

Immersive Interactive Narratives

The art.live consortium, IST project 10942

<http://www.tele.ucl.ac.be/projects/art.live>
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ABSTRACT

The goal of the *art.live* project is to develop an architecture and a set of tools, both generic and application dependent, for the enhancement of narrative spaces thanks to the production of a mixed-reality environment. Having in mind the mixed-reality framework (as defined by Milgram in “A Taxonomy of Real and Virtual World Display Integration” [1], in *Mixed Reality - Merging Real and Virtual Worlds*, 1999, Ohmsha Ltd. and Springer-Verlag), the *art.live* architecture aims at creating narrative spaces, e.g. interactive stories, that mix graphical elements with live inputs of cameras. The real impact of the system occurs when some persons are in front of the cameras: they get themselves immersed within the visual ambiance and they are therefore involved within the narrative, which they are able to interact with through their behavior. At the opposite side of the architecture, other persons are looking at screens where the mixed images are rendered and they might be offered to interact with the system.

1. INTRODUCTION

The present paper introduces the *art.live* project, its general concepts, and its architecture that will, through an authoring tool, offer multimedia authors the capacity of designing immersive interactive narratives involving real people into

The eight following partners constitute the *art.live* consortium: Université catholique de Louvain, Louvain-la-Neuve, Belgium; Casterman Edition S.A., Bruxelles, Belgium; Associação para o desenvolvimento das telecomunicações e técnicas de informática, Lisboa, Portugal; Ecole Polytechnique Fédérale de Lausanne, Switzerland; Fastcom Technology S.A., Lausanne, Switzerland; Association pour le Développement de l'Enseignement et de la Recherche en Systématique Appliquée, Paris, France; Université Joseph Fourier Grenoble 1, France; Centro Studi e Laboratori Telecomunicazioni S.p.A., Torino, Italy.

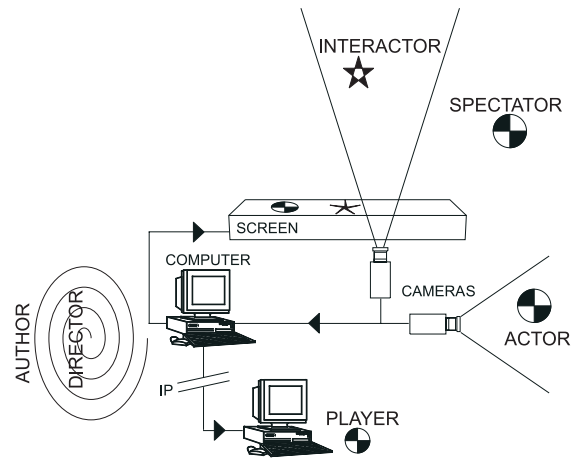


Figure 1: Repartition of users in the system

their own universe of pictures, graphics and associated designs. Section 2 provides the reader with an overview of the various system aspects, while section 3 outlines the implemented architecture. Section 4 focuses on one of the novel aspects of the *art.live* approach: the management of interactive scenarios. A typical result is provided in section 5.

2. CONCEPTS

Considering a human-centric approach, the various “users” depicted on figure 1 are involved within the designed architecture.

They are ranked here by their degree of influence on the overall system:

1. The *Author*, who designs the whole narrative system, i.e. the scenario, the related story and its elements (musical analogy to composer or theatre/film analogy to the scriptwriter);
2. The *Director*, who can modify (via the authoring tool) some aspects that the au-

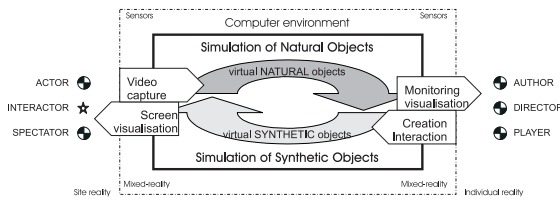


Figure 2: Overall art.live processes

thor prepared to be modifiable (musical analogy to performer or theatre/film analogy to the director achieving the mise-en-scene);

3. The *Consumer-Interactor*, who is captured by some live camera, and can directly interact with the system via its gesture. The Interactor is aware of his/her role in the narrative thanks to some (large) screen where s/he sees himself/herself within the mixed-reality environment;
4. The *Consumer-Player*, who interacts with the system through a mouse on a Web browser (clicking on some MPEG-4 hyper-video);
5. The *Actor*, who is any person in front of some live camera. The Actor is not aware of his/her status within the system;
6. The *Spectator*, who is any person looking at the images without interacting or being captured by the cameras.

It is important to stress that the difference between an interactor and an actor only resides in the degree of awareness of the user itself. Basically, both these users are in front of some cameras and have some influence on the system because of their attitude. Since the interactor is really made aware of the impact of his own behaviour thanks to the big screen, it is expected that he will not remain a passive actor anymore but will adopt specific gesture and attitude in order to interact with the system.

In figure 1, a systemic approach has been adopted: users are bound to a narrative apparatus which consists of cameras for image capture, computers for image composition, signal processing and scene composition, and screens for image rendering. For the sake of clarity, it is important to provide a praxis-based typology of the different spaces in which the bodies, objects and events are taking place. With this respect, it is interesting to quote Deleuze [2] who already elaborated on such considerations about different types of spaces: “We opposed the virtual

and the real: although it could not have been more precise before now, this terminology must be corrected. The virtual is opposed not to the real but to the actual. The virtual is fully real in so far as it is virtual. Exactly what Proust said of states of resonance must be said of the virtual: ‘Real without being actual; ideal without being abstract’; and symbolic without being fictional.” Relying on such a point of view, the following definitions are used:

- The *Actual Space* is the space in front of the camera. It is the space in which any person becomes an interactor.
- The *Real Space* is the space in which the user is living, be it consumer, spectator, author....
- The *Virtual Space* is the space which is rendered on the screens. It is composed of real-time images of the interactors or other real elements as well as bodies and objects generated from a computer database.
- The *Diegetic Space* (which is more specific for narrative films) refers to the world of a film story. The diegesis includes events that are presumed to have occurred as well as actions and spaces not shown onscreen. The concept of diegesis will take its plain dimension once we will be able to offer to the audience an extended narrative experience similar to viewing a film.

On the content point of view, the *art.live* system considers various types of objects:

- *Artificial Objects* (AO). They have been artificially created by an artist: typically they are produced by a graphical designer thanks to a computer, e.g. pictures, drawings, graphical animations, and so on;
- *Real Objects* (RO). They exist in the real world: typically they are extracted from a real scene and separated from the background;
- *Virtual Objects* (VO). They are perceived through a media, being:
 - *Synthetic virtual Objects* (SO), when they represent some artificial objects in the virtual space (e.g. a particular picture becoming the background of the mixed-reality scene),
 - *Natural virtual Objects* (NO), when they represent some real objects that entered the actual space (typically the

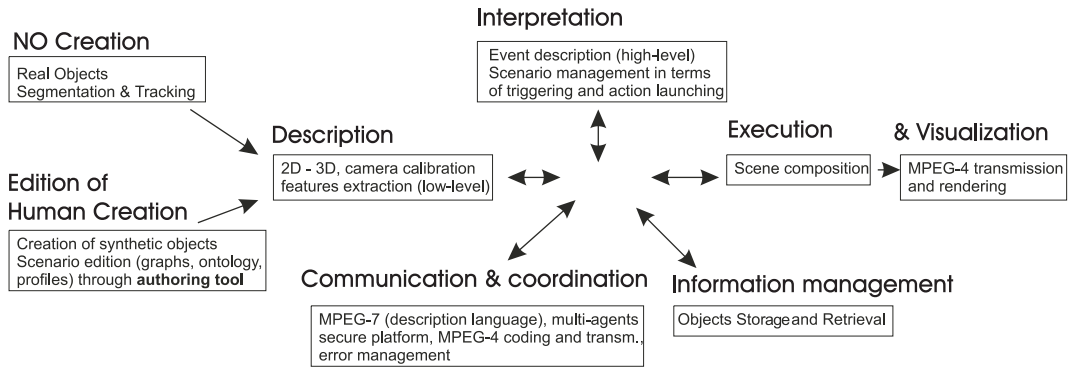


Figure 3: Functionalities underlying the architecture

persons, actors and interactors, in front of the system cameras).

In this framework, all the users are proposed to participate (at their own level) into a scenario, a narrative, made of the previously mentioned graphical elements. In order to be able to offer a rich environment to authors, the demonstrated system relies on the following choices:

- an open (notably through the use of standards) and scalable architecture, open to emerging and future technologies like, for instance, new cameras;
- a WWW-compliant system, notably with communications based on the Internet Protocol;
- the inclusion of database aspects that facilitate the work of the creator/author;
- an authoring tool to pilot the system.

Moreover, through public demonstrations and trials, the project aims not only at technological developments but also at tackling the narrative aspects, where the sole goal is to offer a “meaningful experience to the user”. This means allowing the consumer to have some pleasure in following a story that is to be provided to him/her. This requires the definition of ad hoc narrative patterns.

3. SYSTEM ARCHITECTURE

At a high level of abstraction, the *art.live* objective of capturing real-life objects and including them into mixed-reality worlds can be described as a combination of two generic processes (as illustrated on figure 2): Computer Creation of Natural Objects, and Human Creation of Synthetic Objects.

In the *Computer Creation of Natural Objects*, one or more sensors capture the reality, typically under the form of audio and video. “The computer” then creates a virtual reproduction of the real objects and characterizes them, i.e. it creates an automatic simulation and interpretation of the real world. Finally, some visualization of this simulated world is provided. This visualization can motivate or not some changes in the reality that is caught by the sensors. Then this process starts again. It is important to note that this process is data driven in the sense that from a set of real data (implicit model of the world), it attempts to discover the explicit model.

In the *Human Creation of Synthetic Objects*, the reality is also captured by one or more sensors, like keyboards and mouse, specially designed to interact with individuals. Here the simulation begins with a set of editors that help humans to reproduce and characterize their creations and dreams. These synthetic objects can then be digitized into the computer, visualized and can stimulate, or not, some desired interaction. This makes the human creation process start again. Such a process is model driven, in the sense that it transforms a set of human modeled objects into computer data. These models are implicitly (ex. set of draws) or explicitly defined by describing their essential properties.

Both processes are relatively classical and well mastered in their own. The major challenge consists therefore in combining them to create meaningful mixed-reality scenes. The main assumption is to consider that these processes are very complementary: they are both directly involved into a generic and repetitive process of

1. sensors *capture* of reality (which includes human and computer creations),
2. *simulation* (virtual or mixed realities, objects representation and characterization),

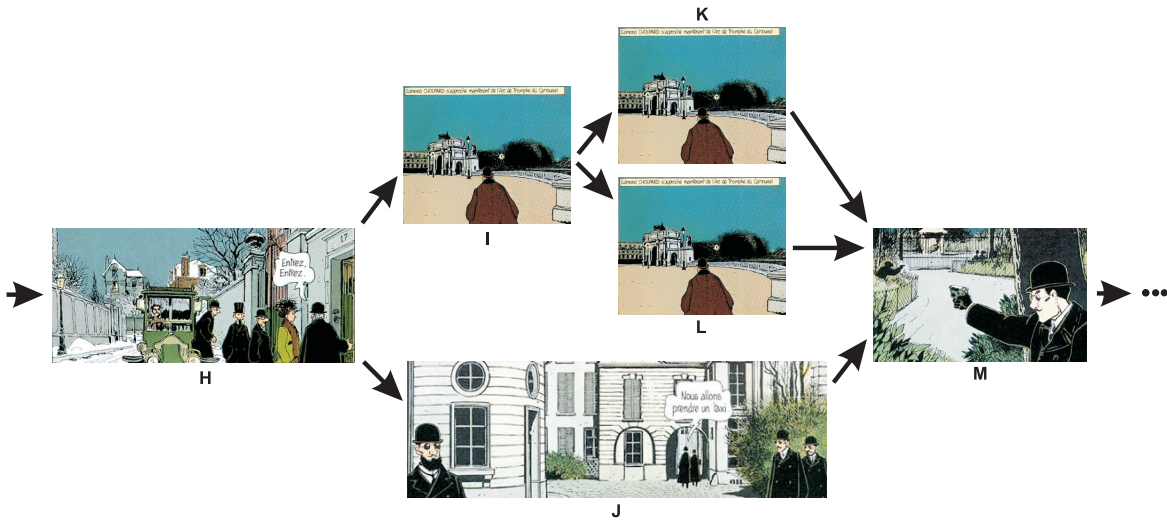


Figure 4: Example of narrative graph (images are (c) Casterman-Tardi)

3. visualization.

When it is considered as an endless iterative process, one obtains a combined process of a specific living art creation permanently inspired by reality.

The concrete implementation of the system architecture relies on the dedicated tasks highlighted in figure 3.

4. SCENARIO MANAGEMENT

Any *art.live* narrative is established as a (narrative) graph. Every node of the graph provides a scene (composed by various virtual objects) along with a list of events to be triggered. For instance, the author may decide to look for a NO being a person, to ‘touch’ a particular SO which is a door, to detect two NO moving ‘fast’ in opposite directions, or simply to wait for 15 seconds. According to the detected trigger, an action occurs. The action is a move to some next node of the graph, where another scene is depicted and other triggers are searched for. The scene can be a completely new one or the same one from the previous node with just some additional (or suppressed) graphical element (scene refresh or update). Figure 4 presents an excerpt from a simplified typical scenario (where one should imagine that more elements like moving people and graphical objects are added to the scenes). It is crucial to note that the evolution of the narrative is different for every screen of the system, i.e. for any player or for any set of interactors in front of the same big screen. Narrative graphs are thus managed in an autonomous way in order to allow different users



Figure 5: User filming himself on the Mixed-Reality screen

to enjoy the same story at different moments and with different interactions.

5. RESULTS

A typical scene appearing on screens of the *art.live* system is shown in figure 5.

6. REFERENCES

- [1] P. Milgram, “A Taxonomy of Real and Virtual World Display Integration,” in *Mixed Reality - Merging Real and Virtual Worlds* (Y. Ohta and H. Tamura editors), 1999, Ohmsha Ltd. and Springer-Verlag.
- [2] G. Deleuze, “Difference and Repetition”, London, Athlone, 1994.