THE MUSEUM MACHINE - OR - A DATABASE APPROACH TO THE REPRESENTATION OF SPACE

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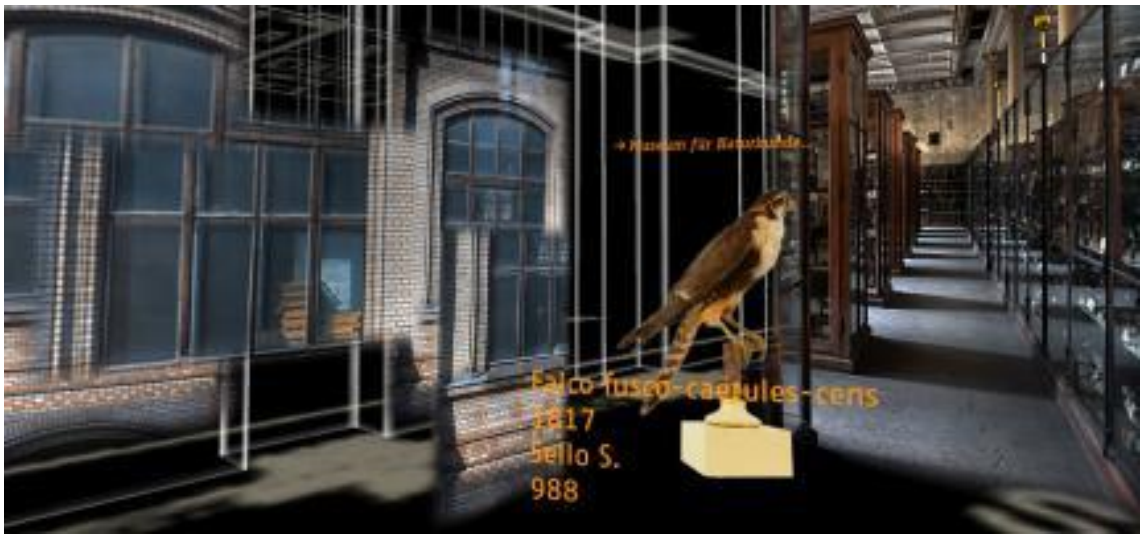
We generally think of space as a coherent and continuous extent and the representation of it is dominated by the linear perspective. In the project “Venture to the Interior” we are formulating a database approach to the representation of space. We are creating a hybrid mixed-reality environment that integrates multiple points of view and allows to explore a layered structure of parallel spaces.



Venture to the Interior / Vorstoss ins Innere, 2010, Juri Hwang and Andreas Kratky, computer-based interactive installation, Copyright by the authors.

In this paper we will discuss the methods and design considerations that we developed for the creation of the Cine-Interactive “Venture to the Interior / Vorstoss ins Innere.” The project is a real-time 3-d environment that investigates the nature of the museum as an apparatus of collecting and cumulative knowledge construction. We used the collections of the Natural History Museum in Berlin, Germany, as an example case for the act of collecting as a way of understanding the world. With the project we are looking at a tradition of collecting objects as part of an emerging scientific practice and worldview that originated during the Renaissance period, when the first private collections were formed in the 15th century, [1] and that had its high time as a public institution during the age of enlightenment and the 19th century. Collecting material objects was regarded as a prime way to gain knowledge since then and only lost its primacy in the recent years around the end of the twentieth and the beginning twenty-first centuries, when the material object got replaced more and more by its coded representation in form of DNA sequences, scans, and measures, and when the museum as a spatial construct started to fade behind the ubiquitous databases. [2] With our project we are reflecting on the status of the object and its representation, and the museum as an architecture of knowledge – a spatial construct that embodies a particular worldview. In creating a virtual representation of the museum and its objects, we are on one hand contributing to the virtualization of the material culture of the museum while at the same time raising awareness and questioning this very process. The question of representation of objects and space is therefore a key element of the project.

THE IDEA OF THE MUSEUM

What gets lost in the reduction of objects to their data representations is the material existence of tangible objects and their binding to a location in a spatial continuum. It is a turn away from the material culture of knowledge that was established in the Renaissance period and dominated the natural sciences for a long time.

Among the Renaissance savants the possession of objects was equal to the possession of knowledge. In the acquisition of such objects – preferably exotic objects, such as birds of paradise or fossils – one could physically acquire knowledge and display the possession of it to gain the reputation of a learned person. [3] Building private collections was a popular activity among the upper class along with the creation of spaces to display these objects as a way of showing economic wealth as well as knowledge. It was an important part of learning about nature and it was the foundation of a particular material culture as part of the sciences that moved away from studying the antique texts as the source of knowledge and towards an experiential contact and engagement with nature. [4] The museums of the early Renaissance – more cabinets of curiosities than museums akin to our modern concept of museum – were architectural structures representing the order of the world according to the "book of nature", and displaying the secret relationships between the objects was a way of deciphering this book and the divine order of the world. [5] The spatial arrangement and the act of "taming" the wild beasts on a shelf in a collection was also a way of maintaining some control over the exploding natural world that was constantly growing in complexity as travel and increasing knowledge revealed more of it. [6] These early collections were conceived around their owners as the central figures. Representing the world from their point of view, the collections were at the same time reflections of nature and of the individual self. This importance of a spatial ordering system persisted when the majority of the private collections became public institutions and as museums became a display case of national importance and pride.

The other aspect that gets lost by the replacement of the object with its data representation, is the aspect of reality. Even though the real object needs to be preserved in order to survive over time and become the eternalized reference for a species, and the wild animals need to be killed and transformed into a taxidermy in order to be stored in a cabinet, they still preserve a reminiscence of their individuality and the reference that they once were living beings. And even though the taxidermy is in some sense also a representation, as one single dead instance stands as pars pro toto for entire species of living creatures, the data object in contrast does not have this reference at all and thus lost its direct connection to the world.

THINKING ABOUT PERSPECTIVE

With these considerations in mind we developed a spatial concept for our project that allowed us to address these questions and make them tangible. As a central element of the project we decided to create a virtual representation of the museum space itself as we found that the actual built space is the core element in the function of the museum as a collecting, ordering, and display system, and it is the stage of the play of representation versus the object. This virtual representation is conceived as a real-time 3d environment that users can explore at will using a common game-engine. The way most software represent space as a virtual entity on the screen follows the principles of linear perspective as it was devised by the Italian Renaissance architect and artist Filippo Brunelleschi and that had its first description in the "construzione legittima" by Leon Battista Alberti in 1435. A good description of this perspective approach can be found in Erwin Panofsky's seminal essay "Perspective as Symbolic Form:" The way we see

a perspectival representation of a space is as a “planar cross-section through the so-called visual pyramid; the apex of this pyramid is the eye, which is then connected with individual points within the space to be represented. Because the relative position of these ‘visual rays’ determines the apparent position of the corresponding points in the visual image, I need only draw the entire system in plan and elevation in order to determine the figure appearing on the intersecting surface. The plan yields the width, the elevation yields the height; and if I combine these values into a third drawing, I will obtain the desired perspectival projection.” [7] This construction renders a continuous and homogeneous space, but in order to realize this impression and to absorb all content into one single “quantum continuum”, as states Panofsky, it has to be assumed that there is a single viewer who sees the scene only with one eye and that the planar projection of the space can be seen as a valid representation of our spatial perception. [8] This notion of linear perspective corresponds rather closely to the way the collections of that time were conceived – a perspective of the world of which all lines converge in the one person, the collector, at its center. This way of representing the world was shattered by the development towards modern science.

The computer generated real-time rendering is not per se constrained to the assumption that the viewer stays immobile as is the case in static linear perspective constructions, since the viewpoint is continuously updated to the current position of the viewer. But nevertheless, most computer-based perspective constructions adopt the postulate of the continuous and homogeneous space. There is still only one single point of view from which the entire world falls into place and is displayed correctly. These are abstractions to which we are so accustomed that we almost accept them as natural. We have seen them throughout centuries of painting, in almost all of the photography, and finally we see them taken over in most of the computer graphics imagery. It is for this inherent feeling of natural perception that computer graphics go generally with linear perspective, even though the machine would be perfectly able to generate all kinds of other representations of space that follow different mathematical models, such as Michael Noll’s four-dimensional hypercubes, [9] or fractal geometry.

BAROQUE PERSPECTIVE

While linear perspective and the Renaissance collection correspond strongly in their way to represent the world, the modern museum stands for a different perspective. Even though it is equally conceived as a location within which all things in the world fall into place and in this way constitutes one big system of order and knowledge, it realizes this notion based on other abstractions. In order to represent entire species, single individuals are collected; likewise single objects stand as representations for entire regions. The museum space in fact presents itself as a system of references reaching out into the world – like a space that is folded over and over to encompass and absorb all the distant locations into its own volume. This notion comes close to some of the central elements of the thinking of Gottfried Wilhelm Leibniz, a Baroque scholar who was instrumental in the founding of the museum in Berlin and in the development of the idea of scientific collection and display as a generator for knowledge and further research. Leibniz is well known for the invention of the infinitesimal calculus and his solution for the “quadrature of the circle”. The intuition for his approach to determine the surface of the circle stems from linear perspective eventually dissolving it into a system of floating points of view. The quadrature of the circle was one of the paradigmatic problems raised by the ancient geometers and became a metaphor for an intractable problem. Taking inspiration with perspective construction, Leibniz divided the circle from a single point of view into an infinite series of triangles. The area of each of these triangles can be calculated and therefore the area of the circle can be calculated as the sum of a series of triangles, which can be infinitely smaller and thus the calculation can be infinitely more precise. [10] From

this notion he developed a general approach to calculate any shape or curve by subdividing it into a series of small triangles in order to make it tractable. While this quadrature of the circle solution is still close to the idea of one central viewpoint from which the entire shape falls into place and becomes calculable, the way this concept enters into the philosophy of Leibniz is as a duality of inflection points and points of view of which Gilles Deleuze gives a succinct description in his book "The Fold – Leibniz and the Baroque". The point of view in this model is the point at the interior of a curved shape where all the perpendiculars to the tangents of this curve converge. The inflection point on the other hand is the point where a curve changes its direction. As the Baroque curve is marked by an irregular and changing curvature, it is described by an infinitesimal series of directional changes. We can see it as the complement to the vectors on the interior of the curve converging in the point of view, as a series of divergent vectors reaching into infinity. [11] This concept of an endless variability implies that the resulting space circumscribed by this curve is characterized by multiple points of view that change their positions from the interior to the exterior as the curvature shifts from concave to convex and back. This Baroque extension of the perspective view as it was formulated in the Renaissance, introduces a relativism that perceives space as the sum of a multitude of points of view. It constitutes space as endlessly folding between local discontinuities within a large continuum. This is what Deleuze calls the "very idea of Baroque perspective." [12]

A DATABASE APPROACH TO PERSPECTIVE

This inspiration about the representation of space and the idea to extend the linear perspective as it is implemented in most computer graphics applications led us to the development of a hybrid approach that we call "database perspective". It integrates the familiar linear perspective construction with a series of defined relative points of view and allows us to address the composite nature of a collection that draws a comprehensive picture of nature from an almost endless amount of collected individual objects. It uses the idea of a folding principle connecting the museum building to the various locations out in the world and, by referencing the idea of a continuous shifting of viewpoints and the successive "falling into place" of the perspectives, gives a metaphor to the procedural nature of the ongoing and by definition never finished project of collecting. The concept of cumulative knowledge construction as it stands behind the idea of the museum is an endless process of generation and revision of knowledge.

The layout of spatial elements in our project uses the museum as a central hub that is explored by the user. The museum is represented as an abstract space consisting of the floor-plans and elevations of the original building as it is described in the quote from Panofsky above. Using the line drawings of the plans gives us the opportunity to evoke the notion of the building of knowledge as an imagination and points the viewer to the fact that the museum itself is an abstraction and idealization made regarding the human understanding of nature. It appears as a line drawing delivering associations on one hand to the architectural plans of imagined buildings yet to be completed, and on the other hand, it is akin to the wireframe images evoking the imaginary worlds of virtual reality as they have been established as classic notions of computer-culture by media pieces such as the Gibson novel "Neuromancer," [13] the film "Tron," [14] or the game "Rez." [15] From this central hub the viewer can access multiple "context spaces", which display certain topics and explore other locations and times, such as the submarine fauna or objects from the 'Wunderkammer'. The viewer can access these spaces by passing through objects located in the virtual museum that serve as representations of and portals to the "context spaces." The geography of these spaces and their relationships to each other are organized in a recombinant database structure symbolizing the references and vectors reaching out from the museum into the world

and that follow the intuition of a folded space with various extensions, which are only possible as virtual spaces in a virtual architecture.

The central museum space is filled with photographic images of the actual museum building, arranged in the virtual space according to the perspectives from the various points of view as they were taken in reality. The resulting impression of the space is a composite akin to a spatial collage of images that fade in and out as the viewer passes through the space and approaches the various points of view. We have adopted a similar concept for the representations of the objects in the museum that serve as portals to the context spaces. Each object is represented by a series of photographic images of the real object showing the different sides of it, which are displayed as the viewer moves around the object. All sides of the object are shown in ten degree steps and imply the notion of continuity and three-dimensionality while at the same time communicating the gap between the individual representations, much like the idea of an infinitesimal series – coming close to the original but never reaching it. Our decision to use photography in combination with a computer generated space was motivated by the desire to evoke the reality reference of the objects and contrast it to the abstraction of pure data representation. As Roland Barthes describes, photography has the power to evoke an idea of direct reference to the object that was photographed, much as the reality reference of the taxidermy in the museum: “The photograph is literally an emanation of the referent. From a real body, which was there, proceed radiations which ultimately touch me […] like the delayed rays of a star.” [16]

As a way of overcoming the abstraction made by most of the linear perspective constructions, the restriction of the view to one single eye, we decided to present the project as a stereoscopic three dimensional projection. This significantly heightens the immersive quality of the experience and makes the complex spatial system more readable for the viewer as it uses stereoscopic vision to support his perception and resolve the spatial relationships within the space.

THE MUSEUM AS EXPERIENCE

The reflection about perspective and the representation of space is an important aspect of the the project “Venture to the Interior / Vorstoss ins Innere.” During our research and production of the project we have realized that the specific quality of the space and the distinct feeling of historic presence that spans many centuries are essential aspects to communicate. We have used the representation of space as a symbolic way of communicating these feelings and allowing the viewer to enter a space that is normally inaccessible, as, in contrast to the show-collection, the scientific-collection, which is the largest part of the museum, is not publicly accessible. These decisions are important aspects of the communication process and warrant careful consideration, they should not be left as contingent on the tool that is being used, as there is no neutral or, as James Elkins writes, “meaningless perspective.” [17] With the reference to Leibniz we are alluding to the notion of the museum as an educative and entertaining experience that he formulated in 1675 in his text “Drôle de Pensée” and where he described the use of exhibitions, machines, and all kinds of media spectacles as a way of fostering scientific engagement and as a generator for new insights into nature. [18]

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