NEMO SYSTEM: NEW MUSEUM APPROACHES - DEVELOPMENT OF PORTABLE NAVIGATION SYSTEMS FOR EXHIBITIONS

Michael Charakis [a]

[a] Charakis Research & Consulting Ltd, Managing Director, 10 Kosta Charaki Str., Limassol, Cyprus,
mcharakis@crccy.com

KEY WORDS: **Museum Navigation, location-based services, digital heritage content promotion, PDA, software platform, mobile application.**

ABSTRACT:

The **NEMO** project involves the development, design and implementation of a location-based information system for cultural heritage content. Within the scope of *"NEMO"* project, was the development of a software platform for handheld and mobile computing devices (known as Personal Digital Assistants: PDAs), which are employed by the visitors of cultural heritage sites.
The NEMO system allows the process and the presentation of content in real-time based on the location of the visitor within the physical space, providing the following capabilities:

- Retrieval of Multimedia Exhibits

- Interactive tours in the site, both predefined and free tours, with embedded audio – video and textual information.

- Retrieval of information in different levels according to the available time of the visitor within the physical space.

In the context of the specific project a client-server architecture was developed, based on Java technology (J2ME) for mobile devices, which enabled the functionality of distributing multimedia content form the Server to the Clients of the system. The content was provided to the clients of the system based on the position of a specific the client in the space. The localization of the client was determined through the utilization of wireless network 802 11.g. This innovative approach provided us with the exact localization of the client in 34 distinct locations within the physical area of the museum, with a precision varying from 0% to 0.3% position error, by utilizing a set of 18 wireless antennas (including the redundant access points) and the same time providing simultaneously content to 4-5 clients (visitors).

1. INTRODUCTION

1.1 General Information

The NEMO System is the result of the research program: **New museum approaches - development of portable navigation systems for exhibitions- NEMO.**

The NEMO project involves the development, design and implementation of a location based information system for cultural heritage content. Within the scope of *"NEMO"* project, was the development of a software platform for hand held and mobile computing devices (known as Personal Digital Assistants: PDAs), which is employed by the visitors of cultural heritage sites.

The NEMO system allows the process and the presentation of content in real time based on the location of the visitor within the physical space, providing the following capabilities:

- Retrieval of Multimedia Exhibits

- Interactive tours in the site, both predefined and free tours, with embedded audio – video and textual information.

- Retrieval of information in different levels according to the time that visitor has for touring within the physical space.

The NEMO project includes also:

- The realization of both design and implementation study of the software and hardware architecture of the system, the detailed description of the tools and the different components that are needed as well as an installation study for the physical space.

- The realization of a tour plan for the visitor, in order to obtain a complete set of information for the site that is being visited thus ensuring the interactivity between the user and the digital information provided and the continuous flow of information

- Digitization of the content according to the technical requirements posed by the requirements of NEMO platform.

In the context of the specific project a client-server architecture was developed, based on Java technology (J2ME) for mobile devices, which enabled the functionality of distributing multimedia content form the Server to the Clients of the system. The content was provided to the clients of the system based on the position of a specific the client in the space. The localization of the client was determined through the utilization of wireless network 802 11.g.

Figure 1: Actual snapshot from NEMO System

The specific installation, which has been already successfully completed in the Pieridis Museum in Larnaka is actually the first, at least in European level, that has fully integrated the use of Location Based Services in the context of cultural heritage. This innovative approach provided us with the exact localization of the client in 34 distinct locations within the physical area of the museum, with a precision varying from 0% to 0.3% position error, by utilizing a set of 18 wireless antennas (including the redundant access points) and the same time providing simultaneously content to 4-5 clients (visitors).

Figure 2: The introduction screen of the NEMO System at Pieridis Museum

The project has been not only innovative in using existing technological capabilities, but it is also designed in such a way in order to be fully scalable to cover further functional requirements which could be introduced in the future, if the need arises.

The main advantage of the Nemo System lies in the creation of new means of content management and especially presentation of cultural heritage content, incorporating an intuitive and personalized manner, tailored to specific needs of each visitor.

1.2 General Objectives of the Project

The general objectives of the research project were:

1. The Exploitation of the possibilities that new technologies offer.

2. To provide new educational, instructive and recreational ways of presenting content (collections).

3. To Provide advanced services of information of cultural content.

4. To find new future use of the application from the Business Community.

1.3 Special Scientific and Technological Objectives

The special scientific and technological objectives of the research project were:

1. The presentation of information and knowledge with a friendly and ease of use approach.

2. The selection of more suitable technological solution for relevant applications.

3. The development of all relevant infrastructures.

4. The integration of modern technology for presenting cultural content.

5. To develop an application of techniques for the tracking in real time the movements of a user in an internal space, via a wireless network.

2. RESEARCH RESULTS

2.1 General

The Project is characterized by a high degree of scientific character and requires the harmonious coexistence of heterogeneous objectives and activities. The methodology that was adopted combines all the individual approaches in order to ensure the required level of presentation of content, technological solution, diffusion of results and further exploitation.

More specifically, during the development and implementation of the System, the Project Team worked under the following approaches:

1. Technological Approach

2. Spatial Approach

3. Museum Approach

4. Socio-economic Approach

2.2 Techonological Approach

This Approach is divided into 3 distinct phases:

1. the planning and the implementation of the Server where the digitalised material will be stored,

2. the planning, the development and the implementation of the application that is installed in the device of the user, και finally

3. the completion of the software that is required for the computing the exact location of the user inside the museum physical space.
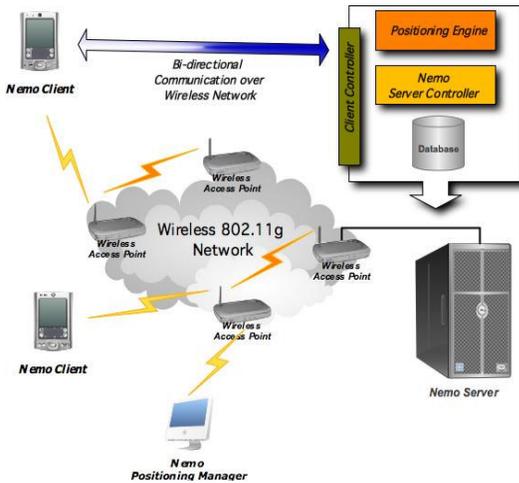

Figure 3: Technological Approach

In the context of the specific project a client-server architecture was developed, based on Java technology (J2ME) for mobile devices, which enabled the functionality of distributing multimedia content form the Server to the Clients of the system. The content was provided to the clients of the system based on the position of a specific the client in the space. The localization of the client was determined through the utilization of wireless network 802 11.g. This innovative approach provided us with the exact localization of the client in 34 distinct locations within the physical area of the museum, with a precision varying from 0% to 0.3% position error, by utilizing a set of 18 wireless antennas (including the redundant access points) and the same time providing simultaneously content to 4-5 clients (visitors).

The receptors were positioned in specific points of the museum, taking in consideration the architectural properties for each room of the museum and in such way as to maximise the strength of the wireless network.

At the same time, the museum drawings were digitalised and then installed at the handheld computers. There, a process of "their normalization" was applied, so that there is a complete identification between the coordinates of the architectural drawings with the coordinates that will be used by the wireless network. In such a way, the land-planning perception is created. After the necessary corrections, the software was integrated in the System.

2.3 Spatial Approach

The Spatial Approach refers to the secure performance and functionality of the system within the physical space, the safe keeping and storage of content and the protection of all hardware and peripherals.

The technology used for computing the "location" of a user in the internal space is based on a probabilistic concept, which enhances the advantages that result from decisions theory, probabilistic models and information theory.

The Spatial Approach describes the planning of arrangement of wireless appliances (access points) in the physical space, with the advantages and disadvantages of the various network topologies that were tried. This process is examined within the particular application, pioneered at the Pierides Museum.

Finally, the methods that were used for the improvement of output and precision of location software were presented and evaluated.

2.4 Socio-Economic Approach

The socio-economic effects from the use of mobile systems in presenting cultural content had a particular importance, both during the adoption of the script/Strategy Phase and later, when all the potential possibilities were being considered.

The Project Team, early decided that the system would have an instructive and promotional character concerning the cultural element, and at the same time, a commercial value in multiple application in terms of future growth.

The introduction of new technologies in the culture industry, according to European and international standards, creates new prospects and growth opportunities for relevant organisations and for the local economy. New scientists are focusing on new technologies and state-of-the art policies and are developing relevant applications in order to incorporate modern museum and educational tendencies in the museum community of Cyprus.

At the same time, in a country as Cyprus, where services and especially Tourist Services, constitute the most important productive area of creation of National Wealth, the use of modern technology for the presentation and projection of cultural characteristics it is considered henceforth necessary.

The NEMO System, on its own way, generates and enhances the competitiveness of the tourist product of Cyprus, something much needed in a highly adverse market.

NEMO System is not only **technologically innovative** but can also be **expanded immediately** (in terms of technological solution and content management) in commercial applications, contributing in the creation of a new approach in the management, projection and presentation of various "collections", in easy and individualized way. The location based information management System is very well suited for spotting products in large areas (e.g. shopping malls), and thus providing multiple information and increased customer focus.

2.5 Museum Approach

In this Approach, the script strategy of a conducted tour was developed, a tour which includes the ideological dimension of report, the proposed historical but also territorial ways with the special points of interest and the training of special list on the digitalisation of content.

Αρχαϊκή ✕

🔊 🔇

Σε αυτήν την προθήκη βλέπουμε
αρκετές Κύλικες Δίχρωμης
Κεραμικής V.
Πάνω δεξιά υπάρχει μια Κύλικα
Δίχρωμης Κεραμικής V με πόδι και
δύο μικρές αντικριστές λαβές
κολλημένες στο σώμα. Το εσωτε-
ρικό της είναι διακοσμημένο με
λεπτές μαύρες περιθέουσες γραμ-
μές, ενώ στην εξωτερική του
επιφάνεια αναπτύσσονται τέσσε-
ρις οριζόντιες ζώνες με φυτικό
διάκοσμο.

Τριποδικό αγγείο δίχρωμου ρυθ-
μού. Δύο ζεύγη ενωμένων αντι-
κριστών λαβών στο πάνω μέρος
του σώματος σχηματίζουν τα
κέρατα αναγλύφων ταύρων.
Κυπροαρχαϊκή Ι περίοδος (750
-600 π.Χ.)

Μικρές πρόχοι ή θήλαστρα δίχρω-
μου ρυθμού με γραπτή διακό-
σμηση. Αρχαϊκή περίοδος (750
-475 π.Χ.)

Figure 4: Actual Screen from the application in the Pierides Museum

The various scripts/Strategies for touring the Museum, took into consideration the most advanced and state-of-the art educational methods for promoting cultural content.

At the same time, the creation of the digital multimedia material was completed. In this stage, the digitalisation and digital treatment of the primary or other forms of content was realised, the adaptation and assiduity of this material was configured according to the exact specifications of the System, the translation and adaptation of was finalised in both English and Greek.

Finally the application was installed in the handheld devices (PDA's) and then it was "live" pilot tested in the Museum.

3. REFERENCES

J.M. Humbert, «Living in the Present: Museums and ICTs}, *First International Workshop on Information Technologies (ICTs), Arts and Cultural Heritage*, Donostia-San Sebastian, May 5th 2003.

P. Kalliaras, A. Sotiriou, S. Zoi, John N. Karigiannis, N. Farandouris, N. Mitrou, *"The AVATON Architecture: Location Based Multimedia Services for Tourists"* ITI 2nd International Conference on Information & Communication Technology (ICICT 2004) "Multimedia Services and Underlying Network Infrastructure", Cairo Egypt, 6-7 December 2004

M. Schnaider, «Innovative Mixed Reality applications in archaeological sites: the ARCHEOGUIDE project», *First International Workshop on Information Technologies (ICTs), Arts and Cultural Heritage*, Donostia-San Sebastian, May 5th 2003.

Vassilios Vlahakis, John Karigiannis and Nikolaos Ioannidis **"***Augmented Reality Touring of Archaeological Sites with the ARCHEOGUIDE System***"** 9th Issue of Cultivate Interactive February 2003

John N. Karigiannis, Vassilios Vlahakis, Patrick Daehne, *"ARCHEOGUIDE: Challenges and Solutions of a Personalized Augmented Reality Guide for Archeological Sites".* Computer Graphics in Art, History and Archeology. Special Issue of the IEEE Computer Graphics and Application Magazine.

4   OTHER INFORMATION

4.1   Project Team

The project consortium consisted of important organisations and individuals in the area of specialised technological applications for the promotion of cultural heritage information as well as in the area of research project management and EU funding.

Project Leader

Project leader of the research project NEMO is **Charakis Research & Consulting Ltd**, (CRC Ltd). CRC Ltd., with presence in Cyprus and in Greece (CRC Hellas ΕΠΕ), is a Research & Development and business consulting company in a wide range of sectors and areas. Charakis Research & Consulting Ltd., invests in R&D, targeting the development of innovative sulotions and services. In the specific project, CRC Ltd, was in charge of the coordination of the consortium, and most importantly the successful development and launching of the NEMO System and the pilot application. Morevoer, Charakis Research & Consulting, was responsible for the Mass Media coverage.

Project Manager: **Michael Charakis**, Managing Director - Charakis Research & Consulting Ltd.

Scientific Head: **Peter Ashdjian**, Manager - Pierides Museum

Individual Researchers: **Thomas Pliakas - Charalampos Doukas**

Other Partners

Foundation of the Hellenic World: It's mission is the preservation of Hellenic history and tradition, the creation of an awareness of the universal dimension of Hellenism and the promotion of its contribution to cultural evolution. Its aim is the understanding of the past as a point of reference for the formation of the present and future so that contemporary thought may once again be inspired by the Hellenic spirit. The principal objective is the dissemination of Hellenic culture and history in any way possible.

TIME HERITAGE is a company established in order to meet the present-day need for a strategic approach and action towards the safeguarding and enhancement of cultural heritage. It offers an interdisciplinary scope, working with experts in Conservation, Science and the Humanities, interested in the study, conservation and further preservation of monuments and sites in Greece as well as in other countries, particularly those of the Mediterranean.

End User

The first pilot application was held at Pierides Museum in Larnaca, Cyprus. NEMO System is now on day-to-day operational basis used by the visitors. Pierides Museum, is one of the most important museums in Cyprus, since its archaelogical exchibits are the most characteristic exchibits of the Cyprus heritage through the centuries.