

Comparing Two Sound Design Styles: Between Determinism Emergence And Interactivity

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Abstract

In the design process of sound installations, the composer designs his sound for a real or a virtual space according to the listener's walking path. One way to design this walk is to allow the listener to interact with the system via Non-Player Characters¹. For a given piece, the creator affords the interactor a certain amount of freedom; and the system, according to its level of self-sufficiency, a certain amount of autonomy. We assume that these choices are directly related to design styles: the "scripting style" and the "emergent style". In the scripting style, the designer takes the point of view of the interactor, who becomes the narrator. In the emergent style, the designer takes the point of view of Non-Player Characters. We have designed two versions, composed in each style, of the same interactive sound installation *The Listening Walker*. This paper is mainly devoted to a comparative analysis of the sound design styles experienced, and to the presentation of the two artistic and development experiences.

Keywords

Emergence, Interactivity, Narration, Sound Installations, Video Games

Introduction

One of the authors of this paper has worked as a composer on numerous sound walk art installations [1]. During the last decade, her work has been influenced by the design methods used in video games, leading to interactive pieces. In the design process of such pieces, as compared with interactive music works, the composer conceives his spatial sound design in a real or a virtual space according to the listener's walk path. Such an installation shows the evolution of the composer's role from a deterministic creation to a non-deterministic one [8]. For a given piece, the composer affords the interactor a certain amount of freedom; and to the system, according to its level, a certain amount of autonomy. According to these two parameters each art piece can be positioned somewhere within the DIS triangle (Figure 1), the vertices of which represent the Designer, the Interactor and the System. In [2] and [3] a set of interactive pieces are analyzed in order to place these works within the DIS triangle.

¹A Non Player Character (NPC) in a video game is a character controlled by the game as opposed to the avatar controlled by the player.

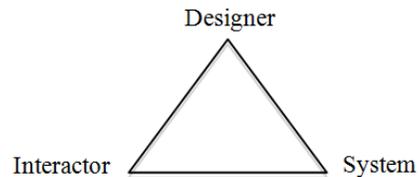


Figure 1: The DIS triangle

In this triangle, the designer has a very particular role: he is the decider. He may choose to create a piece for which execution is perfectly controlled, near the D position. He can decide to design his composition as a generative and emergent art system, near the S position. He can also afford the Interactor a high degree of freedom - collaboration in the execution of the piece. Of course, any mixture of these three positions can be considered and has been experienced by artist and designers.

Our research attempts to investigate conceptual and practical tools that allow the sound designer to understand and choose his position within the DIS triangle. We assume that this choice can be directly related to a choice of designing style. We designed two versions of the same interactive sound installation *The Listening Walker*. First, we present the concept of the sound installation *The Listening Walker* and the two design styles. Next, we present a set of criteria with which to compare the two styles. Finally, we explain our experimentation and development process. To conclude, we pose questions relative to the artistic consequences flowing from these two design styles and present our future work.

The Listening Walker

The Listening Walker is an artwork produced as part of the Terra Dynamica project, funded by the French government. The purpose of this project was to bring to life Terra Numerica, a static virtual city [4]. The production of an artwork, the scripted version of *The Listening Walker*, using the Terra Dynamica technology, was one of the tasks assigned to the CNAM. The title of this piece comes from a book by Michel Chion [5]. The installation was created in Paris during the "Futur en Seine" festival in June 2013.

The goal of this sound walk is to discover a virtual district of Paris around the Pantheon. The interactor walks around this part of the city wearing headphones with personal binaural sound rendering. The experiment takes about ten minutes. This installation is designed as a video game with different levels of exploration. The interactor's reward is the discovery of the city mainly via sound. Success depends on his listening behavior: NPCs surround him, interpreting his moves, the direction he takes and the time spent listening to particular sounds. Depending on the listener's attitude, each NPC has his own reaction, such as running away, getting closer to the listener, ignoring him or helping him to discover secret areas. The listening walker must be aware and must try to understand these NPCs.

The Two Design Styles

The Scripting Style

An interactive narration is written according to the scripting style if it takes the interactor's point of view. He is the narrator of an interactive scenario, written in a procedural form. The rules are contextual and related to a relative chronological order determined by the path the interactor follows. So any variability inside the narration is linked to the interactor's previous experience, and in particular, his trajectory. Each NPC's behavior is described in relation to this experience at a given point and time of the interactor's path.

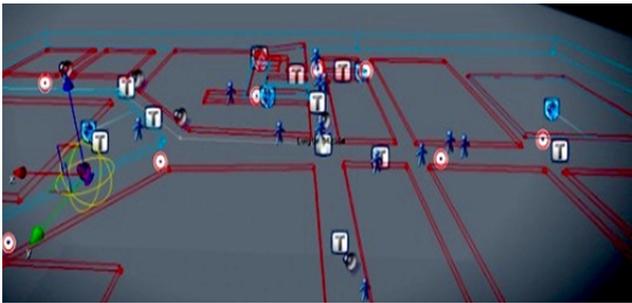


Figure 2: City 4 map in the CryEngine editor

As an example, consider the City 4 version of *The Listening Walker*. City 4 is a constrained itinerary in which the interactor, hearing a sound, starts from an empty space and gradually builds the city. Invisible barriers are set up in the space as interaction spots. These set off events when the interactor enters their influence area. A trigger can set off a sound, create a new road or a new building. The triggers are also logically ordered. Some of them can only be activated if the interactor has come across previous ones. This logical scripting ensures that the events occur in a non-anarchic way as well as ensuring the consistency of the itinerary.

The Emergent Style

An interactive narration written according to the emergent style takes the point of view of each NPC as a potential narrator. It has its own perception and memory, which influences its behavior, described in a generic (non-contextual) way.

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As the player appears at the intersection of rue Saint-Jacques
and rue Soufflot,
A sound hidden in rue Saint-Jacques 2 is activated;
When the player arrives over there,
    A part of the urban outline of a district becomes visible;
(see FlowGraph /entities/Floor.Appear :FloorSoufflotPantheon).
The sound of rue Saint-Jacques 2 deactivated
and a bass tone comes up rue d'Ulm;
An NPC – Le Chevalier – appears visually, read a text and
heads towards the back of the Pantheon following a given path;
If the player follows him, he triggers a sound moving around him;
If the player stays longer enough listening the moving sound,
two more sound entities are triggered;
If the player tries to catch them at the intersection
of rue Clotaire and place du Pantheon, they vanish;
NPC Bakal appears place du Pantheon, talking to himself.

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Figure 3: Example of City 4 map scripting

For example, City 5 is an open itinerary. The interactor travels on the map from one area to another. Each area is controlled by an NPC. Its main goal is to follow and memorize the movements of all characters (avatar of the player and NPCs) that are or have been located in the controlled area. So a trigger, like an invisible barrier, is no longer a mechanism associated with the interactor's avatar, as in the scripting style, but part of an NPC's perception system. Global geographical zones, like districts, become themselves interaction controllers. This is also mostly the case when each NPC perceives the interactor in its own area. This determines the elements of the city (sounds, lights, outlines, buildings) that the NPCs will reveal at a given time and a given point of the listener's experience.

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Bakal's control a zone situated between rue Soufflot, rue Le Goff
and rue Saint-Jacques 1. His main personality is to be fearful.
Bakal's behaviour :
Each time someone enters my zone,
I activate a given set of sounds and lights
I identify the intruder.
I increase the visit count of the given intruder.
If an intruder is present in my zone and if it is a player and if it is
his first visit,
    I speak to the player.
If an intruder is present in my zone and if it is a player and if it is
his second visit,
    I appear, silent, in front of and at a given distance from the
player.
If the player comes too close of me, I run away.

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Figure 4: Informal specification of Bakal, a fearful NPC.

A First Comparison of the Two Styles

A Game Design Point of View

In the context of creating an interactive walk installation like *The Listening Walker*, an object-based methodology inspired by Game Design is certainly applicable and, from our point of view, efficient.

The scripting style of design has been, until recent years, the main one used in the game industry. Such an approach has some clear advantages. On the one hand, it is a subjective narrator-driven interactive storytelling style, which is rather easy to understand. Its validation, which uses program tests, is "classical". On the other hand, this method relies on describing a universe as a kind of egocentric, centralized simulation. As a consequence, describing autonomous NPC behavior is difficult, or even impossible. The development of evolving games (Massively Multi-player Online Role-Playing Games, Facebook games, games based on physics...) pushes the emergent design style.

According to Jesper Juul's classification of games [9], the scripting style leads to "games of progression", that is to say games in which rules are contextual. The emergent style leads to "games of emergence", in which rules are relevant in all situations. From the designer's and hence the composer's point of view, the scripting style of design leads naturally to a branched approach of interactive narration and, therefore, to "progression-style" game types rather than to "sandbox-style" ones².

The Narrator and the Memory

The scripted design writes the story from the point of view of the interactor's avatar. This is the method; the universe and the events exist only when they have been or are perceived by the interactor. In this way he is the narrator and he holds in his memory the events involved in his narration. In the emergent approach, each NPC has its own memories thanks to its own perception system. For example, Bakal has the memory of each intruder in his zone. The story is described with respect to what has been perceived and remembered by each actor (avatar and NPCs). In both cases, it is possible, from a narrative point of view, to simulate a universal narrator who has knowledge of events that no or not all actors have seen or heard.

Finding a Place in the D.I.S Triangle

Returning to the introduction of this paper, the main open question is: how much freedom and knowledge is the listener afforded?

From the point of view of an electroacoustic composer working on spatial sound installations, most of our work was created for a given indoor or outdoor area using a set of speakers adapted to the chosen space. In such artworks, the sound and the spatial sound rendering are synchronously controlled. Each piece has a beginning and an end, and a given duration. The freedom of the listener consists of being able to walk, wait, sit or lie down somewhere within the performance space. A previous work on interactive soundscapes, *Listen Lisboa*, produced at IRCAM [6], used the same approach. The listener is walking through a physical empty space hearing sounds through geo-localized headphones. According to

²"A sandbox is a style of game in which minimal character limitations are placed on the gamer, allowing the gamer to roam and change a virtual world at will. In contrast to a progression-style game, a sandbox game emphasizes roaming and allows a gamer to select tasks." <http://www.techopedia.com>

his trajectory, the listener is able to hear different versions of the same soundscape, without having real control over it. As a consequence the writing of *Listen Lisboa* relies on the scripting style.

In this current research, the composer is moving towards more open works. The goal is to give the interactor a more potentially accessible and comprehensive interpretation of the piece, which is constructed as an emergent composition through the use of intelligent agents.

Using the scripting style leads to design a piece in a constrained space (a progression in a corridor). The designer may open the map, giving the interactor more choices, with an understanding of the consequences of his decisions. The piece will be designed as a walk in an open space and a local and implicit description of the NPC's behavior, using the emergent style.

In this way, a controlled composition of the two styles and the structure of the map are a way to design and implement a piece at a defined position in the DIS triangle.

The Two Versions of the Listening Walker

Aspects of the development process of the scripted version

This development is part of the OCTAVIA³ project. The scripted version was designed using a method strongly inspired by the level design of adventure games, as well as the maze principle [7]. The interactor's avatar appears at a given initial point of an empty map. Invisible barriers and their associated triggers are placed according to the possible paths of the interactor's avatar. The paths and the triggers are partially ordered to create sound events and the revealing of roads and buildings. Triggers are also used to guide the interactor: they lead to sound events located within the space. NPCs, according to scripted behavior, try to seduce or intrigue the interactor. As the city is progressively revealed, the path of the avatar becomes more and more constrained by the walls of the buildings. The story ends when the last trigger is activated, revealing the Pantheon. The mapping between triggers, events and NPCs behavior is written using Flowgraph, the graphical programming language of a game engine (CryEngine⁴).

Aspects of the development of the emergent version

The main principle here is that any action is decided and executed by a Non-Player Character using its own perceptions, decisions and actions. Its behavior relies only on the events that it has been able to observe and memorize. The empathic relationship between the player and the NPC are the same on both versions. However, the corresponding actions and rules are non-contextual. For example, a rule for Bakal, in the scripted version is written as follows:

"When I (the interactor's avatar) arrive at the crossroad, Bakal appears.

If I move too close to him, Bakal runs away".

³Tool for Creating and Testing Atmosphere Life Interactive and Autonomous. <http://www.masagroup.net/products/innovation>

⁴<http://www.crytek.com/cryengine>

In the emergent version, the behavior of Bakal is described as a finite state machine, and the same rule becomes:

*"Each time I (Bakal) perceive somebody near me,
I identify him
If it is the first time I see him and he comes too close to me,
I run away"*

Therefore Bakal is defined by:

- His perception: Bakal can see in front of him (180 degrees), hear all around him without any distance limit, and receive messages from all other NPCs.
- His possible actions: Bakal can walk, run, speak a set of given sentences, sing a set of music, can be visible or invisible, and send messages to all other NPCs.

To summarize, the design process follows these steps:

- Structure the map into districts.
- Choose the set of NPCs.
- For each NPC define his perception, decision-making and action system.
- Specify all messages exchanged by NPCs.
- Define the NPCs' finite state machines.

Conclusion and Future Work

Comparing the two styles

The use of video games tools is probably a good choice as they are designed to support both styles. But, in both cases, the translation of an informal specification into a formal one is a complex task.

From an artistic point of view, the possibilities opened up by the emergent style are very promising. But this way of thinking about an artwork as a set of localized and dynamic pieces is a break with the habits of music composers. The scripted style is a much more comfortable way to think and develop an interactive sound walk. To summarize, based on the results of our experiment, it is easier to write a story, even an interactive one, than to design an open world. The artist gives up control of space, time, and progression in a story and then takes as a designer a new position. So the most interesting artistic challenge is to design an evolving process, an open combination, rather than a final, fixed object.

Our comparative analysis takes the point of view of the designer, and, more specifically, that of one of the authors of this paper. As a consequence, it cannot be directly generalized. With the help of the sociology department, we arranged interviews with seven well-known artists and designers from various fields. Eric Viennot, the Game Designer of *In Memoriam*, one of the first Alternate Reality Games, summarizes the result of our study:

"At a given time, as a designer, we are creating a universe where some emerging part of the story may appear. It is something that we did not really forecast. It is really interesting and I call it emergent narration..."

I like to master the time when the player feels a given emotion. I think that we must find in some way a mixed solution: too open works lack artistic dimension."

Future Work

The comparison of the two versions of *The Listening Walker* takes only the point of view of the composer. Up until now, only the scripted version has been exhibited. As the two versions are developed, it is possible, by conducting a public survey, to have the point of view of the interactor. Of course the scope of the results is limited to this piece but it is probably a unique experiment as the same piece is rarely developed twice.

We are working on sound walks in a real city, using an augmented reality 3D sound system. As a consequence, we will try to specify and prototype efficient authoring tools.

Acknowledgments

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