Virtual Models of Architectural Spaces: Methods for Exploration, Representation and Interaction Through Narratives and Visual Grammars

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ABSTRACT

In this paper, we aim to present a conceptual framework for virtual creation, exploration, and representation of architectural space. This framework will allow us to establish a method that will drive the viewer along a path, intended by the researcher, to experience, interact and get feedback on spaces in the study, through linear or interactive narratives. Space virtual computational representation tools have evolved over the last decades and are now providing advanced new tools from gaming, AI, and VR real-time complex fictional environments creation, depiction, and interaction. For conception and planning as for studying or research in the architectural field, this is an area of expertise to explore, as these new graphic computing tools can pursue new approaches, using several methods available to apply in each research, to provide analysis breakthroughs.

Keywords: Architectural virtual representation, Visual narratives grammars, Immersion, Interaction, Virtual exploration methods

INTRODUCTION

There are three main goals to pursue when talking about virtual models of architectural spaces. The first is how to model virtual space and how to represent it, having ergonomic considerations applied to the space design, which requires knowing anthropometry, posture, motion, and how space design affects the user. The second one is how to create interactive plot storytelling suited to its exploration by immersed first-person viewers. In each plot step, the third one is to plan the creation of the virtual world and in it all action and ambiance features that enable the needed space perception for the desired interaction upon that world. With that in mind, we aim to find an approach for creating virtual models capable of representing architectural spaces that will allow a fulfilled experience of exploration and interaction by the user. It's not really about choices of programming languages, game engines, or modeling tools but it's about analyzing and applying the main principles already known in other fictional fields that explore human perception.

It is important to understand our ability to look at abstractions representing space, as the collective culture is imprinted when we plan interactions with virtual worlds. From the concept of two-dimension representation to the immersive proposal experiences in VR spaces, there is a great deal of information to grasp if we want to gather the main aspects needed for creating a virtual world. The visual cinematic storytelling is based on devices of scripting, directing, lighting design, iconic and subliminal meanings approach, photography and painting composition and syntax of representation, perceptual and cognitive issues, editing, fictional world space representation.

The overall of several visual syntaxes, intentionally applied, must get together in a cinematic coherent telling dramatized narrative flow, portraying a fictional world, inducing in the immersed viewer percepts: spaces, environments, emotions, thoughts, feelings, expectations, dreams, ideas, passions, fears, exaltations, or events. We must focus our attention on the architectural space representation, translated into virtual models, interrelated with visual grammars and narratives in its exploration and interaction. That can't be achieved without visual cinematic storytelling and their grammar. As defined by Cohn (Cohn, 2013) the conceptual role of architectural spaces must be considered.

VISUAL GRAMMAR AND VIRTUAL SPACE

Visual grammars are generative systems that use symbols applied through rules to achieve formal visual languages. Architectural space also uses grammar and syntax to achieve coherence by combining several identifiable components translated into images that will empirically guide users through a path. Once an architect starts a design there are preset rules and symbols directly connected with human interface needs for planned uses. Those rules imply the same rules applied into visual narrative grammar as they also need consideration about spaces, environments, emotions, thoughts, feelings, expectations, passions, and fears. At this point, it is important to understand the bond between narrative syntax and architectural space. Without outstanding visual narrative grammar, we hardly can get a great design of architectural space, in real life.

This experience of a fictional narrative in the first person is planned and intentional, in meaning and perceptual terms. This narrative is perceived by the viewer as excluding his own world reality. Anthropometric measurements must be used as a guide for the creation of the space intended to sustain the narrative path. So, the viewer understands virtual worlds within an ergonomic and physical beacons framework, as they are biological, perceptual, psychological, emotional, cultural, and experiential clues, based on the viewer's cognition, learned experiences and memories, in their individual and collective imaginary concepts and from the one he got from his life, his "real" world.

In the line of Filippo Brunelleschi's work (1420), Piero de la Francesca (1519), in "De prospectiva pingendi", contributed, by deepening the laws of optics and Euclidean geometry to a method of construction of space

according to parallel and perpendicular lines, converging the third ones to a vanishing point (Argan and Mammi, 1999), that today we call linear perspective and all depend to represent space. The space modeling and creation and its visualization always follow rules of cognition and perceptual system of seeing, as always follow the geometric cartesian, proportional, and rhythmic nature of space, that man tends to use in its conception.

Linear and Nonlinear Narratives

In linear narratives, the main syntaxes are from film, animation, photography, theatrical staging, cartoons, or painting. Premeditated communication strategies use these syntactic metalanguages, in a planned, disguised but precise form, telling a dramatic fiction in a visual representation and experiential flow. The conception and portrayal of linear narrative's fictional spaces and architectural ones are inseparable from the telling and staging of actions and events elapsing in them. In the linear visual narrative, the viewer is carried by the flow of immersed visual narrative storytelling, along with the plot, through virtual spaces, events, actions, ambiances, and characters. There is emotional and somatic feedback on the viewer from the world tale and its action and characters. He cannot interact with that fictional world, but the fiction acts upon him, which is being felt like a lived experience. The viewer is immersed in the fiction but unable to have an active role in it.

In interactive non-linear storytelling, linearity is transformed into theoretically infinite lines of possible events and plots, with diverse endings. The player is allowed to act on the plot's fictional world, in its characters and events, but he is subject to a script that conditions the entire process. There is an intentional and pre-defined fiction to be imposed on the player, who can interact with the fictional world, but only in what is available for such and according to constraints. The viewer/player must act in response to challenges that are posed to him. He lives and experiences fictional tales and their worlds, feeling like a protagonist and a co-builder of the fiction plot. The viewer thinks and places himself before new challenging and never thought perspectives, ideas, values, and concepts: "the subjective experience that emerges from the interaction between game and player" (Adams and Rollings, 2010).

In a game or gamification, the player has the notion that he is the center of the fiction world, that he sees in subjective view (stronger in First-Person Games). All the visual world surrounds him. This creates in him a strong sense of immersion in the fictional world. The player has a lived experience of the Game's tale, and it unfolds, having readings and feelings from a dream-like narrative. Immersion involves a "sense of presence." Physical immersion occurs when the individual is physically surrounded by experience. This is where is based the phenomenon of "suspension of disbelief" (Zagalo, 2009), which occurs in the viewer/player persuading him to accept as true the premises of the game fiction. Space is understood as experiential and bound up with the physicality and material existence of the body in the world: "a form of praxis that involves spatial practice or performance, representations of space, and spatial experiences." (Flynn, 2008, p. 123).

The Fictional World and Game Limits and its Constraints

The essence of interactive fictional storytelling, plot, and gameplay is based on the relationship between the challenges that the player must overcome and their actions, which will allow him to fulfill those challenges. The challenges that a game offers, such as the player's actions to address these, and the effects of their actions on the fictional world, will determine the procedures and rules of the game, as well as its objective, and conditions to achieve its plot's goals. This player interaction will define the game mechanics, which are planned sets of rules, objectives, challenges, obstacles, consequences, and rewards, dependent on the player's actions, embedded in the interactive fictional world, tale, plot, and script. These key mechanisms of a game are the ones that produce gameplay and playability. Obstacles emerge as opposition forces to the progress and success of the player in reaching the plot goals. They involve all the opponents, elements that hinder the action of the player, or others that impose a constraint to the progress of the player to reach the phased goals.

The fictional space must convince us of its authenticity. It is this one that we seek to convey in space where fiction will occur, rather than a straight realism. This atmosphere creation induces in the viewer emotions and states of mind that are primarily anchored in the life illusion. Reproduction of form and characteristics of objects and phenomena of our world is required, without however to be intended as a simulation of a real-world that we can take as our own. Human factors must be considered to achieve the intended goal of the proposed use of virtual space. A better understanding of ergonomics as they relate to viewer needs will necessarily mean a better space design.

Being infinite in concept, fictional space is one of the circumstances that determine the action of the player: both limits and constraints are obstacles to the player's navigation and progress. Limits and boundaries are combined and blended in space: they are elements that delimit the game world area, preventing the player to transpose them and obstacles to the player's progression in the fictional tales. At the same time, topographic orientation requires detailed close readings, that emerge from the body's relations with the environment: "The player's self-image as one of situation or circumstance is central to their preoccupation with the virtual self and agency in the game world." (Flynn, 2008, p. 126).

It must be considered the importance of "the subjective experience that emerges from the interaction between game and player" (Adams and Rollings, 2010). The way the player acts in an interactive tale fictional space and world, how he can move and perform actions on it, depends on a great measure of indirect control on his journey and action: "the way the user moves in the environment, cognitively, what the player has to know and do, to move once in there and behavioral level, how to configure movement, how they express"(Zagalo, 2009). This unnoticed control can be achieved through visual emphasis, balancing, visual composition of fictional world contents and representation, using careful control of color, perspective, depth, volumetric versus flat object readings, space morphology, light contrast, lighting direction and temperature, apparent sizes, perspective, fog, overlapping, like many others common in the depiction of linear visual narratives.

The Production Design infers and materializes from the Script and the Game Design, with the Concept Art, the creation of the Fictional Universe - its spaces, characters, props, and ambiances: "The atmospheric qualities of sets, places, and environments are essential in establishing a mood and the deployment of an emotional feeling about the world around the movie". (LoBrutto, 2002) For this purpose, visual metaphors, such as the symbolism of color and light-shadow, power, monumentality, religion, the fantastic, the mystic, ways of life, period and historical culture, romance, and technology, must be imbued on the architecture of the game fictional world, because the scenic space is intrinsically linked to the characters that inhabit and interact with it, as also with game action and events that take place in those spaces. This kind of fictional space and events taking place in them induce in the viewer emotional states, an aspect that is essential to a bigger involvement in the game's storytelling and gameplay. These emotions make even deeper the player immersion state in the game fiction and its plot.

Kinds of Interaction

As the storytelling of an interactive tale progresses, the plot stages and scenes progression can have different kinds of control approaches: A - Sequence of events are sortable and therefore partially built by the player himself, having the same final requests for each plot stage. So, just when the player, by any order, has them accomplished, he will be allowed to the next stage (often called level) of the game's plot. B - Parallel and alternative plots with diverse sets of actions and spaces are created in a way that any of them will lead ahead to the same point of the plot. There can be parts where there is divergence or parallelism. Soon after, it will have always to be a point of convergence and reunion in the plot. C - Another option is to have an open fictional world and script, with no storyline, where the player meets a defined fictional world, having the freedom to build his storytelling and path.

In a game, the player is simultaneously an intervenient and a viewer; he both receives and sees information flowing from the storytelling and contributes to it. He "not only enters in the worlds games, as well he changes them and their elements" (Nitsche, 2008). This arising interactivity can steam from explicit interactions with concrete objects or characters in the game's fictional space or from emotional and experiential interactivity with that space. The player's interaction has another concern: the kind of interfaces he will use to interact with the game. It can be through an avatar – the representation of the player himself - and multiple other kinds of visual elements: main and secondary menu game views, feedback elements like indicators, maps and colors representing the game's information and space, buttons assemblies of interaction, written, spoken or sound elements, among so many others. The appearance and how those interfaces are blended into the game's fictional world changes their identity and representation, which are a cornerstone of the gameplay's success and functionality. As the existence of interfaces is essential to interact and travel upon the game's fiction and space, interfaces themselves always tend to destroy the credibility and authenticity of the storytelling and its world, as it constitutes an artificial layer between the player and the reality feeling sought.

VIRTUAL WORLDS AND RV TOOLS

Virtual Reality implies the user/player immersion into an alternate reality world and plot. A virtual world can exist without being displayed in a VR system, and immersion can be a mental state, or also a physical and sensory immersion. When using RV, the physical immersion will reinforce and amplify the user's mental immersion, involvement, and being more deeply engaged in the virtual tale, world, action, and plot: "Being immersed refers to an emotional or mental state—a feeling of being involved in the experience. In the medium of VR, however, we also refer to physical immersion as the property of a VR system that replaces or augments the stimuli to the participant's senses" (Sherman and Craig, 2019, p. 10).

The player's suspension of disbelief, the notion of belonging to that virtual world as a native inhabitant, and the notion that his actions can shape the plot outcome upon that world (sense of "agency"), are all amplified via RV technologies: "Physical immersion: bodily entering a medium; the synthetic stimulus of the body's senses via the use of technology; this does not imply all senses or that the entire body is immersed/engulfed" (Sherman and Craig, 2019, p. 11) Sensory feedback is critical to physical immersion, and thus to VR. The VR system provides direct sensory feedback to users based on their physical placement. In most cases, it is the visual sense of Head Based systems that receive the main feedback, although VR environments can also be haptic (touch) or have sound feedback.

CONCLUSION: A CONCEPTUAL FRAMEWORK

A methodological approach to an architectural object will be developed according to one or more telling (scripts), with interaction and feedback intended accordingly, providing a user's lived experience. The player will look and travel through the fictional space, in a lived, immersed, convicted, and experiential way. The representations of space, events, and their narrative created for the viewer, are planned and intended to create those effects on him. So, we need to plan the experience of the fictional narrative in the first person as intentional, in meaning, and in perceptual terms. For that, we should regard the psychological, emotional, cultural, and existential dimensions. It comprises script, plot, control of attention and dramatic tension, world space representation and its moods and readings, lighting, color, framing, composition, human perception, editing, and sound, to mention some.

This method could comprise steps such as:

1 - Synopsis and Plot Idea
2 - Storytelling Script and Planning
3 -Planning the narrative, human factors and space into visual storyboards and layouts, according to an architectural program based on anthropometry and motion data
4 - Establishing the environment, ambiences and mood of spaces matching the storytelling
5 - Modelling three-dimension natural, humanized and architectural spaces

6 - Designing the model interaction required by the narrative sequences using gaming and cinematic grammar

7 - Testing the viewer perception and interaction created by the space and interaction model and its telling

This method to drive the viewer along a path with linear and interactive narrative, where reality and fantasy can be blended, asks for user readings from reality versus dreamlike narratives, from "agents" working to the dramatization and plot intended for a space in each experience. The next step is the definition of the space grammar and syntax to achieve coherence by combining several identifiable components translated into images that will empirically guide users through a path. It implies creating a bond between the narrative grammar and syntax, and architectural space. Authenticity must be sought in depicting virtual world spaces, according to the plot fiction, rather than a straight realism from the real world. It's imperative to create atmospheres that will induce in the viewer emotions and states of mind, anchored in the real-life phenomena, dynamics, space, and societies, to add an illusion of authenticity to fiction spaces.

For that to occur, it becomes clear that the search and effort in conceptualizing spaces as involving bodily participation. Space must be understood as experiential and bound with the physicality and material existence of the player's somatic existence in the fictional world. It's also clear that immersion and the ability to intervene directly in world events amplifies in the user/player the "sense of presence" and "agency", the player's illusion that he has control over the game's virtual world.

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