The Virtual Electronic Poem project

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Draft

The *Poème électronique* has been a unique experience, originated from the request made by Philips to Le Corbusier for the design of the company's pavilion at the Brussels World Fair in 1958. The result was the very first multimedia project to involve a sense of total experience of vision and sound. The whole project was initiated and directed by Le Corbusier, who also created the images for the audiovisual show, with the organized sound composed by Edgard Varèse, and the stunning surfaces of the building designed by Yannis Xenakis. It is not of secondary importance the role played in the operation by Louis Kalff, art director of Philips industries. He initially had the idea of a participation in the World Fair not with a pavilion intended as an exposition space for the Philips products, but rather with a show of sound and light effects that could illustrate the technical progresses of the company. Le Corbusier responded with a Pavilion that was a synthesis of colored lights and contemporary sounds that filled the volume of the building, and enormous warped images that were projected on the surfaces of that volume. The common space of the Pavilion hosted the audio and the visual materials as integral parts of the architectural design.

This document is a project proposal for the realization of a virtual reality environment that aims at reproducing the total experience of the *Poème électronique* (Virtual Electronic Poem – VEP - project). The goals of the project are to achieve, as far as possible, a complete reproduction of the real project in a virtual setting. However, as described below, many issues of the project are in fact a matter of scientific research, on both the semiotic and the technical sides. This is why the proposal is articulated in progressive steps, each providing an exploitable intermediate result, from a visit of the Pavilion through traditional interactivity peripherals, like mouse and keyboard, with sound reproduced by stereo loudspeakers (Philips reduction of Varèse's composition), to a complex interaction with a head-mounted tracking device, taking care of how the head movements influence the perception of the audiovisual show, where the organized sound features the highest complexity in simulation, given the limited knowledge on Varese's score details and the reduced possibilities of sound spatialization implemented by the current technology.

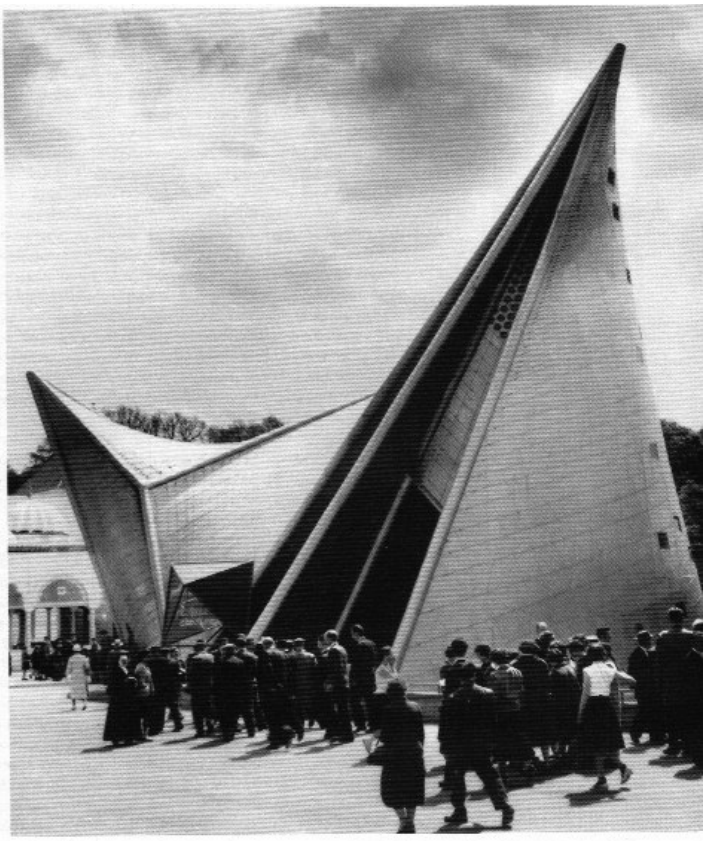


Figure 1. The Philips Pavilion (Brussels, 1958)

There are three individual aspects to be accounted for in the project:

1. The structure of the Pavilion. Actually designed by Yannis Xenakis after the sketches drawn by Le Corbusier, the structure was a cross of surfaces bordered by hyperbolic paraboloids. The structure covered the "stomach", i.e. the space that had to contain the spectators immersed in the audiovisual continuum of 480 seconds that included Le Corbusier's image and color light sequence (images projected on the inner surfaces), and Varèse's *son organisé* (organized sounds conveyed by 425 loudspeakers arranged all around the surfaces). In the VEP project there will be a 3D reconstruction of the Pavilion with a number of navigation forms.
2. The organized sound. With this project, Edgar Varèse realized his lifelong goal of including space in a music composition. Eventually, the technology was able, at that time, to implement such an artistic novelty: Philips engineers distributed a vast number of loudspeakers all around the inner surfaces of the Pavilion, and piloted the sound according to the paths designed by the musician. The result was a complex net of sound trajectories along which the sound could circulate. Moreover, at the exit of the Pavilion,

the audio show was completed by a Xenakisian piece (*Concrete PH*), a significant tail to the path already made.

3. The images. The images were designed by Le Corbusier in complete autonomy with respect to the organized sound. Most of the merits go to the film-maker Phillippe Agostini, who took Le Corbusier's scrapbook of images and made it into a coherent artistic whole. The black-and-white images projected on the two sides of the "stomach" reviewed the history of human civilization from its origins to the present. A voyage from darkness to dawn, a catharsis that evolved in step with the triumph of reason through science and culminated in a finale of harmony and optimistic hope. Images included a nuclear explosion, a child's face, the silhouette of a bull, drawings of Le Corbusier's urban projects. The last images of the film showed a group of children, symbolizing the birth of a new era, and an open hand, as a symbol of peace, while the narrator recited "Observe this open hand, the Open Hand raised as a token of reconciliation, open to receive and to give."

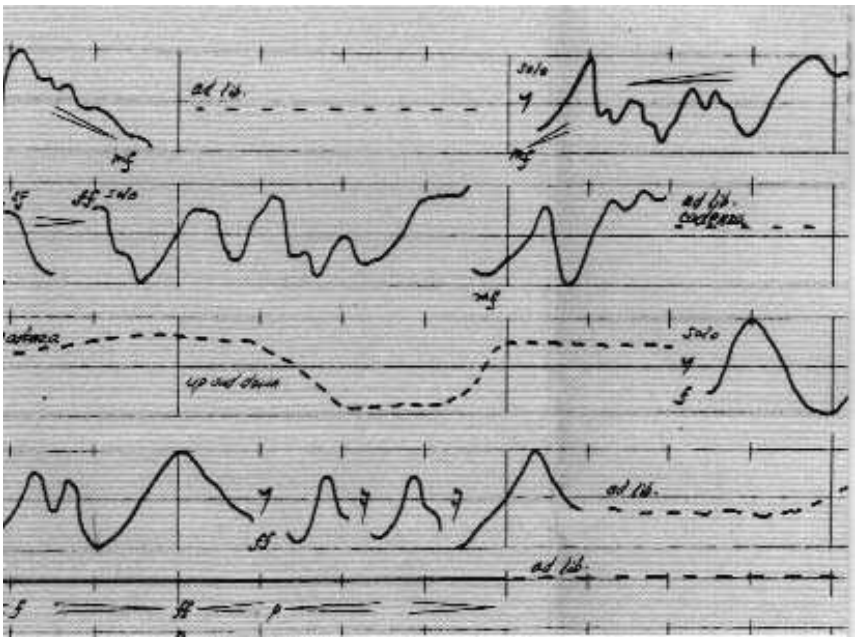


Figura 4. E. Varèse: drawings for the realization of the *Poème électronique*.

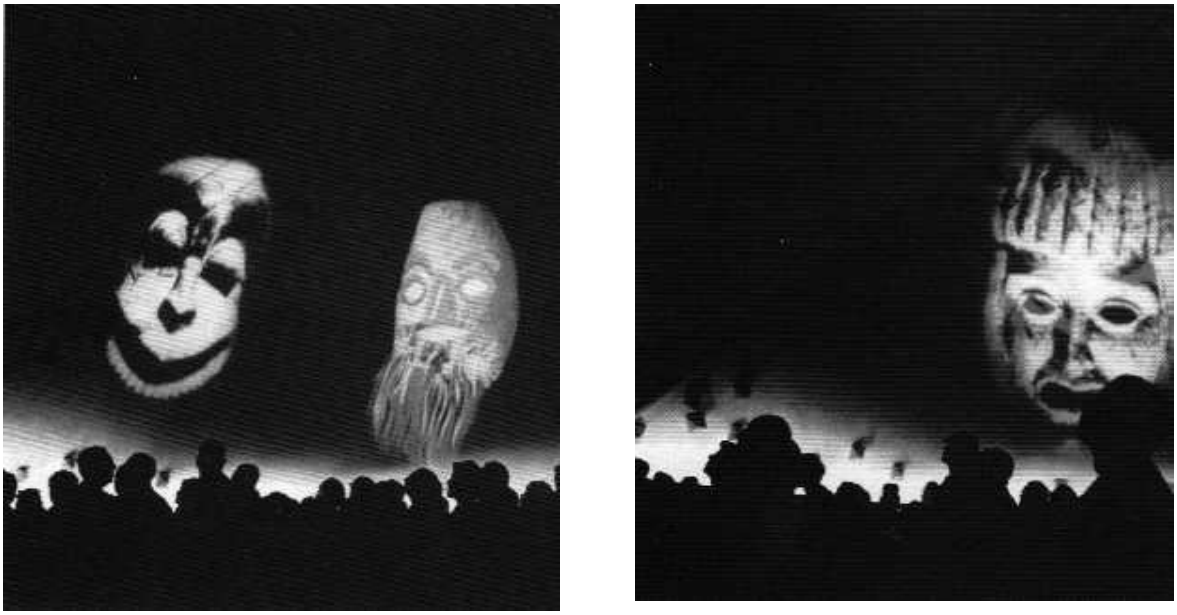


Figure 2/3. Le Corbusier: images projected inside the Pavilion.

The individual components we have just described would suffice to claim the centrality of the Pavilion in contemporary art, and if the visual show was to be overcome by subsequent progresses of the movie industry, the effective spatialization of sound provided by Varese's project is still modern nowadays. Evenly, the *Poème électronique* can find only today a faithful implementation in the digital approach: we can imagine (since we were not there) an ubiquitous presence of noisy clicks while the sound engineers acted on the switches that decided the trajectories of the signal all around the 425 loudspeakers.

However, the real conceptual advancement introduced by the *Poème électronique* was the integration of multiple media in a unique project. Even if the Poème cannot be considered the very first multimedia project (Walt Disney's Fantasia had been released in 1940), the characteristics of a total bathing environment made it a totally new experience. With Fantasia, the Poeme shares the fact of not being a fully successful enterprise: so a visionary synthesis of innovative ideas couldn't stand with its times, and the paradigm was never repeated, or even attempted, again. The Philips family, who financed the project, made negative comments from the beginning (Ouellete 1966, Vivier 1973), and the pavilion, notwithstanding the incredible number of spectators (2 millions (Ouellete, 1966)), was turned down a few months after its inauguration, at the end of the Exposition. The disappearance of the pavilion makes the *Poème électronique* a destroyed masterpiece (Bredel 1984); what we own today are only fragments of the various components. Just to give an example, the acoustic varesian part, which exists in the stereophonic version arranged by Philips' engineers from the three-track spatialized original

version, cannot give even a poor idea of its actual contribution to the electronic poem; the original definition of a total space of watching and hearing has vanished.

Now, the recent technological advances in virtual reality and audiovisual effects makes a rebirth of the *Poème électronique* possible. Motivations do not originate in archeology of multimedia artifacts (even if a VR installation would be a duteous tribute to the first multimedia project), but in the novelty of such an approach:

1. currently, there are no installations with this unity, that are able to convey images and sound paths of such a complexity, in a common digital space envelope[1];
2. a VR installation could return a full interactive fruition of the poem (notice that the perception of the audiovisual show varied with the position of the spectator, and the spectator was free to direct his/her head anywhere in the pavilion space)[2];
3. a VR installation could be a teaching support for one of the most studied themes in contemporary architecture (see, e.g., the number of web sites dedicated to this topic).

Needless to say, the part of the project which features the greatest interest on both the semiotic and the scientific sides is the reproduction of the sound paths planned by Varèse. Nowadays we all enjoy the magic created in cinema by the spatialization effects, and, given the memories reported by some witnesses, sound mobility was the most impressive aspect of the whole poem (Ouelette 1966). At the same time, we remark again the heavy technical limitations that were to occur at that time: sound paths were yielded through the use of electrical devices controlled manually by Philips' engineers: all these devices, much less sophisticated than the ones in use today, were sources of noises and clicks, and the human error could affect all the synchronization in the soundtrack organization. In a modern installation, such problems would be avoided by accurate devices with electronic control. The latter consideration comes in mind after the reconstruction of the *Poème électronique* made in 1999 by Bianchini, Casali and Lupone (2000), who approximated in a real (non virtual) environment the major aspects of the experience. Their setting is being guest of several happenings throughout in Europe.

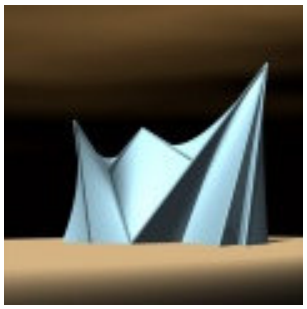
Beyond these issues of re-bringing into life the destroyed tripartite masterpiece, the VEP project can evolve into new artistic and scientific directions. On the artistic side, the virtual version of the *Poème électronique* makes available new different contexts of enjoying it. An immediate

[1] Consider that the VR realization of the poem would implement one of the most famous Le Corbusier's comments about the container and the content: "Je ne ferai pas de pavillon; je ferai un *Poème électronique* avec la bouteille qui le contiendra. Le bouteille sera le pavillon, et il n'y aura pas de façade à cette bouteille" (Le Corbusier cited in Vivier 1973: 161).

[2] The sensation perceived was to be "in the heart of the sound source" (Ouellette 1966, pp. 201-2).

consequence of the dismaterialization of the pavilion allows for an experience through the cyberspace. Also, the basic modules of the project prototype can serve as an initial environment for implementing other artworks. Finally, the prototype can be seen as an open architecture for creating more complex environments to serve artistic needs. On the scientific side, the VEP project will require several original solutions in the integration of the various media and the interaction with the spectator. The current technology in the several areas involved in the project, design of the digital space, display of the visual show, organization of the sound paths, human-machine interaction, can provide several solutions and possible integrations. We have individuated a few research topics in many areas. To be effective, the project is organized in several steps of refinement: from very compressed formats for the audiovisual material, with low quality and reduced effects, and simple interaction tools, to be run on low-end PC's and to be accessed through the Internet, to high definition formats and sophisticated feedback interactions, to be run on high-end machines in stand-alone installations.

The VEP requires a multidisciplinary effort, in that several areas of investigation are at hand, and an interdisciplinary effort, in that the material has to be integrated in a unique solution. The most inter-dependent aspect of the project is obviously the design of the architectural space. On one hand, the building constrains the inner space where the audiovisual part takes place; on the other, the actual result of the audiovisual part depends on several parameters connected with the inner space (chromatic/luminosity/texture features of the walls, locations of projectors and light sources, in the visual part; orientation of the surfaces, reverb coefficients, in the audio part). Then, the definition of the acoustic environment in terms of the possible sound trajectories: this requires a deep philological study of Varèse's project (on excerpts from Varèse notes on the three tracks that operated almost independently in the whole piece), and the technical arrangement of the project on the building structure (location of the loudspeakers and possible constraints posed by Varèse on sound manipulation, resulting from interaction between and Philips' engineers). The results must be available to computer scientists for the design of the actual environment and the controls offered to the user for sound spatialization.



In the last part of this document we illustrate the detailed work plan for the VEP project, with the team involved. In sum, the goal of the VEP project is to create a virtual reality experience of the *Poème électronique*. The project has a twofold goal: a reconstruction of the Philips pavilion and its content (a recreation of the set of sensations that visitors in Brussels experienced in 1958),

and artistic and scientific research on virtual interactive audiovisual environments (a tool with the capability of creating a digital space where to project 2D images and to redirect sound freely in a 3D environment).

The project requires some initial study of the state of the art in virtual reality, with special attention to audiovisual interactivity. Notice that the project requires a very limited sense of interactivity, that excludes the difficult tactile motion feedback. The latter consideration allows us to limit our work on software issues rather than specialized hardware peripherals.

Work plan in 2 years:

1. months 1-6: study of the state of the art in the five areas of digital space design, 2-D image display, sound spatialization, multimedia integration, human-computer interaction, with special attention for artistic requirements, and the needs poses by the *Poème électronique* in particular; the study must be conducted on the artistic and the scientific sides; the result is a composite report that illustrates the artistic areas of the poem, and the technical VR solutions in these areas;
2. months 7-12: study of the software existing in the individual areas cited; attention is specially paid to open source software, and open-architecture software (for plug-in development); this requirement goes in the direction of developing an open environment for artistic expression; software must be classified in the context of serving the several steps of refinement described above;
3. months 13-18: integration of existing software and possible development of new modules (and, in case it is necessary, the launch of new research areas);
4. months 19-24: evaluation of the prototype, debugging, complexity issues, ...

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