A three-dimensional map to outline multimedia path
Representing and memorizing heritage and architectural information

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Abstract

This article approaches, in a sensitive way, cartography and video games to show that spatial perception and visualization are subjective and are reinforced by some media.

By materializing the mental map described by Patricia Marks Greenfield, our proposal allows the learner to outline his path and thus his three-dimensional map.

Thus, this map helps the learner in understanding of archaeological and architectural heritage, by facilitating the representation of the information and by increasing their memorization.

Keywords--- **Cartography, multimedia path, archaeological and architectural heritage, learning, video games, mental map.**

1. Introduction

Maps possess a heuristic virtue. When it becomes a research process, their realization is a performance. By drawing, by erasing, when words are associated with lines, a reflective tool takes shape. Traces of an individual reasoning are preserved on a support, allowing the reading and visualization of its own path.

Through the use of existing numerical tools, the research work consists in proposing a three-dimensional map able to improve the acquirement of archaeological and architectural knowledge.

Experiments in the communication of archaeological and architectural heritage are increasing. Thanks to the attractions of the multimedia, namely interactivity and multimodality, it seems that web sites and CD-ROMs have the capacity to transmit heritage information to the public. But ultimately they miss real cognitive or educational purposes.

David Bolter and Richard Grusin invented the concept of "remediation" [1] to explain the mutual influence of media. According to them, all of the media are evolving mutually, recent or old.

Video games borrow forms and contents from the other media, to establish new codes and propose new aesthetics.

First, video games encourage us in interpreting signs, then in creating. They would also develop skills, transferable to other activities.

According to Jacques Perriault, games are really instructive: "Firstly, they learn to discover game rules. This involves a learning[1]" [2]. It is important for him to locate these ludic practices compared to the constructivist hypothesis: "active knowledge is only created by the person himself[2]" [3].

From an experimental point of view, first, we will base our analysis on examples of cartography. Then, we suggest investigating the characteristics of the video games, to identify those which may be used for the conception of an instructive and communicative system. Finally, as a proposal, we will outline a visualization and immersion tool as an aid to understand archaeological and architectural knowledge.

2. Map as a subjective representation

According to the definition available on the *BNF* website (*Bibliothèque nationale de France*), the map can be "a small scale representation of a space and an idea on a flat surface, it testifies the necessity to represent the territory for utilitarian purposes, it can also become a

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[1] "D'abord, ils apprennent à découvrir des règles du jeu. Les découvrir suppose, quelque soit le contenu du jeu, un apprentissage".

[2] "Il n'est de connaissances actives que celles que le sujet construit lui-même".

tool of knowledge[3]" [4]. The stakes of such map can then be multiple: knowledge, representation, control, action, imagination, etc.

The maps game "Jeu de cartes" (Figure 1), allows, like a cartographer, to imagine a territory by collecting elements resulting from ancient maps.
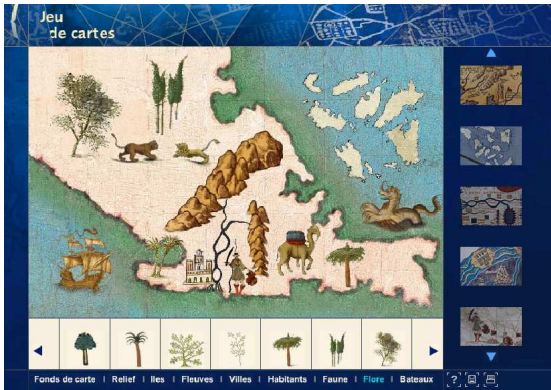
Figure 1 "Jeu de cartes" : maps game on the *BNF* website

According to Philippe Rekacewicz, cartography is governed by both science, "with quantitative and qualitative data", art, as "a work consisting of movements, colours and shapes", but also "lie and manipulation" [5]. The cartographer is a scientist, an artist or a liar, or all three at once, because he is free to show the territory in his own way.

The map is initially thought like a picture, on which selected elements will be assembled in harmony. The author then decides about their representation. Some are reinforced, while others are hidden. The map becomes the personal expression of its author. The poster *History of Life on Earth* (Figure 2) is contemplating first as an artwork. The final result demonstrates a real aesthetic research to reflect the evolution of life on earth.
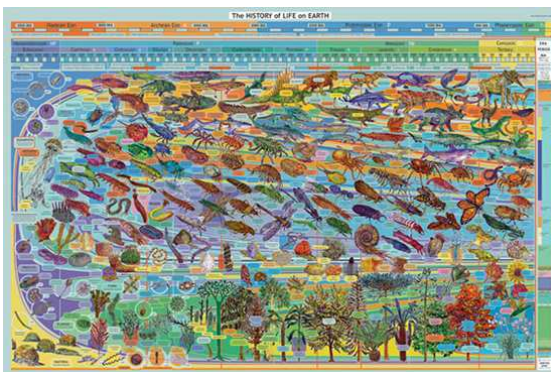

Figure 2 "History of Life on Earth" [6]

In *Terre des hommes* (*Land of men*), the aviator Antoine de Saint-Exupéry only mentioned on his map the elements helpful for his survival : « Guillaumet […] didn't speak to me about Guadix, but of the three orange trees which border a field near Guadix : « don't trust them, mark them on your map… ». And the three orange trees occupy now more space than the Sierra Nevada[4] » [7].

The choices of the cartographer to realize his map will depend on his sensitivity: he can for example, decide to represent the experiences of a place (Figure 3), transposing the physical reality of the place into the imagination.
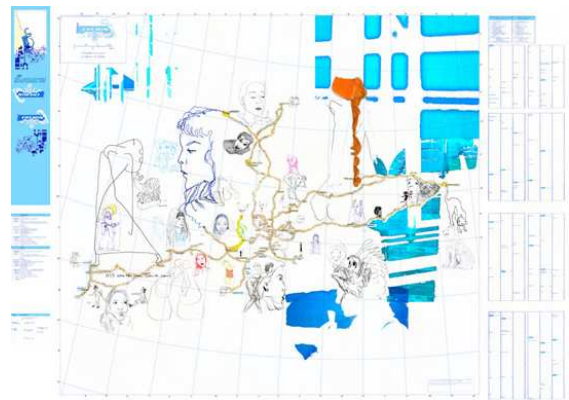
Figure 3 Picture representing the experiences of the place [8]

The school *Fustel de Coulanges* [9], in Strasbourg, proposed its plastic art students, an exercise with the school path as topic (Figure 4). Although the path is the same for all students, the diversity of work shows that walking in the city solicits senses and the emotions of the bystander. The picture is an individual perception of a daily itinerary.

Figure 4 Drawing a school path

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[3] "La représentation à échelle réduite d'un espace et d'une intention sur une surface plane, la carte témoigne de la nécessité pour l'homme de représenter le territoire à des fins utilitaires, elle peut se faire aussi instrument de connaissance et outil de savoir".

[4] "Guillaumet […] ne me parlait pas de Guadix, mais des trois orangers qui, près de Guadix, bordent un champ : "Méfie-toi d'eux, marque-les sur ta carte..." Et les trois orangers y tenaient désormais plus de place que la Sierra Nevada".

The sensitive approach of cartography shows that the perception of a world, a territory, a space or an itinerary, is subjective. In the same way, we can approach multimedia to demonstrate their capacity of adaptation of the user.

3. Video games subserve perception and representation

3.1. Video games as learning systems

Since the beginning of the first electronic games in the 1980's, researchers have attempted to analyze the relationship between video games and education, while questioning the knowledge they transmit in an informal and unconscious way.

Among them, Patricia Marks Greenfield wonders what the effects are that video games have on the way of thinking and perceiving things. In this sense, video games would shape the cognitive process, which has a universal aspect, arriving at the expression "cognitive socialization" [10]. Apart from the fact that they encourage the command of complex systems and develop research skills through induction, video games strengthen the capacity to interpret flat and static images in three dimensions, as well as improve the necessary abilities to transform, manipulate and mentally connect dynamic and changing images. The mechanism consisting of mentally connecting successive different screens enables Patricia Marks Greenfield to introduce the notion of the "mental map" [11] of the player. This ability is reinforced by television and cinema that do not show the entire space at once, but bits at a time. The user then makes a spatial assembly that consists of mentally gathering all the bits to rebuild space.

3.2. Video games as signs systems

Video games incite to exchange "multimedia" codes: visuals, sounds, and sometimes more: vibrations, etc. How to approach the semeiological reading of these universes?

Regarding our relation with signs, Christian Vandendorpe notices similarities in the cognitive mechanisms while reading a story or playing a video game: "it seems that *Riven* [12] can be considered as a pseudo-text, because its reading requires activities of concatenation, recall and selection. This reading uses skills of observation, deduction, abduction and Problem-solving. The word "reading" is used here in the sense of connecting data collected by sight and submitting them to interpretation[5]" [13]. In the video game, interpretation

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[5] " Il apparaît que *Riven* peut être considéré comme un pseudo-texte, car sa lecture exige des activités de concaténation, de rappel et de sélection. Sur un plan transversal, cette lecture met plus précisément en jeu des habilités d'observation, de déduction, d'abduction et de résolution de problème. […] Le mot « lecture » est ici

is a common practice. The player interprets the various messages (in many forms), which are placed in his path. Exploration and clues discovery, sometimes require making notes on paper (Figure 5). He can then create a story in its own way, by thinking and structuring acts.
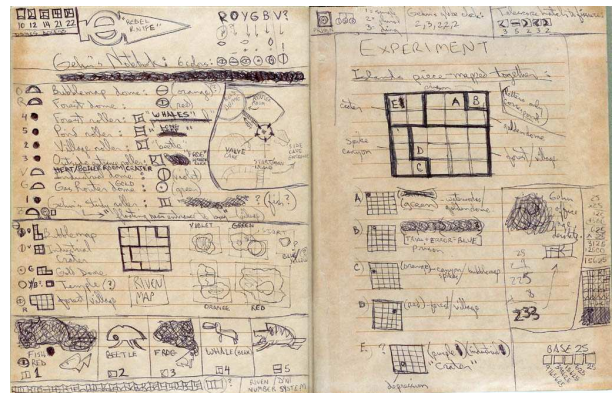

Figure 5 *Riven* player's annotations [14]

3.3. Video games as artworks

The video game narration is an expression firstly of the *game designer*, creating ludic mechanisms, and secondly of the player, creating his own story. The scenaristic structure in which the player evolves is perceived by the latter as a device giving sense to his actions. This device establishes the intelligible framework giving cognitive and practical tools for creating. According to Jacques Henriot, no structure is in itself and by itself ludic: "what makes the toy is the game of the player" [15].

In his essay, Eddy Leja speaks about an artistic expression specific to video games: "having seen that certain game designers were artists, we must ask ourselves if they are only the persons directly affected by video games that can create? I shall call ludo-artistic expression this expression specific to the video games, which is the privilege of the player" [16]. Leja defines the game designer and the player like artists and he suggests that the *videoludic expression* is not an individual action.

4. Proposal hypothesis

The reconstruction project for the Vianden Castle (Luxembourg), having a pedagogical aim, is a support to this work.

The ludic mechanisms and the strategic aspects considered, lead the learner to a total and intuitive understanding of the Vianden Castle.

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employé au sens de mise en relation de données recueillies par la vue et soumises à interprétation".

4.1. Materializing the mental map

We refer of the notion of "mental map" described above, while reinterpreting it. Our approach consists of materialising these maps. The mental map of the learner becomes a real three-dimensional map encouraging him to adopt a ludic attitude:

- The map is used as a guidance and locating tool,
- The latter allows the user to represent and organize ideas,
- And to assist the memorization process of knowledge.

In order to have an idea of the Vianden Castle, the learner has the possibility of gathering and interpreting different points of view during his real time movement (Figure 6).


PLAN - VIANDEN CASTLE - PERIOD 6
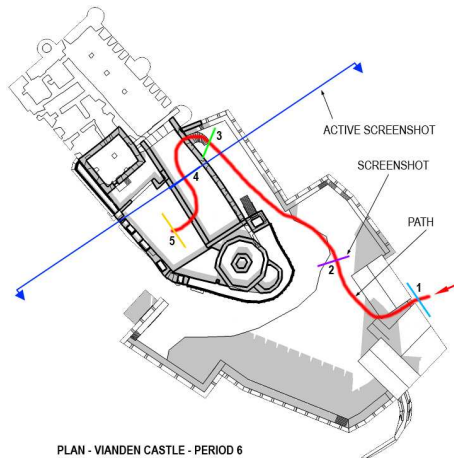
Figure 6 Screenshots on the path in the Vianden Castle

3D connections are possible between the pages. The 3D links can report waypoints in the castle for example, or link clues (Figures 7).
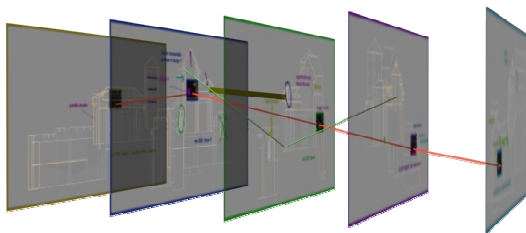
Figure 7 Screenshot-gathering to create a three-dimensional map

Visual or sonorous information is reproduced on the bi-dimensional pages (Figure 8). The learner can search documents from Internet. Sensitive areas allow round trips between the three-dimensional map and the Vianden Castle.
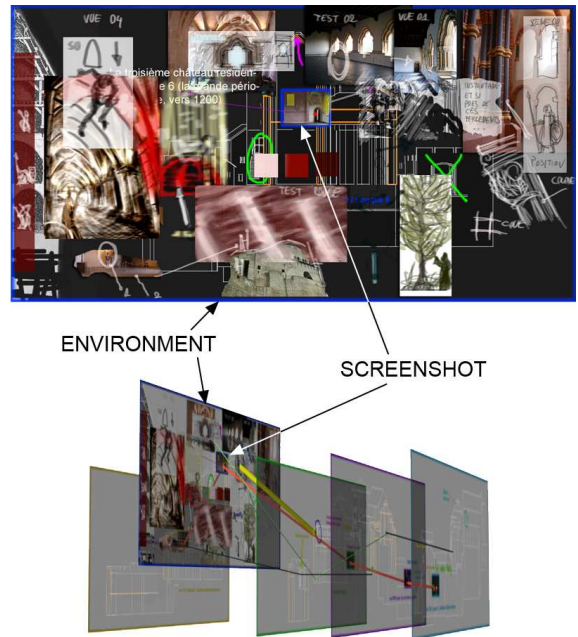
Figure 8 Example of annotated screenshot

Throughout the creation of this map, the learner outlines his path. For that, he must be able to detect relevant elements in the castle, and to use a three-dimensional map to make useful conclusions and debrief his path and his deductions: locate, sketch, formulate a hypothesis, give prominence to points of view, correct, etc.

The map becomes a travel journal, identical to the stories illustrated in the travels of explorers, themselves in the pursuit of knowledge.

The data and the connections the user chooses to the screenshots, allows him to create his own representation of the world. We refer, on the one hand, to the constructivist hypothesis according to which the learning is an active and constructive process and, on the other hand, to cartography, which has multiple stakes.

The map is not the exact image of the castle, but rather the learner's representation or perception. The important thing for the user, and for his individual fantasy, is to make sense of what he perceives. From a semio-cognitive point of view, the map establishes the sensitive framework, encouraging the ludic attitude of the user.

The three-dimensional map preserves the traces and the risks of the path.

Conclusions

Cartography and video games are malleable and hybrid forms, because they are supporting representation, creation, diversion and learning.

By taking into account the cognitive capacities of the learner, by recomposing some concepts related to video games, and by materializing the mental map

described by Patricia Marks Greenfield, this work proposes a new solution for integrating archaeological and architectural knowledge.

Realization of a 3D map, allows to create new writing and reading modalities, and to borrow signs of various disciplines.

But how can we be sure that the message of the designer is understood by the learner?

To conceive an efficient learning system, it's then necessary to define specific rules, and this from the beginning of the conception. For example, the learner progresses through a narrative structure based on riddles.

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