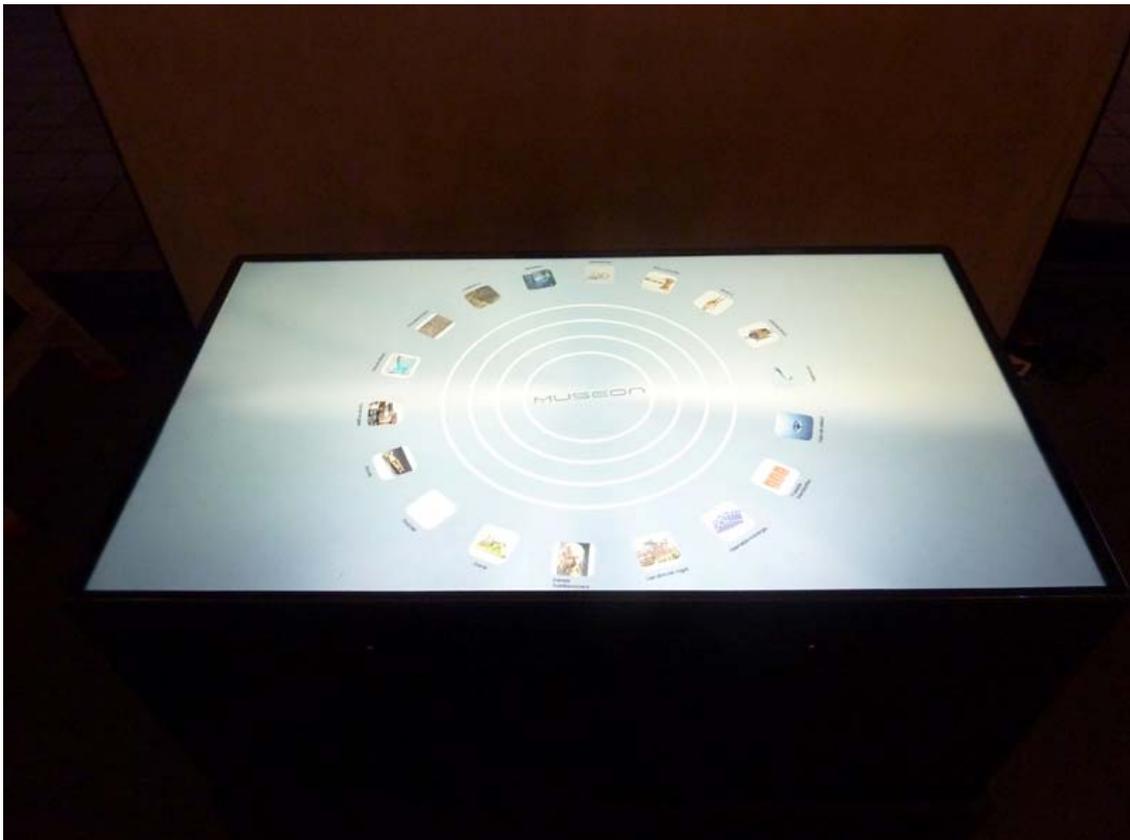


Figure 4. The Multitouch table.

2.1 Application's concept

The application described above is defined as an educational one, aiming at school classes that visit a museum. It offers the possibility to tailor the visit to personal interests, provides guidance to the visit and offers the possibility to dig deeper into subjects from the exhibition after the actual museum visit.

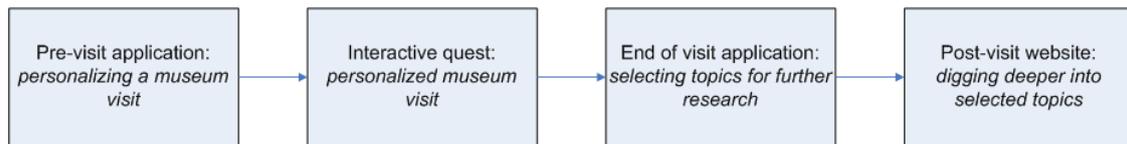


Figure 5. Work flow of the Museum Demonstrator.

The application consists roughly of four different parts:

- **A pre-visit part, using a multitouch table;**
- **A personalized quest through the museum's permanent exhibition;**
- **An end-of-visit part, using the multitouch table again;**
- **An off-site part, using a personalized, post-visit website.**

2.2 The pre-visit application

The pre-game part aims at providing a preparation of the actual museum visit. It has two different functions:

- a) **Registration:** it makes a user known to the system. To register each user puts a fiducial on the table.
- b) **Personalization:** it enables the users to determine the contents of the quest based on personal preferences. This is done by dragging images to a 'container' in the centre of the screen. Each image symbolizes a main topic from the exhibition and has very concise textual information attached.

2.3 The museum visit

The actual museum visit consists of an interactive quest, whose functionality has been built outside the scope of the PuppyIR project. The contents of this quest are determined by the user interaction with the multitouch table: the questions of the quest are related to the subjects that the visitor has selected by means of the pre-visit application. They are selected from a large database with questions and corresponding feedback, in which each question is connected to a specific zone within the exhibition and to a specific exhibit within this zone.

After finishing this quest, the players return to the table for the post-visit application.

2.4 The end-of-visit application

In the end-of-visit application topics that were part of the quest are displayed, represented by images with short informative texts attached. The topics are more detailed than was the case in the pre-visit application: a main subject from the pre-visit application is split up in a number of different topics. For example, if the subject in the pre-visit application was the Inuit from Greenland, in the end game topics like hunting, music etc. of the Inuit from Greenland are displayed. The purpose of this end-of-visit

application is to prepare a more in-depth research into specific subjects after the actual museum visit.

2.5 Personalized, post-visit website

Using the number of the barcode card in combination with the visit date a user can access a personalized website. On this website the topics selected using the end-of-visit application at the multitouch table are prominently displayed. Selecting a topic launches a search that returns a limited set of relevant pages from the web, using the PuppyIR framework.

3 Technology

3.1 Requirements

The PuppyIR Museum Demonstrator makes use of a multiuser, multitouch table from “Multitouch LTD” designed to recognize multiple inputs of various users at the same time and to recognize and track 2D-markers (fiducials) (figure 6).

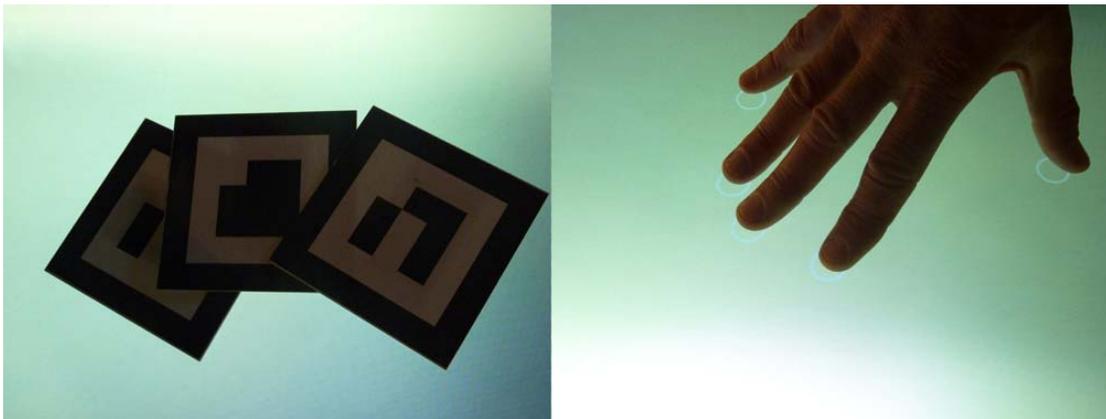


Figure 6. 2D Markers (Fiducials) and Multitouch.

The PuppyIR Museum Demonstrator also interacts with various web services located on a server inside the Museon, interchanging user generated input and requests generated from the museum’s terminal system. Simultaneously, the demonstrator must handle multiuser interaction and to compute any fiducial input.

The target group are Dutch speaking children between 8 and 12 years old. Therefore the Graphical User Interface is optimized and made appropriate for this age group.

The final application is currently stable and requires a minimum amount of maintenance work once operational. No proprietary software is used and the codebase is structured in a modular way to ensure that it is reusable and customisable for other institutions like the Museon.

The demonstrator is built using the popular Multitouch for Java Framework (MT4j) implemented by the Fraunhofer Institut and published under the GPL Licence (additional information, tutorials and download links can be found at <http://www.mt4j.org>). The last official release (31.03.2011) is version 0.95, whereas the Museum Demonstrator has been implemented using the latest version from <http://code.google.com/p/mt4j/downloads/list>.

The source code and documentation can be accessed from the project’s SVN repository hosted on Sourceforge at <http://sourceforge.net/projects/puppyir/>. The SVN version of the demonstrator does not include the connection to Museon’s webservice, but uses hardcoded question strings to allow the execution of the program, due to security reasons.

If not used on a Multitouch table capable of Fiducial (2D Marker) recognition, the TUIO simulation software could be used instead (downloadable at http://sourceforge.net/projects/reactivision/files/TUIO%201.0/TUIO-Clients%201.4/TUIO_Simulator-1.4.zip/download).

3.2 The Graphical User Interface (GUI)

As children are the main target group for the Museum Demonstrator, the Graphical User Interface (GUI) is designed to not only take advantage of touch input from multiple users, but also to be intuitively easy to use and appealing for the younger age groups.

The GUI is strongly visual, relying more on images than text. Nearly all presented data is touch sensitive, and objects are optimised to use fingers for interaction. In an ideal scenario the user, even at the lower age limit should be able to interact with the GUI without the need of guidance by any museum personnel.

Every task that is not self-explanatory is introduced with additional information from the application itself. Furthermore, maintenance tasks are designed in a way that update routines do not require advanced technological knowledge from the museum personnel and at any rate are kept to a minimum.

3.3 Requirements for the post-visit webpage

The post-visit webpage is implemented according many other developments for PuppyIR. It is a web application created using Django and the PuppyIR Framework as the main elements.

Aiming at a user group aged between 8 and 12, the application focuses on a graphical way of information presentation.

By using their ticket number and the date on which the children visited the museum, the web service can identify the topics chosen. The identity of the children is not known in any case. The application only stores ticket numbers.

From the client point of view (the child), the only requirement is a computer with a web browser connected to the Internet. The webpage has been tested with the last versions of the most common browsers for a PC:

- Firefox 10
- Explorer
- Opera 11
- Chrome 17

The webpage relies heavily in CSS, Javascript and AJAX technologies, but it does not uses any feature from HTML5, so it will work with any modern web browser.

From the server point of view, the technical requirements are:

- Python 2.7;
- Django 1.2 or above;
- PuppyIR framework. The particular requirements for the Framework are described in D4.6 or D4.7;
- MySQL database server: this database is connected also with the application in Museon;
- DeCruft (optional): a library for simplifying the appearance of external web pages.

The PuppyIR framework is the key component for searching. The Framework allows making several types of searches and filtering without much programming effort. The application uses some features from the Framework:

- Search: The application takes the Framework to search using Bing. We search using different domains and keywords for a given subject, in order to obtain a set of adequate results. The framework supports passing some parameters to Bing, to obtain result as images and text (only in Duch), or to filter adult content.
- Filtering the results by website: We use the Framework to filter both inappropriate websites and some specific webpages in a website.
- Filtering the results by words: We filter some uncommon bad words not filtered by Bing in Strict mode, or to avoid common or off-topic results.

DeCruft (<http://code.google.com/p/decruft/>) can be used for simplifying the obtained external webpages, after the search. DeCruft tries to extract the main contents from a webpage, omitting frames, menus, and other decorative elements that can be confusing. One of the advantages of being open source is that we can use the huge library of open source tools. Unfortunately, DeCruft is in development and it cannot achieve results good enough for all the possible types of webpages, so it can be disabled if needed.

The post-visit server application and its documentation can be downloaded from <http://sourceforge.net/projects/puppyir/>. The application uses the general style and conventions for the Django application. As it is a native Python application, it is possible to deploy it both on Windows and Linux servers.

3.4 User registration and pre-visit

Tickets equipped with a 2D marker are handed out to users. Each ticket has a unique marker rendering it possible to identify the user and to personalise his or her interaction (e.g. if the user enters a name, it can be shown every time he is interacting using his ticket to create a more friendly, personalised interactive experience).

Up to four users can simultaneously use the table to register themselves, achieved by placing their tickets onto the table – making it a more fun and interesting experience (figure 7).

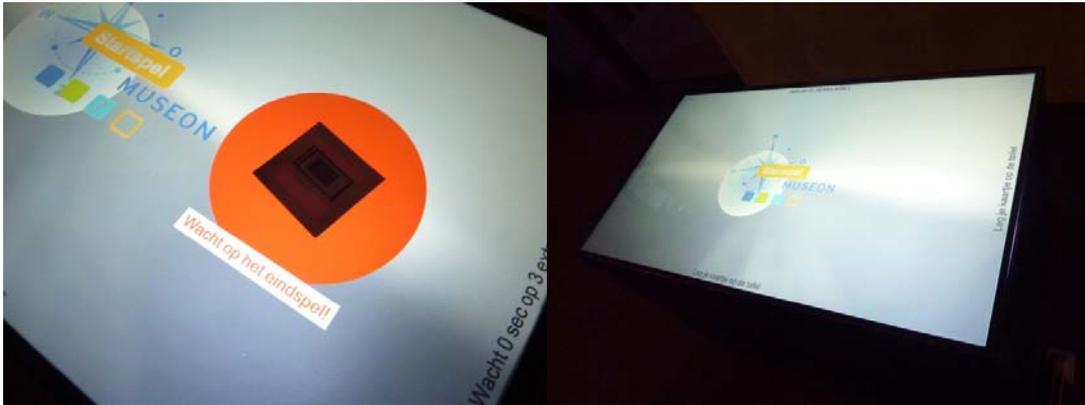


Figure 7. Right: System is waiting for tickets; left: a user has put a ticket after the pre-game was completed.

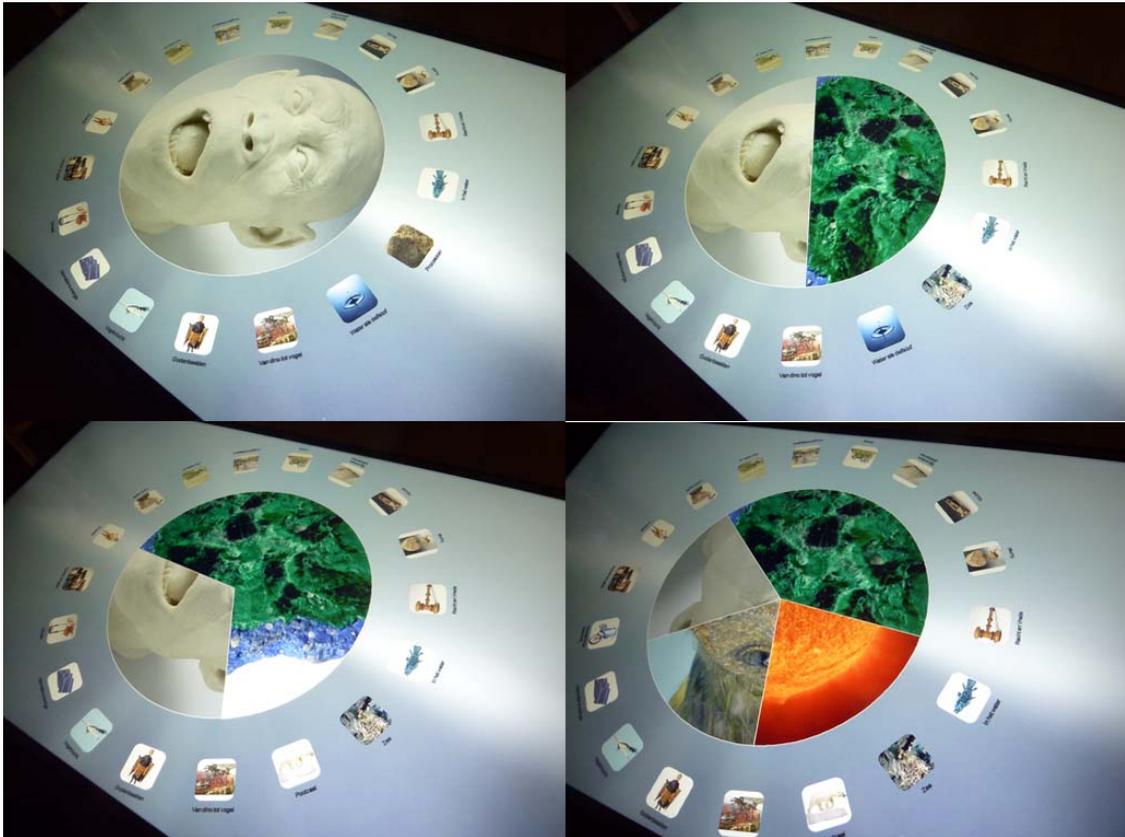
Once four users have registered themselves (or one to three users have registered during a certain period of time) the quest starts with introducing the players to the game rules and explaining the meaning and usage of each object being shown.

The pre-quest's main purpose is to let the users choose 12 topics that are part of 8 different main groups (sun, sea, stone, fight, birds, human, art, religion) related to the different exhibitions that are currently being exhibited in the Museon. In a slowly rotating circle 18 different topics (the amount can easily be changed depending on the amount of feasible topics and the size of the table being used) are represented by pictures and a title. When touched and/or dragged they grow in size and show some more text to inform the user about their meaning. To be accessible from each side of the table the objects automatically change their orientation by rotating towards the user's position.



Figure 8. Circle of objects with two objects selected and dragged.

The centre of the circle contains the terminal responsible for creating the user's question queue, (figure 8). Each object contains all questions the Museon system has generated for the related topic. When it is dropped into the terminal each user receives one of these questions. Up to 12 objects can be dropped into the terminal adding 12 questions to each user id per session. While objects are added to the terminal their appearance is visualised by a graphic representing their corresponding main group (Figure. 9).



9. "Terminal" with different topics selected.

The game finishes after a predefined timeout has been reached; a stop button that appears after some time of interaction has been pressed or the game finishes after the users have selected twelve topics to receive questions about (figure 10). An end screen will tell the users to move to the exhibition space of the museum and to answer the questions they receive when scanning the barcode on their ticket at one of the terminals situated at various locations throughout the museum.

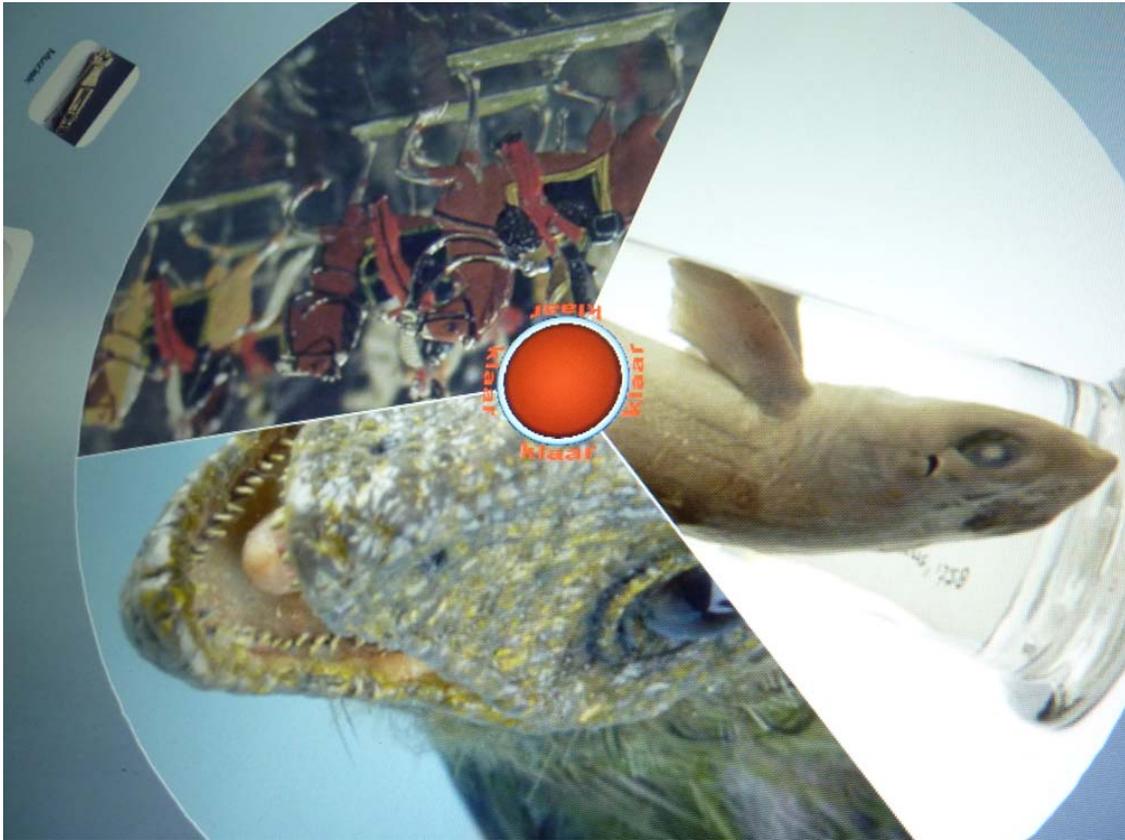


Figure 10. Stop Button appears after a certain timeout.

3.5 Museum visit

The exhibition in the Museon deals with different topics like geology, biology, history, science and ethnology and are situated in different areas of the building. Each of these areas is equipped with one or more touch screens and 2D-marker scanners. When scanning a ticket the user is confronted with one of the questions that has been linked to the ticket's marker id by dropping different topics of interest to the centre of the touch table while playing the pre-game. The corresponding answer is to be found within the exhibition space encouraging the user to actively observe the exhibits.

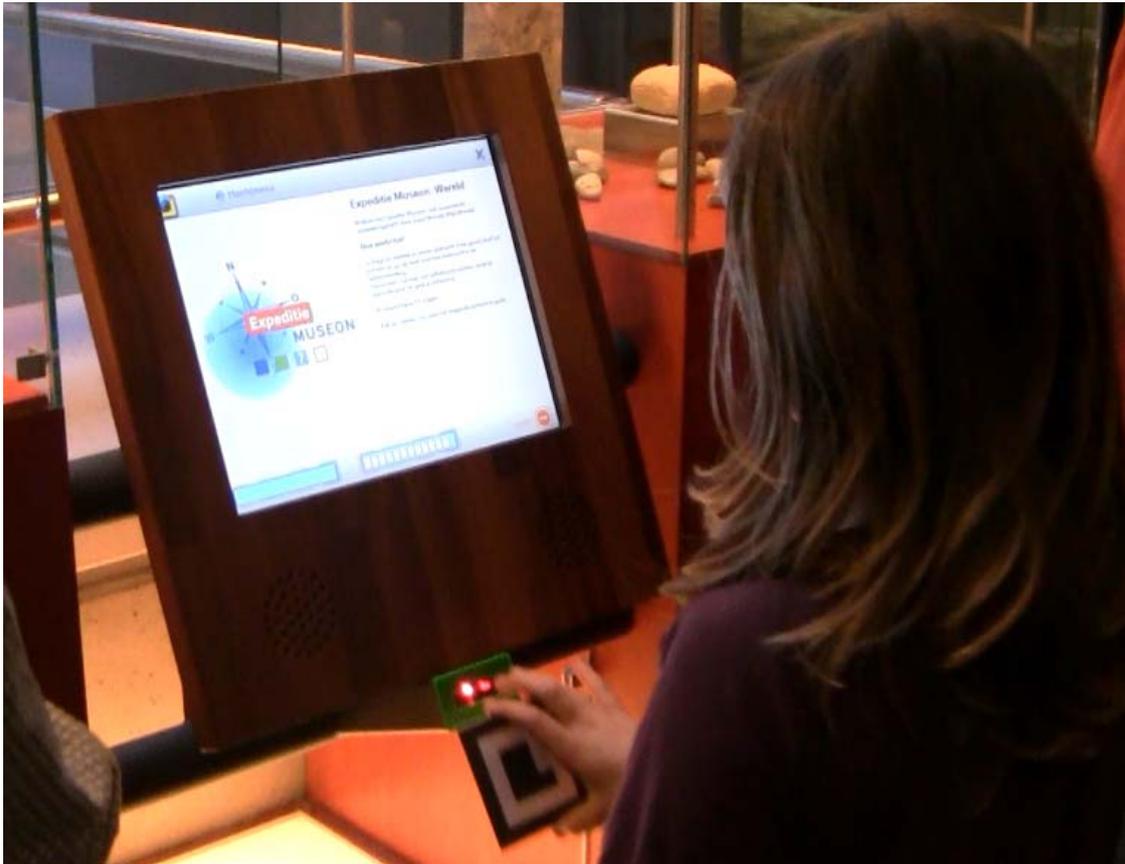


Figure 11. Touchscreen with 2D Marker scanner situated in the exhibition space.

After having all questions answered and coming back to the multi-touch table, the users must register themselves again by using their tickets. The system automatically recognizes if a ticket has not been used in the pre-visit so far and is informing the user that the ticket is not valid for the post-visit. If four valid tickets have registered or a timeout is reached the end-of-visit application starts.

The topics corresponding to the questions extracted from the tickets are used to search for related texts and pictures in a database filled with additional information about the museum's exhibits. This data again is presented by pictures slowly rotating around the centre of the screen in a circular manner. Once more, if one of the objects is touched it grows in size and a (now more extended) info text is shown. But instead of having one terminal in the centre of the screen to drop the objects into, there are up to four smaller terminals, each for one user situated around the circle of objects. If a user wants to have further information about a topic or he/she just want to store it dropping it onto his/her personal terminal saves it to a database linked with his/her ticket id. It will be possible to address this information via the post-visit application, allowing an extended search for related data at home, after the visit.



Figure 12. Post-game with personal user terminals filled with data.

3.6 Museon post-visit

After the visit, the user can use the post-visit online application for learning more about the topics in the visit or other topics in the Museon.

Like in the multi-touch application residing in Museon the main attention while designing the GUI of the web site went to a self explaining intuitive and easy to navigate layout with as little text as possible. With the extensive help of AJAX and Java Script the website follows the approach of filling the website with information step by step guiding the user by always focusing his or her attention on the next task to fulfil.

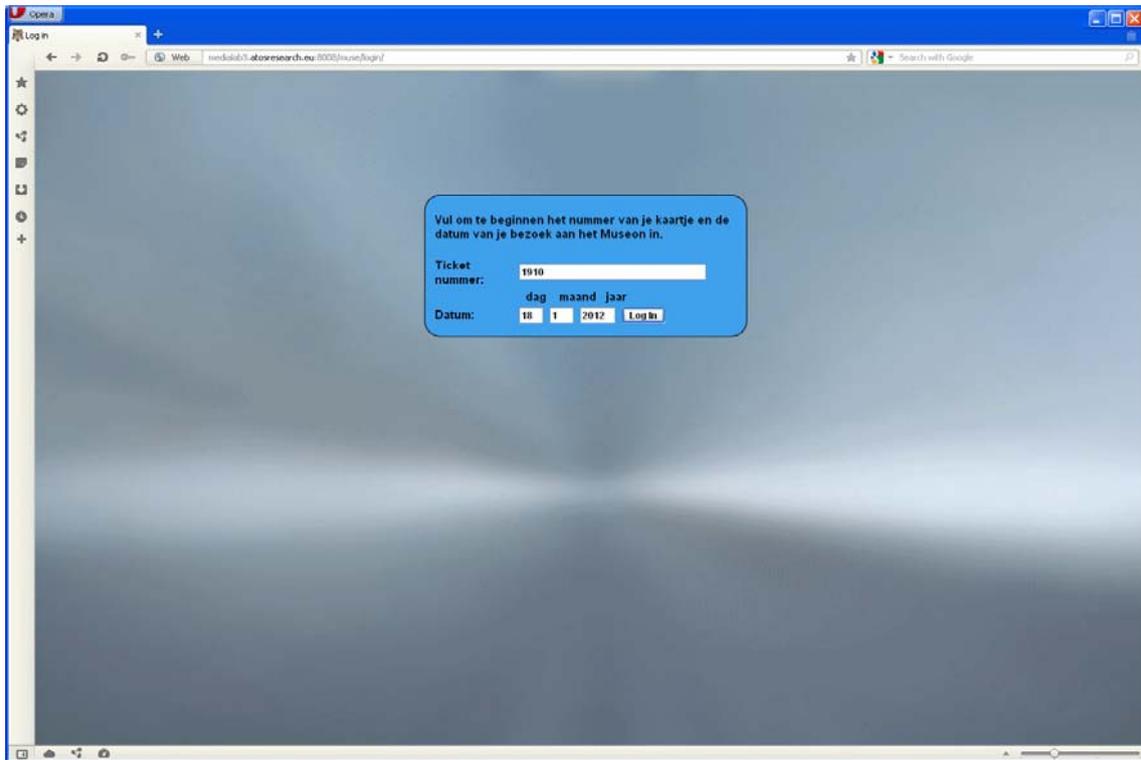
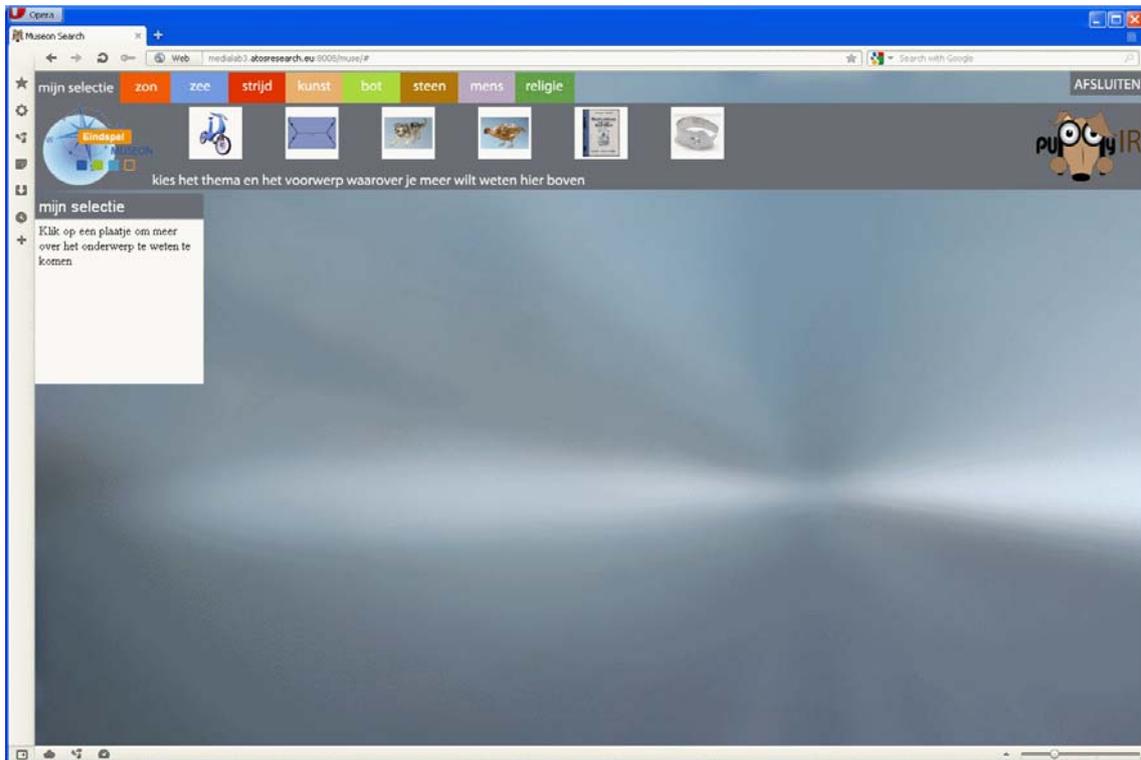


Figure 13. Login Screen.

After registering with ticket number and the date of the visit in the Museon (figure 13) the user is presented with the list of topics that have been collected by the user in the Museon's post-game. A tabbed menu provides further content ordered by the same main sections like in the Museon (Energy, Sea, Geology, Religion, etc) (figure 14).



14. The list of topics from the visit to the Museum.

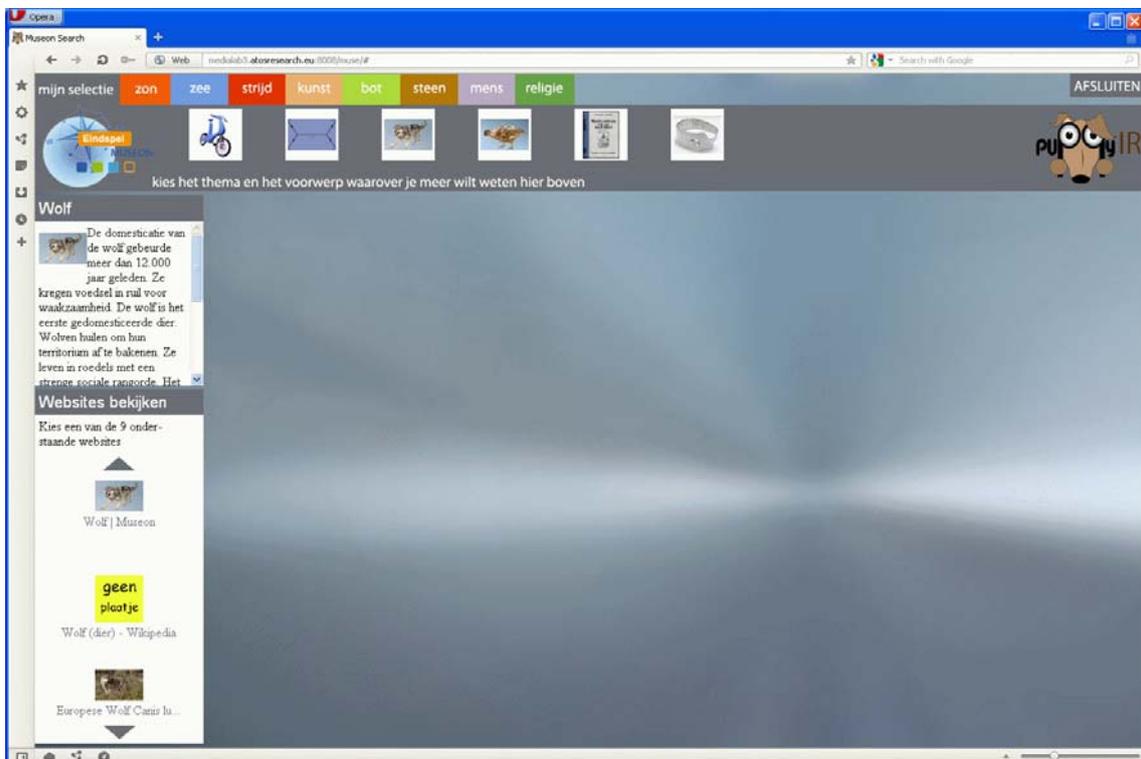


Figure 15. Results from the search. The user searched for webpages related to the topic "wolf".

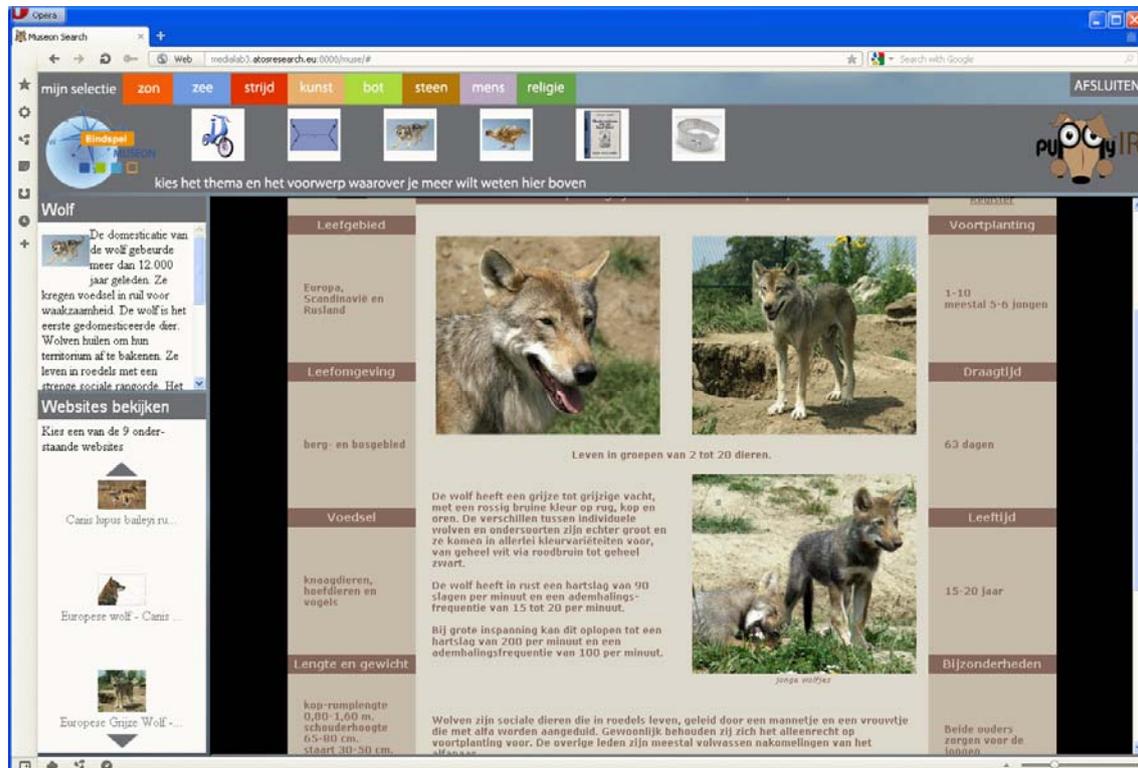


Figure 16. The user choose one of the webpages about the wolf.

If one topic is clicked a text appears giving an overview over the selected topics while the underlying PuppyIR framework searches the Internet for related websites (figure 15). The results represented by pictures and a short title are shown in a scrollable list whereupon the corresponding website opens within an iFrame in the center of the screen to keep the user from being dragged away from the post-visit website (figure 16, 17). When the user decides to trigger a new search the whole website cleans up focusing back to the tabbed menu with the Museon topics.

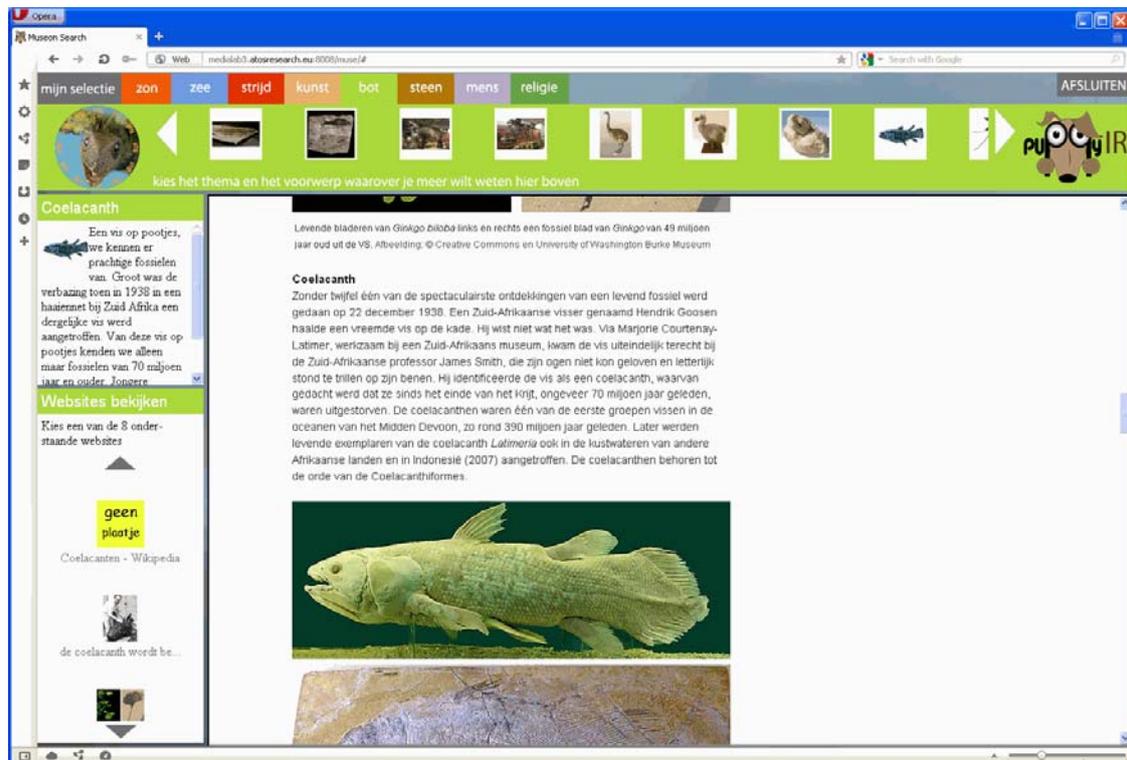


Figure 17. The user can search for information about topics not chosen in the visit: All the topics from the Museum are accessible.

3.7 Known issues

Even though the released version 2.0 has been intensively tested to be stable and all known bugs from version 1 have been fixed it is still a prototype which, regarding that the used framework is in a beta state, occasionally leads to unpredicted behaviour, and even abruptions in the running program.

4 Conclusion

The Museum Demonstrator is integrated with the existing facilities within Museon to create an interactive expedition approach to visiting Museon, using Multitouch for Java (MT4j), a multitouch table and marker tracking, and creating the basis for additional data retrieval and filtering using the PuppyIR framework. The demonstrator can be seen as a virtual guide for children, allowing them to choose their own topics of interest and to retrieve additional information about the museum's exhibits in a playful way that may extend and deepen their knowledge.

The post-visit webpage allows the children not only to retrieve the information collected during their visit in the Museon, but also encourages them to increase their knowledge by searching the web for additional information.