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# Creating interactivity of our heritage stored in Museums

Experimentation with Château des Ducs de Bretagne History Museum of Nantes, France

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*Abstract* — For the 2006 VRIC conference, we presented a scientific article dealing with a new way of thinking our technical heritage. We propose to preserve it as a digital object. However it does not mean beautiful 3D animation with nice static rendering; indeed, we create virtual mock-up which are dynamically operating. We use CAD software and engineering simulation tools. Nowadays the global methodology has been improved: it is named Advanced Industrial Archaeology. In this communication, we will detail a new experimentation done in partnership with a French museum: the Château des Ducs de Bretagne in France. This project deals with a physical mock-up of Nantes city built in 1899 and exposed in 1900 for the World Fair that took place in Paris, France. The heritage object is nowadays in the museum but exposed as “a fish inside an aquarium”. Thanks to a virtual system coupling a tactile screen with semantic research modules, a 3D active screen and a light pointer, it will allow the visitor to better understand the mock-up and emphasize important places of Nantes city life.

*Knowledge data base, Virtual Reality, 3D digitalisation, reverse-engineering, industrial heritage, technical history, Museum, Nantes*

## I. SCIENTIFIC CONTEXT

Industrial archaeology is one specialty of archaeology. This discipline study material remaining from the past but it focuses more specifically on industrial heritage (metallurgical and manufacturing plants, road, bridges, tunnels, railways, marine, waterways, aeronautic...) Industrial archaeology is born in England in 1940. However the industrial heritage is not so widely known, indicating a latent disinterest of our society for our industry.

Since 2004, our research team works to establish a new discipline: Advanced Industrial Archaeology (AIA). Main aspect is that it takes into account multiple contexts as socio-economical background of an object (elements which are so important for a better understanding of our history). AIA wants to initiate a new virtual way for Museums. But be careful that AIA does not mean technological miracle. Technology must not be used every time for saving all technical objects surrounding us; indeed it is a tool which help us to “back-up” ancient technical objects and more widely, our humanity knowledge.

The global process is the core of what we call Advanced Industrial Archaeology:

1. First step concerns the digitalization of the physical object and the capitalization of the know-how learnt thanks to the machine’s studies.
2. Next, thanks to virtual reality technologies, we can valorise this amount of knowledge.

Nowadays, the methodology to design an old technical object has been validated and experimented on several case studies: *capitalize* → *formalize* → *valorise*. For this new edition of VRIC 2010, we would like to give more testimony of the AIA adventure.

We will report a project started in September 2008 that should finished in 2011. The project is done in partnership with the History Museum of Nantes called Château des Ducs de Bretagne (department 44, France). We have to precise that one specificity of the project and consequently one most difficulty is the fact that it is a pedagogical project. That means that students do all works.

## II. NANTES1900 PROJECT EXPERIMENTATION

### A. Objectives and project definition

Since the beginning, the city of Nantes (France) has always been a powerful harbour of the Atlantic sea. In order to demonstrate its power, the Chamber of Commerce of the city decided to order a mock-up of the harbour. It was established for the “World Fair Exposition” of 1900 in Paris. Later, it has been updated until the First World War. After the conflict, the Chamber of Commerce gave it to the Nantes City Museum (the Museum of Salorges). Nowadays, it is classified as a heritage object of the municipal collections. It is installed in the permanent exhibition of the Musée du Château des Ducs de Bretagne.

The mock-up measures 9.2 meters long and 1.85 meters large. Paul Duchesne has built it in 1899. The scale is 1/450 (so as to have a comparison reference: streetlights stick have a diameter of 1 mm inside the mock-up). The full mock-up represents approximately 3.44 km<sup>2</sup> of Nantes city harbour.

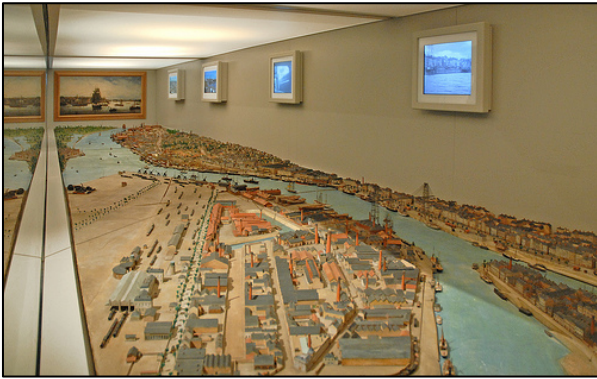


Figure 1. The physical mock-up inside its "aquarium"

Recently, the Museum decided that this Nantes harbour mock-up must "speak". Thus, a partnership was established between the museum and Nantes school institutions (University, Ecole Centrale...) in order to model it and propose an innovative form of valorisation.

The project purpose is to develop an interactive system between the visitor, the Internet, the physical model and the database associated to the virtual representation of the heritage object. The public presentation should be innovative, easy to use and educational. The device will allow combining an Augmented Reality system inside the museum room so that every visitor can access the knowledge (it is an *in vivo* system). Main aspect concerns the creation of the Digital Heritage Reference Model database that will support the knowledge. It will include a 3D scanned model and a compilation of the artifact' knowledge. The data management system will support heterogeneous format (text, image, sound, videos...) and will propose a semantic indexer/researcher.

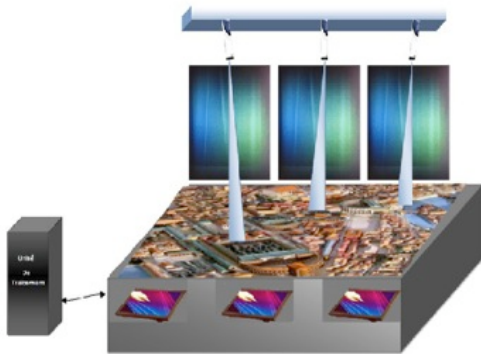


Figure 2. Illustration of the future virtual reality system prototype

### B. Multimedia and Opensource

Notice that one most important constraint is that the system will be Open source (Museum technology choice) in order to permit evolution and upgrade of the knowledge base. Our project will also respect the museum policy: valorising heritage collections by NTIC media.

16 kiosks and over 24 broadcast stations, archives, sound clips, movies (including real-time 3D reconstruction of

Nantes in 1756), and 180° immersive projection have been selected and developed by the Museum. Nantes1900 project is a new one that will continue efforts done until nowadays. An operating prototype will be delivered and tested inside the museum in July 2010.

### C. Inter-disciplinarity team

This project is a multi-field and transversal experiment requiring numerous competences:

- Social and human sciences for the technical and industrial history, memories & heritage, geographical analyses, heritage and museography...
- Engineering sciences for 3D scanning, mechanical design, mathematical computation, informatics database, virtual reality development...

Notice that the mechanical team works on the DMU (Digital Mock-Up). After the digitalization, they are trying to automate the 3D mesh simplification and the colorization of the cloud of points.

Main originality of the project lies to its composition: all members are students from multiple universities and schools of Nantes. It is a voluntary choice done by the steering committee. This innovative approach has led the project to a lack of precise specifications; objective is to unleash the imagination and increase the creativity of the team. Consequently, obtained results are really original and would perhaps have never been found in other circumstances, for example by professionals specialized in museographic business!

## III. TO GO FURTHER

From a scientific point of view, the project consists to establish new research pillars in order to create the basis for the new wave of museum valorisation system. If it succeeds, we hope to extend our proposition to numerous museums and also to propose it to French culture ministry so as to use it as the new reference model for capitalizing our heritage.

Minimum scientific references:

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For more information about the project on the web or to see the television reports: tape the keyword "nantes1900" in [www.dailymotion.com](http://www.dailymotion.com)