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# Artificial Life within a frame of metacreation on stage

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### Abstract

In order to investigate the possibilities of co-creation between performer and interactive virtual system, we have developed a scenic installation composed of two parts: the virtual environment and the interaction interface. We offer an analysis of our creative experience from the point of view of the artist researchers in the field of real-time generative synthetic image. Our results show that the creation depends on how the performer perceives the virtual system as well as how he perceives its influence on this system. The creative potential of the system depends on the mechanisms generated and implemented by the artist in a metacreation context and his interpretation of the interaction data. Our perspectives point towards the conception of a *scenography-character*.

### Keywords

Metacreation, performance, interactive digital art, artificial life, scenography, scenography-character, interfaces

### Introduction

#### Artistic context

The process that produces artistic experiences or artifacts is no longer a secret enclosed in the artist's studio, but a system of creation set in motion by the artist and continued when confronted with the materiality of collective participation, of the spaces of exhibition or of everyday urban spaces. [1], [2]

The digital arts have been developed thanks to the advent and popularization of technological tools. They emerge as a transdisciplinary approach between design, computer science, complexity sciences, biology, and artificial life. The creative processes have become technological. [3]

In the context of participatory works, the viewer becomes an actor in the work and potentially a performer, who can even interact remotely. [4] The type of interaction is no longer responsive but can be adaptive, conversational, and creative, between machines and participants. [5]

The literature gives examples that an evolving virtual ecosystem can be creative or that this type of self-organizing system can demonstrate an emerging potential allowing it to improvise with a performer. [6], [7] Some developer-artists seize the computational capabilities of the graphics card in

an alternative way to create complex systems and use artificial life algorithms, giving rise to emerging behaviors and impressive endogenous interaction phenomena. [8], [9]

Other developer-artists create or hack interfaces using electronic sensors or mobile devices to establish a tangible, intimate and active relationship within the technological social context and connected networks. [10] Through such interfaces, artists seek an adaptive and dialogic, conversational engagement between the participant and the virtual system, in order to investigate possible relationships with the machine and to express the uncertainty of existence through the uncertainty in the work of art.

For Whitelaw, the conception of a generative, evolving, interactive system is one of the characteristics of an artwork that can be described as autonomous. He refers to this method of creating digital works by the term *metacreation*. [11] Such a system contains parameters of appearance and behavior which can be modified according to the interaction with the external environment to the virtual, what Bret calls the sources of exogenous interaction that complements the endogenous interactions which occur between the components of the virtual system. [12] This dynamic diverges from the initial instructions given by the artist-developer and may result in unpredictable behavior occurring during the processes. It is regarding this meta creative process that we will assess the creative potential of the virtual part of our scenographic proposal.

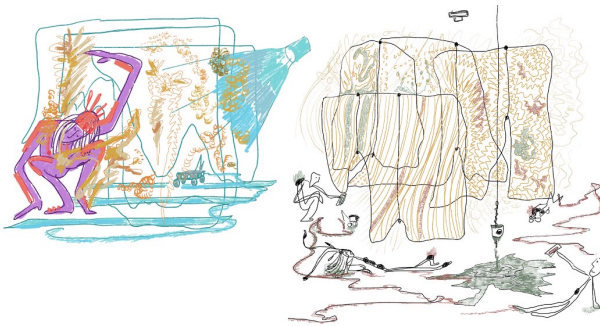
#### Project *Co-évolution, Co-cr ation et Improvisation Homme-Machine* (CECCI-H2M)

The research-creation process described in this article is part of the *Co-évolution, Co-cr ation et Improvisation Homme-Machine* project, led by Chu-Yin Chen: that investigates ways of sustainable behavioral coevolution with emerging human-machine co-creation. The project proposal merges two research-creation approaches through practice. That of the artist-researcher Silvia C rcu, who studies the choreographic interactions between performers and robots. And that of Isadora Teles, which aims to establish a dynamic of improvised co-evolution between performer and evolving virtual system. This article traces and analyzes the experiments carried out by the two researchers during two

artistic studio residencies, from the point of view of the artist developing the virtual system and its interfaces with the scene.

During their experiments, the artist-researchers compared their artistic proposals to find convergences and clarify their intentions and ideas. The common goal was the conception of a co-created performance on stage between the performer, an HRP-4 humanoid robot and an interactive evolving virtual ecosystem. It was also a question of characterizing what the possibilities of co-creation between the performer and two types of artificial entities would be, when those artificial entities are either embodied or not embodied on stage.

The project also aimed to question the design of autonomous and evolving creative tools for performance with the intention of staging an improvisation for the performer and his alter-ego taking the form of an evolving virtual ecosystem. Our hypothesis to establish a dynamic of creative collaboration was that the development of an autonomous and evolving ecosystem would be embodied and therefore would assume a physical form on stage, being able to influence the performer's gestures (**Fig. 1**).



**Figure 1.** Two different sketches representing our conception of the three elements of the stage together: performer, interface, and scenography. ©Isadora Teles de Castro e Costa, 2021

## Experimentations

### Experimental Plan

The experimental plan to set up a creative and improvised interaction between performer and artificial entities consist of:

- Developing, separately, three prototypes of "species" for the virtual ecosystem as well as their mode of intra-species interactions.
- Developing three interface prototypes for interacting with elements on stage and embodying the same virtual system in the form of objects that can be manipulated, played, and penetrated by the gestures of the performer.
- To study the possible co-creative and adaptive interaction relationships between each "species" of the virtual system and the performer.

The aim of the proposal was to use metaphors of emotional states to imagine the shape and behavior of the different species that would inhabit the virtual world. The technical goal was to find ways of expressing and giving the sensation that, by their form and by their behavior, each species is possessed by or acts according to one of the emotions mentioned. Once the shapes and corresponding behaviors were clarified, the next step was to create and test the algorithms that could correspond to such sensitive expressions.

Creating a graphical simulation of a complex system must consider the technical challenge of animating and making many autonomous elements interact. This requires considerable computing power, which increases exponentially with the number of individuals. Therefore, the development of the virtual universe was carried out using mainly the technique of image synthesis by shaders.

The shaders enable the programming of the graphics card to generate images by calculations performed in parallel. [13] We have experimented with fragment shaders and then with compute shaders. Compute shaders allow us to get complex image and behavioral animation qualities which are difficult to achieve by other techniques, because they exploit the computing power optimized by the graphics card.

An important reason in the choice of technical tool was the existence of examples of simulation of common biological phenomena with the subjects treated by artificial life using such technique.

Compute shaders are used for scientific simulation as well as for bioinformatics and simulation of complex dynamical systems. [14] However, such references in the artistic field are rare and steps of taming and technical adaptation are required.

### Virtual environment

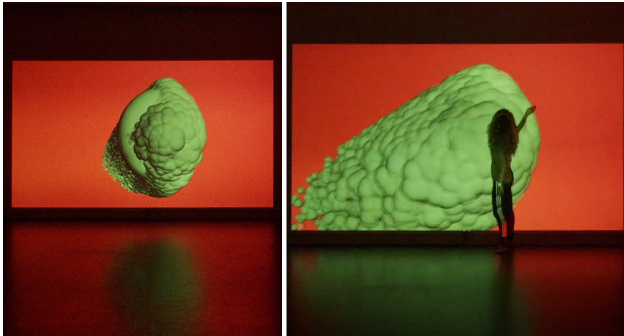
#### Particle system with fragment shaders

The first prototype was designed to express the "dream" or the state of reverie. To do this, we have conceived a type of behavior which shows wandering flight, expresses a lightness in the movements and would be contrasted with another species which would represent "fear". This behavior leads us to think of the imaginary flight of fairies, a dance of birds or leaves heaving in the wind.

To set up this system of "imaginary fairies", we started by programming a particle system using fragment shaders, within the touchdesigner software. Fragment shaders make it possible to deal with many dynamic pixel data, but there can be no interaction between them, nor exchange of information.

The components of the particle system have basic properties of physical simulation, such as mass, velocity, and lifetime. They are influenced by forces external to the system, which can attract and guide them. An interesting aspect of the behavior of this particle system is that, if we

increase the particles' scale and the force of attraction, the collective behavior becomes an organic mass concentrated on a flow of force. This shape, green on a red background, is reminiscent of a pulsating organ (Fig. 2).



**Figure 2.** Recurring shapes during our experiments. Organ-like mass of fragment shader particles are depicted in green. ©Isadora Teles de Castro e Costa, 2021

This particle system behavior was not inspired by cell behavior, but it has emergent collective properties vastly used to model dynamic natural phenomena. [15] In our case it behaved like a pulsating organism or animal organ thanks to specific behavioral parameters explored through the process of improvisational interactional and “tweaking” on stage.

The void in the background of the virtual environment suggested an organ in preservation in a jar, isolated, but still “alive” (Fig. 2). The sensation of a living organ was due to the unstable movement of the system and therefore of the emerging collective form. This instability of the shape was caused by the data obtained from the capture of the performer by the Kinect, which controlled parameters inherent to the particles such as their maximum speed, their mass, and the constants of attraction towards the attractors. This phenomenon of data instability was the positive cause of the pulsating impression of the particle system organic form.

### Particle system with compute shaders

Our second experiment was the modeling of a particle system whose position information was calculated by a compute shader. The change in technique was aimed at establishing an endogenous interaction among the particles and with the virtual environment. For studio residences, the particles could not be perceived among themselves.

The difference between compute shaders and other types of shaders (vertex, geometry, and fragment shaders) is that they do not fit into the render pipeline. The compute and the fragment shader have similarities, but they were designed for different purposes.

The compute shader allows us to use the GPU to perform calculations that are not necessarily related to 3D or image processing. This is the so-called GPGPU technology for General-Purpose computing on Graphics Processing Units.

In our case, we used it to calculate the position and velocity of a particle system guided by a mathematical function that generates organic flow, which can be used to simulate fluids.

We were inspired by the systems of particles moving in a Curl Noise. The technique is often used for dynamic non-autonomous systems such as fluid simulation or the displacement of the sand. In our case, we used it as a wind force to guide the particle movement. The wave variations and their organicity helped us get a prototype of the aimed behavior : an impression of a self-organized multi-agent system [14], [16] (Fig. 3)



**Figure 3.** Choreographic exploration in interaction with compute shader particles. The performer modified the parameters of a curl noise function. The noise guided the movement of the particles. ©Isadora Teles de Castro e Costa, 2021

We tested the interaction between the performer's motion capture data and the second prototype of the “Dream” species. Two joints of the performer were linked to two behavior parameters of the particle system. The elbow position controlled the direction of the Curl noise that guided the movement of the system, and the knee position influenced the direction of the noise and the friction, that is, the damping of particle velocity.

These interaction links allowed an interesting synchronization between the movement of the particles and the performer's gestures. This occurred because we were able to identify a notion of rhythm in the intervention in the friction of the particles and the fact that the movement of the arms influenced their direction, giving the impression of a dance master to the performer.

### Cellular automata with compute shaders

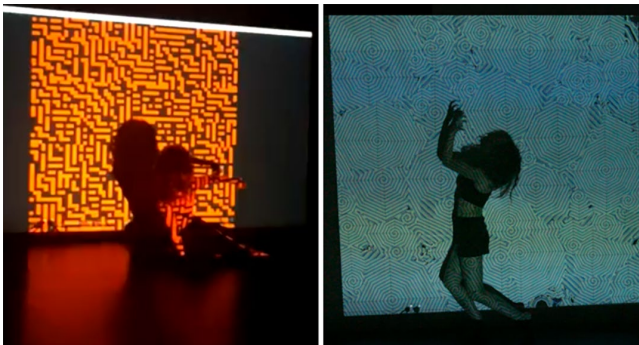
The second species that would integrate the virtual ecosystem represents “fear”. Our main issue was to find a way to create a type of virtual agent that leaves patterns and traces on a surface by its growth or by its displacement to represent fear as something that spreads out on surfaces and that leaves traces. Traces of infectious and unhealthy appearance, and whose appearance is reminiscent of mold.

We were inspired by the modeling of the behavior of *Physarum polycephalum*, a single-cell organism that can exhibit the formation of complex and emerging growth

patterns. [17] The first step in modeling such behavior was first to set up a cellular automaton system to establish the basis of an optimized algorithm for endogenous perception and interaction between virtual individuals. This method is suggested by Arsiliath in his *Psychobiotik* workshop<sup>1</sup> where the goal is to build a complex system of autonomous agents with compute shaders. Two variations of the cellular automata were tested. One based on the concept of cyclic cellular automata and the second based on Langton's Edge of Chaos article. [18], [19]

The peculiarity of the cellular automata algorithm is that, depending on the combination of parameters of interaction behavior with neighboring cells, it can generate a large amount of different emerging patterns in a complex way and therefore difficult to predict by the artist. One would have to manually test a wide variety of different rule combinations to visualize the possibilities and choose a specific type of behavior corresponding to an intention, in our case, the internal emotional state of the performer.

The plethora of pattern possibilities emerging from several interacting entities is one of the issues studied by genetic algorithms (exploration of "landscapes" or "landscapes" of possibilities), especially when they are used as an aesthetic evaluation technique in interactive generative processes. [20] However, during the interactive experience, the performer explored this landscape of possibilities through his gestures, in a negotiation between the intention of his movement and the projected pattern that formed in response to the behavior generated by automata's evolutionary rules, conditioned by the position of the joints (elbow and knees) of the performer (Fig. 4).



**Figure 4.** Choreographic exploration in interaction with compute shader cellular automata. The performer's movements modified the parameters of the systems' behavioral rules ©Isadora Teles de Castro e Costa, 2021

### Conclusions about the virtual environment

The development of a particle system through fragment shaders was a stage of learning and appropriation of the technique. The system was used during the experimentation

with the performer and opened aesthetic perspectives for further development of autonomous agents.

Once the technique for calculating particle behavior with the fragment shader had been entered, the use of texture buffers and separately rendered geometry instances allowed us to switch to the compute shaders to perform the calculation of virtual environment elements behavior.

The cellular automata algorithm was used as an intermediate step in the appropriation of the technique of building a base algorithm optimized for the creation of endogenous interactions. However, in view of the interesting patterns that emerge dynamically according to the exploratory exogenous interaction modifying endogenous interaction rules, this algorithm will be used as a component of the virtual ecosystem.

This will require an assessment of the expressive and poetic function of the patterns and an assessment of the interaction in the context of the artistic intention to express the internal state of the performer. The discussion is ongoing, but it should be noted the possible addition of a new kind of emotion to the virtual ecosystem following the experiments in the studio.

In the case of the prototype which aims to represent the state of "dreaming", the intermediate stage of development has also instigated thoughts. The particles produced with the fragment shader showed us the plastic potential of such a technique for building systems. We may use distinct levels of autonomy in qualifying different types of virtual individuals. However, a physical simulation operation without collision limitations and a degree of autonomy, can also prove to be a rich source of raw material for the creation of geometric shapes and masses in interaction with the performer. The variation in autonomy levels among the types of virtual elements was important to have a more malleable species, such as a kind of digital clay or a raw material that could be turned, like a vase on a potter's wheel. For the potter, although clay is not an autonomous or living material, it nevertheless presents physical properties and possibilities of plastic derivation rich in creative potential when it is modeled and glazed.

Likewise, the potential for plasticity of the particles' behavior, that were attracted and recalled by the symbolic representation of the performer in virtual space, made us question the condition of the autonomy of a virtual material conducive to creation. How exactly is a virtual simulation of clay matter, for example, more or less fruitful to co-creation than the simulation of a collective of ants or cells, when manipulated or influenced by a performer?

<sup>1</sup> "arsiliath (@arsiliath) / Twitter," *Twitter*.  
<https://twitter.com/arsiliath> (accessed Oct. 22, 2021).

## Interaction interface

### Tested hypothesis

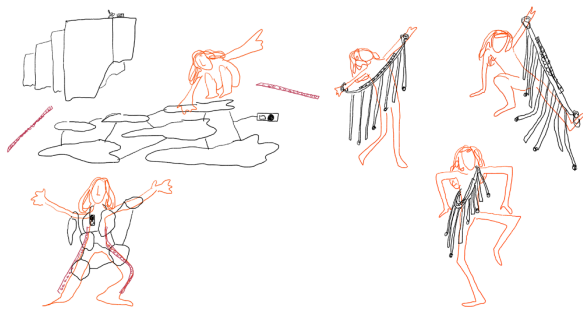
First, we designed an electronic collar that captured the acceleration data of the perforator and transformed it into a rhythm of luminosity by means of two strips of LEDs.

Nonetheless, the interaction with the collar was not perceptible by the performer and this fragile structure did not adapt well to the performer's movements (**Fig. 5**). Given the priority of connecting his gestures to the virtual system, we conducted interaction tests by capturing movement with the camera of a Kinect. This allowed us to have fruitful interactions and gave us some leads about the links that the gestures could have with the virtual system. The interaction with the Kinect provided us clues on the plastic potential of virtual forms and their ability for enjoyment by the performer (**Fig. 5**).



**Figure 5.** Two moments of experimentation with the Kinect (left) and with the electrical-interactive necklace (right) ©Isadora Teles de Castro e Costa, 2021

Despite interesting interaction experiments with the Kinect, we wanted to keep the possibility of allowing the performer and director to improvise with sensitive interfaces. To explore the creative possibilities of the incarnation of the virtual on stage, the creation of sensitive stage objects that can be manipulated and played was important as a hypothesis to allow us to have a margin of movement in terms of layout in the stage and on the performer's body (**Fig. 6**).

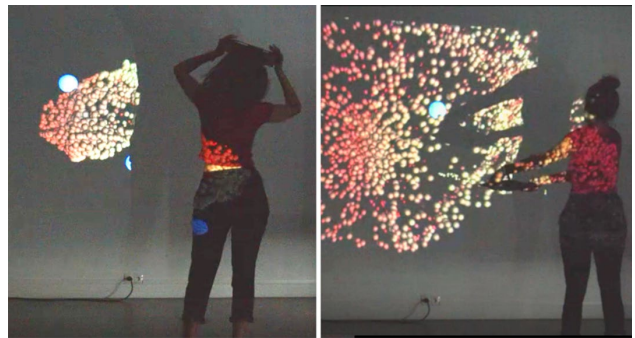


**Figure 6.** Two different sketches representing how we imagined the interactive interfaces being manipulated by the performer ©Isadora Teles de Castro e Costa, 2021

## Prototype 3: Communication between connected mobile devices and virtual system

To test our hypothesis of a modular, fragmented, and sensitive scenography, we needed connected devices allowing reliable communication and resistance to the movements and gestures of the performer. We therefore considered devices linked to mobile technologies as a hypothesis to solve this problem.

We have tested the portable device interaction hypothesis during the second studio residency (**Fig. 7**). During our experiments, the performer had to hold the devices limiting his movements. For the on-screen drawing interaction, the performer had to look at the screen of the portable smartphone. We do not yet know if this constraint of movement limitation is an interesting creative path, but, although this limitation seems unconstructive to the dancer, it reflects quite faithfully our daily use of portable devices.



**Figure 7.** Experiments of choreographic interactions with fragment shader particle system through the manipulation of a tablet. ©Isadora Teles de Castro e Costa, 2021

## Conclusions about interface interaction

The use of this portable device by the dancer on stage led to the following observations:

On the one hand, the public or anyone connected to the web server could act as an attractor to the behavior of the virtual environment, partially controlling it from their smartphone. This is part of a process of active participation of the spectator in the performance. On the other hand, we could use multiple cell phones, which are more easily accessible to create connected objects or costumes. The function or the appearance of these smartphones would thus eventually be "recycled".

In our co-creation context, the exploration of the creative possibilities and the potential gestures that these portable devices allow remain to be deepened during a next residency together with an evaluation of the theoretical issues that their use gives rise to. For example, if we fix them on parts of the performer's body, what type of movement can the sensors of the portables acquire and make usable by the virtual system? The interaction by their sensor motivates an original use of cellphones or would daily gestures persist?

## Results

For Whitelaw, metacreation as an artistic technique is theorized as a creator method itself, because the artist creates a creative process: "Familiar tropes of endless novelty and metacreation reappear; often the works are somehow autonomous; once made, they make themselves". [11] This creativity is developed in a different timeframe than the one we planned to study. Prior to the establishment of a co-creation between the virtual system and the performer, there is a co-creation stage between the artist-developer and his generative system that must be considered. In order to be able to characterize the emerging aesthetic phenomena that result from the functioning of the virtual system in interaction, the creation of a vocabulary specific to the generative system and to the performance.

The ability to describe a moment of creation and adaptation between the performer, the artist-developer and the generative system turned out to be necessary in our case study.

Although we have developed several types of virtual systems, they took on new meanings and those new issues arose during the studio experience. Prior to the establishment of a potentially autonomous and emerging system, the question of the perception of virtual autonomy by the performer as well as the physical characteristics and conditions of communication by the interface are important aspects that must be tested in situ. These are variables that can promote or jeopardize performance, and therefore, co-creation.

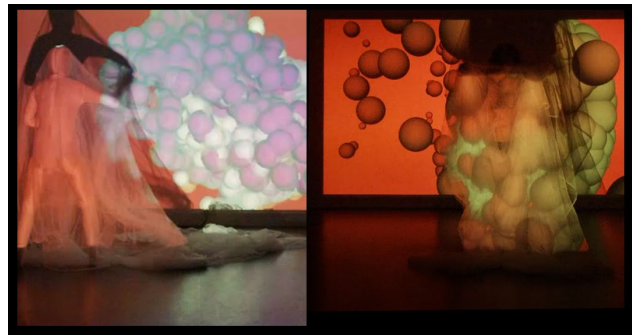
The hypothesis of creating an interface began with the idea of having a means of exchanging data between the stage and the virtual environment. Its appearance and operation have been designed to respond to artistic intentions and to the metaphor of the representation of emotions. Very early on during our experiments in the studio, we realized that their presence on stage fell within a broader framework than that of communication with the virtual ecosystem. We were confronted with the staging intentions and with the construction of the meaning of performance in general (in contrast with the sense of the virtual in isolation). The projected virtual environment and the interface became the scenography of the performance and therefore had to be considered together with the means of perception of the scene by the performer.

We developed some of the interfaces during the studio experience and tested them in the initial phase. This experience allowed us to direct our expectations and assumptions based on the materiality of the stage and the performer's body; the creation was therefore more applied and more suited to the desired artistic situation. The constructive or ineffective constraints of movement, induced by interfaces, were identified from interaction observations made in the studio. They allowed us to consider the performer's movement in a precise way

according to emerging hypotheses about the interface and embodiment of the virtual on the stage.

Through conversations and an interview with the performer, we noticed that the perception of co-creation (expressed by the performer as a perception of the autonomy of the virtual during interactions with autonomous entities) was more present when the interaction was simpler, clearer, and more responsive by the performer. This impression might be explained by the stage layout which was not very ergonomic or not very consistent with the idea of an exploratory and improvised creation with the virtual system. Indeed, the image of the virtual ecosystem was projected on a screen located behind the dancer and by which he was implicitly attracted. This generated a form of confusion or conflict of attention linked to the sharing of focus between the bodily creation of the moment and the follow-up of the exploratory interaction with the virtual. For the performer, the dynamic lived between that of being a spectator of an interactive installation and that of a dancer who focuses on his presence and his expressive gesture on stage.

This shared attention between the real and virtual environments turned out to be unconstructive and therefore uncreative. This observation made us consider the possibility of spatializing the projection on the stage, by means of a projection on the fabric of the performer's costume (**Fig 8**).



**Figure 8.** Experimentations with the projection of particle simulations over white and translucent fabric ported by the performer ©Isadora Teles de Castro e Costa, 2021

The first impressions of this ongoing test are already promising. They outline a path towards the resolution of the problematic of the interaction by the perception of the scenography. This scenography attracts the performer's commitment to the co-creation. The problematic of the perception of the scenography by the performer lead to the hypothesis of creating a scenography-character incorporated into the scene as a staged element. Such a hypothesis is as important a condition for co-creation as the construction of an autonomous evolving virtual ecosystem. Moreover, if the virtual system is not perceived as autonomous or if it is not perceived at all, how can it be in creative dialogue with the performer?

## Discussion

Our experimentation in the studio gave us clues to understand the conditions conducive to co-creation in three key aspects of the scenic environment conception: the scenography (how the performer and the audience perceive the virtual), the interface (how the virtual perceives the "real") and the programming of the virtual system (creation of the behavior of virtual entities and of its endogenous and exogenous interaction modalities).

In view of the prototype state of species and interfaces, at several times the artist developer intervened to calibrate the interactions, test new relationships between the collected data and the parameters to improve the configurations of the virtual system. The presence of the artist-developer as an operator or mediator in the relationship between the performer and the generative system was studied within the INREV team and represents a concept and a model in its own right, within the dynamic of co-creation between the participant and the interactive device. [21], [22] The sensitivity and perception of the mediator enter as a variable in the evolution of performance.

The concept of performance co-created between mediator, performer and generative system gives us indications on how to incorporate a virtual system on the stage. Can or should this type of hybrid scenography have a mediator? Can he participate in the performance while being on stage? The operator's mediation on the perception of the performer's data by the virtual system could be used in the design of an evaluation function (fitness function) aiming to characterize the adaptability of the virtual system and its species as part of the implementation of an evolutionary step by genetic algorithm.

The studio development experience allowed us to consider the performer's expectations and needs and helped us build an emotional bridge between him and the virtual system. An added step in the interaction experience plan was the familiarization with the functioning of the system, during which the artist-developer explained to the performer how the system worked, how it was developed, what were his inspirations and what were the links that united the simulations or algorithms of artificial life described in many publications and the digital art systems created on these principles. After this introduction, the performer was able to forge subjective links with the virtual and led the interactions based on his new knowledge.

The learning and exploration phase have been shortened and new clues for co-creation have emerged, which Edmonds calls the adaptation and dialogue phase. [5]

A need of the performer was to perceive his influence on the rhythm of the particles. She felt that this influence existed at times and waned at others. The moments when she rediscovered this interaction became moments of creative awakening, driving new gestures. This need expressed by the performer motivated the start of the creation of a common vocabulary, mentioned in the **Results** section of

this article, which served as a bridge between the programming of the virtual environment behavior and the scenic vocabulary of dance. This need manifested by experience suggested the idea of introducing parameters into the behavior of virtual entities that could be identified as the "rhythm" of the virtual by the performer. How to identify dance phenomena in the language of virtual autonomy simulations to make the interaction clearer and more constructive with a view to co-creation? Other concepts from the vocabularies of the modeling of complex systems and of performance were exchanged such as: autonomy, incarnation, form, flow, among others, for which links will be built and discussed during the next studio experiments.

At the end of the first residency, we presented an excerpt from our experiments and received constructive feedback from the *Centre des Arts d'Enghien-les-Bains* and INREV teams. As spectators, they problematized the surface of the projection as well as the way in which we staged this projection. During a team discussion, we realized that this problem was also perceived by the performer and could thus be formalized from the angle of the perception of the virtual environment by the performer: how a specialized and fragmented scenography in space, not only at the level of the interfaces, but also at the level of the projections, can it contribute to a better perception of the scene and therefore encourage a dialogic / adaptive improvisation on the part of the performer?

This feedback was considered for the second round of studio experiments, when we tested projections on fabric in space and on the performer's costume. The new environmental specialization tests have been promising and are in line with our goal of building co-creation conditions.

## Conclusion and Perspectives

The goal of designing a scalable virtual ecosystem quickly shifted to creating the virtual environment and building some form of onstage incarnation to support the performer's adaptive engagement. Our new research-creation hypothesis is to develop the evolving virtual environment so that its incarnation on stage allows spatialized perception and interactions with the performer. If we want the scenography to be played, touched, and manipulated by the performer, but also to be autonomous, acting and reacting to the stage environment, that supposes that it becomes an actor on stage. We call this conformation a scenography-character.

The dialogue will be established not only by the attention that the performer pays to the virtual environment projected on a screen or on himself, but also because in inhabiting the stage, the virtual induces constraints but also the suggested possibilities, which are as many attempts to confront these two elements.

The expression of emotions was initially implemented by following a process of metaphoric and analogical description of emotional sensation, and by transcribing it



through virtual movement from the point of view of the artist-developer. But these descriptions were changed during the studio experience thanks to observations and exchanges of ideas with the performer in an improvised situation. In this case, the expression of emotions by the entities is co-created at the level of the initial programming of the behavior of the virtual entities, within the limits of the emotion-behavior metaphor set up by the artist-developer. The scenography intends to express the alter-ego of the performer during an evolutionary transformation; its implementation will be our next work step.

The studio experience also caused the adaptation of goals and methods development of the virtual system and of the interaction interfaces, considering the limitations of the initial proposals through the materiality of the experience, the expressive needs and intentions of the performer / director and discovering the weak points and new potentials of the creation when it is put in a situation.

The characteristics of the hybrid scenography described in the article make us think of the possibility of interpreting the design of the scenography in a way integrated with the conception of the staging, by improvisation and by experimentation in the studio, in the form of a *scenography-character*.

### Acknowledgements

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