PLAN_B

The architectonics of sonic information

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Abstract. The paper addresses the influence of digital technology on architectural design and production, particularly considering the possibilities of sound for the design and conception of architecture based on the dynamic condition, which is present in the "everyday" and its permutations. The day-to-day condition is regarded as a highly dynamic flux of economic, social and political aspects and conceptually linked to sound and musical variation as guiding design principles, to actually retain and reflect the vitality of every day's measure.

We have traced precedents and cases in sound reproduction and its implications on the codification of architecture and have created a digital design tool in Max/MSP. The primary objective of the tool is to produce the corollary between sound reproduction and the conception and production of an architectonic codification, and ultimately to propose a strategy of architectural construct that has given way from the clarity of static geometry to the complexity in dynamic variability, that of dissonance.

Virtual architecture and its techniques are considered to express and implement such permutations and induce a measure of change in every step and direction of the design process. The application of digital technology is regarded as the intervening of "apparatus" and to represent a different approach in relation to the prevailing regime.

1. Introduction

Our intent in this experiment is based on the parallel between the systems of both sonic and architectonic structure that can be discerned in terms of composition and design. In our view, complexities inherent to sonic structure will help incorporate into architectural design the similar type of permutations and variations.

Since the advent of mechanical reproduction and eventually the digital media, the disjunction in the very nature of defining uniqueness and meaning becomes problematic. On the one hand, the technology made the plurality of an object possible. On the other, the objects' nature and meaning are called into question as it is decontextualized and reconstituted. (Benjamin, 1995) Furthermore, in the case of digital technology, given its efficiency of dissemination and its power of proxy, the process which causes the dislocation and decontextualization is immaterial and ubiquitous. In this process, the only tangible constant that remains is the apparatus and its construct. As a result the value of any given product (including *information*) is predetermined by the potential of the process for such dissemination and ubiquity.

In music, digital sound recording and processing created a new kind of professionals (producers and recording engineers) who profoundly changed the very notion of the actual performance of sound and who have commanded a type of knowledge and skills, therefore influence, quite unique in history. In architecture we can observe the appearance of a similar class of professionals whose primary and central role in the production of architecture is the mediatization and simulation of the actual. In addition, just as in the case of music, the simulation of the actual in architecture intensified the power of the manufactured reality of which the attractiveness and commodity value are as meaningful, if not more, as the actual body of the tangible edifice.

Going back in history, the Baroque represents the quintessential development in both architecture and music in terms of the geometric precision and the importance of individual technical capability. In the early 20th century during the pre-WW II period, the avant-garde movement in music opens a new chapter with the inclusion of "noise" within its legitimate sonic spectrum. (Futurism, Luigi Russolo, The Art of Noises, 1913) Later in Dada movement, specifically Kurt Schwitters's works, Ursonate (1922-32) and Merzbau (1923-33, 1937 & 1947), provide a case for the relationship between the phonetic, generative textual construction and its architectonic form. Subsequently, during 1950s and'60s, the idea of contingency in everyday life, as in the Situationist International, most notably, Guy Debord's and Asger Jorn's works come into play. In the post-WW II period, the discussions on the notation-performance relationship in music also focus

on indeterminacy and the aleatory, namely John Cage and Pierre Boulez. John Cage's position and influence can be best described as the one who initiated the investigations on the behavior, rather than the making, of sound and on the environment within which this behavior can take place. His approach can be best described as a process of conventionalization, in the sense that the environment in which the sound occurs is constructed based on rigorous technical operations, but the operations are detached from the (presupposition of) substantive narratives in the form of tangible music. This shift is also evident in architecture, in which the apparatus emerged at the core of the discipline when the digital process became the dominant form of conception, evaluation and production of architectonic constructs.

2. Conceptual Context

Within the context of sound, music is always described as a specific kind of sound that has historically become to be specific to certain instruments and their combinations (resonance and consonance). Music as a sonic entity has qualifications such as timbre, spectrum, envelope, tonality, frequency, etc. In other words, the specificity of music is based on the possibility of distinguishing various parts according to the discursive organization of the specific properties that have been established within a convention or as scientific constituents.

Noise, on the other hand, may be thought of as organized or not organized in respect to a specific sound or sound system. In other words, noise may consist of a different and/or contrary organization of sounds that are outside the given culture's dominant regime, e.g. such classification as ethnic or alternative music, etc.; minimally discursive a sonic event or occurrence; excessive repetition and/or variation relative to the human auditory scope.

Silence could be considered as a pronounced non-presence of a discursive sound, or to the extent that the notion of differentiation is no longer possible, that is, without sufficient articulation to be perceptible, cognitive and therefore mnemonic. Hence in this case silence could be considered congruent to noise. However, silence is in actuality an impossible condition to occur at least in human terms, therefore silence becomes a conceptual construct within which the central issue becomes the negated state or a void, the notion of which is based on the negation and erasure of the existing and therefore the removal of the perceptive, cognitive and/or mnemonic.

On the other hand, an attempt to investigate, understand and/or deploy silence or noise would at least partially render its alterity or its indifference irrelevant as the very act of its domestication under the dominant regime (of

sound or music in general) and therefore they can no longer maintain the qualities that made them the object of (in)difference in the first place. At the same time, the shock-value of noise to cause disturbance (dissent) in the equilibrium of the status quo of the archaic regime is a frequent intent of noise and silence.

Thus the question becomes: how do music, noise and silence operate and how are they distinguished in different conditions? With modern and popular music, in the age of apparatus driven repetition, reproduction and simulation in which the sound industry produces the consumers of its aural products, there is no possibility for actual noise or silence as they are appropriated and institutionalized under such apparatus of which primary operation is the surveillance, control and normalization of noise and silence.

Analogous to this technological command structure, in architecture also the digital technology is increasingly used to maximize the sanitization of the alterity, rather than enriching itself by including ever more diverse sources and possibilities. In other words, the repetition of the similarity, rather than the invention of the difference, is becoming the distinguishing characteristic of digital design in architecture.

Our experiment, Plan_B, was an attempt to incorporate a sonic object as analogous to the elements of everyday occurrence. Ultimately how we incorporate the fleeting moments of everyday will increase the richness and the technological potential of our apparatus driven life today. Toward this end, in the age of digital supremacy is indeed that of the union between episteme and techné as our apparatus allows, where no accumulation of knowledge is possible without the specific skills involved in the codification and operation of the apparatus.

3. Experiment

Plan_B as a work in progress deals with the complexity of everyday sonic phenomena through 3D digital modeling in terms of geometrical transformations of sonic parameters in a CAAD environment in real-time. The project particularly addresses the way sound can be used conceptually in the first stage of a design process. For this purpose, a digital design tool was developed in the Max/MSP/Jitter software package.

3.1. CONCEPT

The primary objective for the design tool was to construct a link between sound reproduction and the conception and production of an architectonic formal codification. Its main purpose is to propose a strategy of architectonic construction that moves away from the clarity of static geometry to the

complexity of dynamic variability, or in terms of sound, that of contingency and dissonance. Virtual architecture and its techniques are implemented to express permutations and induce a measure of change in every step and direction of the design process.

A digital design process and methodology were defined to connect the generation of free form virtual geometry to the timing and composition of a sonic object (music, noise and silence). The connection is made by electronically processing a sound sample for simultaneous real-time deformation of a 3D prototype model. The formalism of the virtual model becomes a visual equivalent of the sonic object's performance.

The tool itself is based on two techniques that are commonly used in digital design to describe and generate complex curved geometry: NURBS and time-based digital animation processes. The 3D model is constructed with a NURBS surface. Time-based design processes primarily rely on dynamic techniques implemented in animation software to generate design sequences by continuously transforming shapes. The concept of dynamic transformation and animated permutation was a logical choice, as the element of time is an inherent and crucial part of a sonic object and its performance. Specifically music as a type of organized sound involves several components, such as rhythm, pitch, timbre, etc., which are not only audible but also discerned in the real-time deformation of the geometry. The simultaneous transformation of the shape and the playback of the music allow for the interpretation of the parametric link between 3D shape and sound file.

3.2. IMPLEMENTATION

The Plan_B application was created within the software environment Max/MSP, using its programming environment and objects for sound. Max/MSP was expanded with the Jitter object library, a set of matrix data processing objects optimized for video and 3-D graphics, including 3D geometry and Open-GL objects. Max/MSP/Jitter was chosen because of its support of both real-time audio synthesis and Open-GL graphic rendering. This enabled the creation of an application with real-time shape generation and full audio-visual feedback.

Initially, a 3D prototype was set up with a NURBS surface, on top of which an object file can be grafted. This resulted in the initial shape of a NURBS model. Subsequently, the deformation was achieved with the sound attributes extracted from the music score. The deformation effect of the score is a formal 3D translation of the sound's information matrix. The transformation consists of scaling, rotating and displacing the 3D geometry.

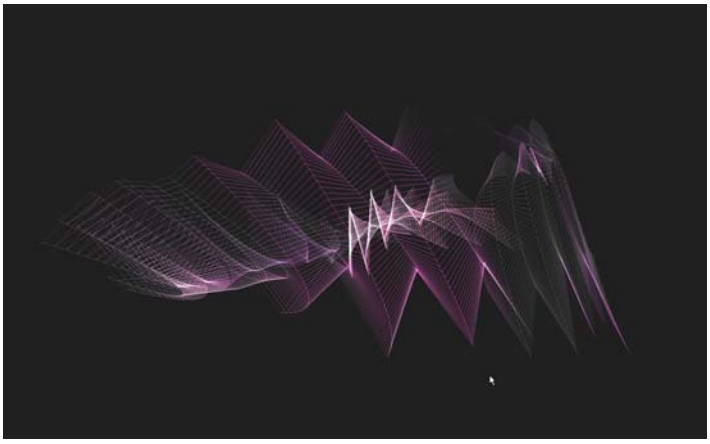

Figure 1. 3D prototype with obj-file influence.

3.3. PROGRAMMING

Max/MSP is a graphical programming environment for music, audio and multimedia, used to design cross-platform programs and user interfaces. Programming takes place in the Patch window, where Max/MSP Objects, represented as boxes, are connected with patch cords. The program library contains objects to perform a wide range of tasks, from basic arithmetic to waveform editing, etc. The Plan_B application consists of a main patch and sub patches for sound source input and 3D geometry.

3.3.1. Plan_B main patch

The Main patch contains a NURBS object and OpenGL visualization objects for the generation and adjustment of the NURBS surface. The surface is created by the Jit.gl.nurbs object. The control point matrix of the NURBS is iterated with the matrix output of a jit.gl.model object. The NURBS is then displaced with the parametric data flow from sound signals.

3.3.2. Sound sub patch

Sound is mapped on the NURBS surface by filling a matrix with the audio signal flow and iterating it with the NURBS control points matrix. Mapping is achieved using the jit.iter object. This object sends out the matrix cell values through the left outlet, accompanied by the coordinates of the cell through the middle outlet. This data flow is rendered in the jit.window via the jit.gl.render object. The amount of deformation on the 3D object model can be controlled by changing the iteration algorithm and its influence value. The jit.xfade object sets the morphing value between minimum and maximum deformation.

4. Discussion

The application was developed as a probing and representational system to improve understanding of the immaterial, yet undeniable spatial connection between sound and 3D space and its implications and potential use in digital design. Using the abstract representation of context related information, i.e. sound, the application opens up new formal expressions, thus allowing the stimulation of the architect's imagination through a continuous series of possible formal iterations. In other words, the resulting formal expression embodies the notion of *instances* rather than being fixated on the finality.

The application will be developed further to link formal 3D space generation to acoustic attributes to permit the acoustic evaluation of the space as well. The software will be extended to assist in the generation of complex curved geometry with specific acoustic qualities, hence relating real-world implications to the generation of architectonic forms.

5. Conclusion

In architecture, the visual experience is regarded as the dominant perception and is the main concern of designers. As mass media become more pervasive and influential in our everyday experience, the digital approach to design and construction will involve other senses, such as hearing. The Plan_B patch is part of an application which is being created to support the design and acousticl enhancement of soundscapes. On the other hand in a broader perspective, this experiment suggests a direction in architecture in which there occurs a close symbiotic relationship between the apparatus and the kind of knowledge that is gained from its practice. In this case, the potentiality of an intervening apparatus and its codification suggests that we reached a point where techné *is* episteme.

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