

# X3DIRECTOR

## *A Front-end For Modeling Web Virtual World Navigation And Visualization Parameters*

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**Abstract:** With the advent of digital communication technologies, a huge quantity of information can be stored and transferred. However, with increased possibility comes increasing complexity. As indicated by the dissatisfaction often experienced by users of information technology, current systems of accessing, organizing and navigating information are proving insufficient. For this reason, in the Web world, besides new media contents, new technologies for implementing more dynamic and user-friendly interfaces are being developed. Currently, the last step in the evolution of digital technologies for web interface and contents is represented by virtual environments which, despite the appearances, are, in some cases, very accessible and economic. This paper will provide a panorama on the functionalities of language X3D and the identification of the cases in which is possible to use X3Director.

## 1 INTRODUCTION

With the advent of digital communication technologies, a huge quantity of information can be stored and transferred. The last step in the evolution of digital technologies for web interface and contents is represented by virtual environments, and so by X3D.

The syntax and data structure of X3D provide an excellent tool for the modeling of three-dimensional worlds that are functional and interactive and that can, ultimately, be transferred into fully immersive viewing systems.

X3D allows to combine other Virtual Reality (VR) technologies and real environment, for example motion trackers are employed to monitor the movements of dancers or athletes for subsequent studies in immersive VR. These 'Augmented Reality' technologies allow for the viewing of real environments with superimposed virtual object; for example telepresence systems (e.g., telemedicine, telerobotics) immerse a viewer in a real world that is captured by video cameras at a distant location and allow for the remote manipulation of real objects via robotic arms and manipulators.

As the technologies of VR evolve, the applications of VR become literally unlimited. It is assumed that VR will reshape the interface between people and information technology by offering new ways for the communication of information, the visualization of processes, and the creative expression of ideas. Note that a virtual environment can represent any three-dimensional world that is either real or abstract. This includes real systems like buildings, landscapes, underwater shipwrecks, spacecrafts, archaeological excavation sites, human anatomy, and so on and abstract systems like magnetic fields, molecular models, mathematical systems and any other conceivable system including artistic and creative works of abstract nature.

This paper and therefore X3Director is proposed like an aid in virtual environment refining those already existing, but not complete and not still ready for the distribution in the Web world.

In particular, the paper mainly deals with a specific category of users who might be called "non-expert developer". They are users that use, for work or pleasure, 3D graphics development software which supports virtual development language as X3D. These users can get a virtual representation of their 3D projects without having any knowledge of the X3D language. The goal is therefore to provide a

software that helps this category of users in the refining phase, again without the exigency of any particular knowledge.

The second chapter introduces the X3DDirector software and its features.

## 2 X3DIRECTOR

The production of the three-dimensional structure of an X3D environment can completely be delegated to the software of authoring 3d and, that concurs to customers non-expert of X3D to develop, in immediate and practically free way, virtual environments compatible with the Web. After such phase it is necessary, for the effective fruibility of the virtual representation, a phase of post-production that proceeds along one series of tried and modifications. Phase that cannot be delegated to the software of authoring 3D is because often, being thought for other, do not support some of the demanded characteristics (e.g. the Background node), or, in case they come supported, their implementation demands specific knowledge of language X3D.

X3DDirector helps the “non-expert developer” to accomplish the post-production phase. The software provides a series of functions to manage the 3D aspect of an X3D file. It allows realizing different actions so as to add localized audio contexts or sounds that start after having clicked on a particular area or object, thanks to the use of the TouchSensor node.

X3DDirector proposes a linear, intuitive and provided of continuous assistance interface that allows the user in few mouse clicks to edit or to add ex novo the Background node in order to better characterize a three-dimensional environment, the NavigationInfo node that describes the view and the characteristics of the avatar, user’s alter-ego, and the Sound and AudioClip nodes. Moreover, thanks to integration of parser DOM with the data structure JTree provided from the Java Swing package, X3DDirector provides, at nodes level, for the loaded X3D file, an interface characterized from tree structure that reflects the characteristic hierarchical structure of XML files. As far as the attributes, instead, X3DDirector has integrated an other data structure, the JTable, in order to organize and to edit in “expert” way the attributes of the nodes.

Such a software, conceived in order to come towards requirement of a non-expert user in the modeling of virtual environment in X3D, allows to verify the user’s modifications, before the final

saving, thanks to the preview function (it is necessary to have a player X3D installed in the operative system). This function can be used in order to evidence the modifications carried out globally in the file X3D and therefore to have a preview of the final complete file X3D or to evidence single geometries and therefore to have a visual reply on the single Transform or Group nodes. In order to complete this global view on the X3DDirector it is to be underlined that such a software does not forget the more expert users that they do not have need of the driven procedure. In order to edit or to add the above mentioned nodes, these users can either use simple functions of “add” or “delete” or can directly modify the values of the attributes editing them with a simple double click on the data structure JTable left on purpose editable for this function.

### 2.1 Characterizing Features

The absence of the necessity of specific knowledge differentiates X3DDirector from the others editor X3D and it renders it ideal for the phase of post-production. The below table shows a comparison of main editors X3D and X3DDirector. From the comparison, that refers exclusively to the phase of post-production, tool of optimization of the code and the software of authoring 3d have been omitted.

Table 1: Comparison between X3D post-production tools.

Software	Knowledge X3D	Potentiality	Complexity
X3DDirector	null	medium	low
SwirlX3D	medium	medium	medium
X3D-Edit	high	high	medium

Everyone of the software shown can be used to modify file X3D exported from the software of authoring. It is obvious that, with the exception of X3DDirector, is however necessary a sure level of knowledge of language X3D.

SwirlX3D is a powerful X3D authoring environment that gives full access to the data structures in an X3D file and is able to preview the completed scene. The specific knowledge of X3D are not excessive but of against it does not offer, as instead X3DDirector offers, no visual procedures that it renders the formulation of the parameters independent from the knowledge of language X3D.

The graphics file editor X3D-Edit includes the typical characteristics of this type of editor: context-sensitive editing prevents creation of incorrect scene-graph structures and detects invalid numeric values, context-sensitive tooltips provide concise

explanations and warnings of each X3D node and field, tag-inspectors, syntax highlighting, tag hints, code fragments, objects, edit dialogs and much more. They demand a deepened knowledge of language X3D with the exception of X3Director that has a complexity of use practically null thanks to the friendly and intuitive interface, and offers to the developer the possibility to act on the independent, from the three-dimensional structure, aspects of the virtual environment (phase of post-production for non-expert customers), or to modify whichever other parameter (expert way). In the next sections the several features are described in more detail.

## 2.2 File Selection and Parser

When the X3D file is selected and loaded, X3Director displays it using a JTree that reflects the hierarchical structure of an X3D/XML file (see Figure 1 below).

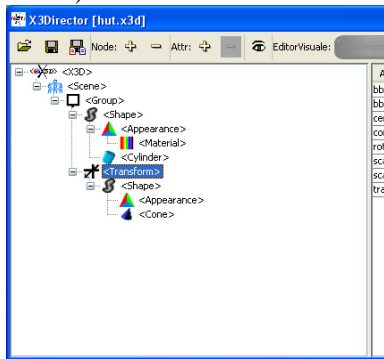


Figure 1: Node X3D in tree structure.

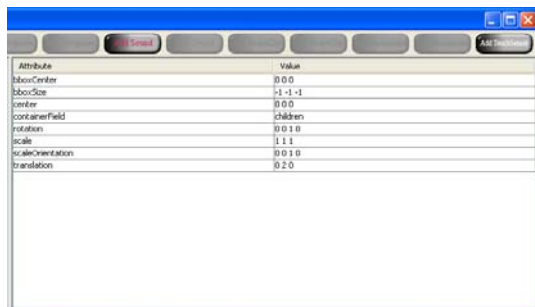


Figure 2: Attribute X3D in JTable structure.

Now it is possible to have access of all functionalities provided by X3Director. As an example clicking on any node, such software will show to right, organized in a JTable, the attributes and their values of the selected node (Figure 2): then, as pointed out in the previous cross-section, it is possible to edit manually, by the more expert users, the values of the attributes.

## 2.3 Update

Once the file is loaded, a series of operations can be carried out on it as addition or the modification of nodes Background, NavigationInfo, Sound, AudioClip and TouchSensor.

In the next subsections the driven procedures provided by X3Director will be analyzed one by one.

### 2.3.1 Navigation and Avatar Parameters

Navigation and Avatar parameters are included in the NavigationInfo node. In order to open frame (Figure 3), where it is possible to update such parameters, it is necessary in a loaded X3D file, either the presence of a NavigationInfo node to be modified, or clicking on the Scene or Group node and to push the AddNavigationInfo button present in the toolbar of X3Director in order to add a node ex novo.

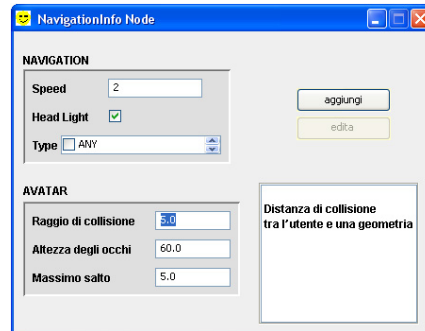


Figure 3: NavigationInfo procedure.

### 2.3.2 Background Parameters

Also for this node, as for the NavigationInfo, the driven procedure (Figure 4) can be opened in order to modify an existing Background node or in order to add a Background node ex novo. Such procedure allows the user to select three colors for sky and three for the land through the JColorChooser class supplied from the Java Swing package.

X3Director provides an interface with a text field for every cube's face with relative file browser button. The image path can be directly put in the relative text field or it can be obtained by file browser. The software, moreover, features a preview of images selected.

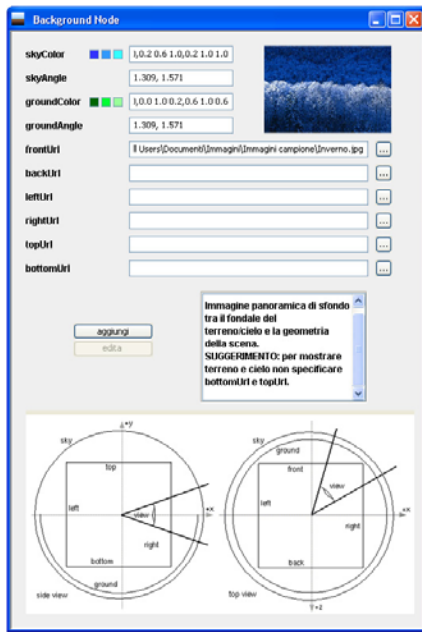


Figure 4: Background procedure.

### 2.3.3 Sound Parameters

For the adjustment of sound parameters X3D Director provides a further driven procedure (Figure 6). Here it is possible to modify the parameters regarding the ellipsoids representing localization and propagation of the audio source (it is also possible to listen in preview the file audio selected) that otherwise have to be specified in a procedure regarding the AudioClip node (Figure 5).

Taking up the Sound procedure again, X3D Director gives the possibility to add audio file with use of TouchSensor node. In this case the audio will start from the user's click on the geometry before selected in the Sound procedure. Once added the Sound node with TouchSensor it is possible to add to a further TouchSensor node and respective node ROUTE required to assume the task of "stop" to the file audio enabled with a click thanks to the previous TouchSensor.



Figure 5: AudioClip procedure.

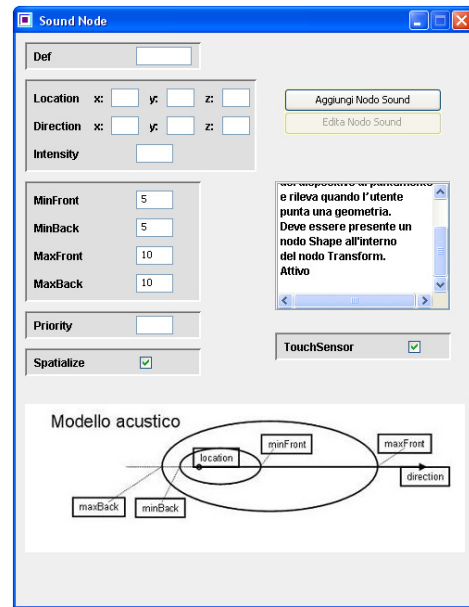


Figure 6: Sound procedure.

## 3 CONCLUSIONS

The Web represents today a fantastic showcase for commercial or non-commercial messages. Its diffusion and inexpensiveness makes it the best way to obtain visibility and in this scenario it is fundamental to offer a good Web experience that is not frustrating and that has a good impact on the visitors. It is therefore developed X3D Director, a front-end which helps the X3D non-expert users (but it could also be helpful to expert users) for modeling navigation and visualization parameters in X3D environment. The software allows realizing the post-production phase without any knowledge of X3D language.

An X3D non-expert user could therefore develop and deliver a X3D content on the Web by using the combination 3D authoring software-X3D Director.

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