The Virtual Reality Modeling Language (VRML) is the file format standard for 3D multimedia and shared virtual worlds on the Internet. The first release of the VRML 1.0 specification was created by Silicon Graphics, Inc. and based on the Open Inventor file format. The second release of VRML added significantly more interactive capabilities. It was primarily designed by the Silicon Graphics VRML team with contributions from Sony Research, Mitra, and many others. VRML 2.0 was reviewed by the VRML moderated email discussion group (www-vrml@vrml.org) and later adopted and endorsed by many companies and individuals. In December 1997, VRML97 replaced VRML 2.0 and was formally released as International Standard ISO/IEC 14772.

Hyper Text Markup Language (HTML) the basis for the current WWW, provides a document-based interface that can incorporate raster graphics images (as GIF or JPEG files.) While the document paradigm is suitable for some forms of interaction, it has serious limitations both in terms of its information structuring and its interaction capabilities. VRML adds the next level of interaction, structured graphics, and extra dimensions (z and time) to the online experience. The applications of VRML are broad, ranging from prosaic business graphics to entertaining web page graphics, to manufacturing, scientific, entertainment, and educational applications, and of course to 3D shared virtual worlds and communities.

VRML blends the intuitive human sense of space and time with user interface interaction and programming language integration producing a truly new and exciting technology for the Internet. The evolution of the Net from command-line to 2D graphical to emergent 3D interfaces reflects ongoing, fundamental progress toward human-centered interface design--that is, toward a more immersive and responsive computer-mediated experience.

The Web3D Consortium was formed to provide a forum for the creation of open standards for VRML specifications, and to accelerate the worldwide demand for products based on these standards through the sponsorship of market and user education programs. VRML applications have been actively pursued by many organizations for quite some time. This community has spearheaded the development of the VRML 1.0 and 2.0 specifications, which provide the basis for the development of associated applications. The organizations involved in this effort felt that the creation of an open consortium focused exclusively on VRML would provide the structure necessary to stabilize, standardize, and nurture VRML for the entire community.

Language Overview

VRML 1.0 allowed content developers to create static 3D worlds which contained links to web content. VRML97 builds on the geometric foundation of VRML 1.0 with the addition of three basic concepts: sensors, scripts and sound.

Sensors - Interaction with the User

Sensors provide mechanisms for the user to interact with objects in the world. Functionally, they generate events based on time or user action.

- ProximitySensor
- SphereSensor
- TouchSensor
- VisibilitySensor
- CylinderSensor

- TimeSensor
- PlaneSensor

Scripts and Interpolators - Behavior and Animation

Scripts and Interpolators are the way you breathe life into the VRML97 world. Interpolators are a built-in behavior mechanism that generate output based on linear interpolation of a number of key data points. Use of these key data points to generate animating objects is called keyframe animation. Scripts are used to create more intricate forms of behavior. Script nodes themselves contain source code or pointers to code for logic operations. Authors can feed data into a Script, have the script analyze the input and output an event to change the world.

Interpolators

- color
- coordinate
- position
- normal
- orientation
- scalar

Script Languages

- ECMAscript
- Java

Sound

3D Spatialized Audio for added realism and increased immersion in the virtual world. Smart use of sound can have a significant impact on the user experience. Ill-conceived use of sound can lead to worlds that are too big to download. Keep in mind that VRML supports MIDI for background sound tracks and that small .wav files can be triggered randomly by a script node to create ambient effects.

Geometry - Polygonal Description of the World

VRML97 has new geometry nodes to enable more compact descriptions of complex virtual worlds. These nodes and use of the DEF/USE notation are crucial to making interesting worlds that people will be able to experience over 14.4 and 28.8 baud.

Billboard - align objects to an axis

ElevationGrid - create terrains

Extrusion - create objects by simply describing their outline

Text - now internationalized to enable multi-language support

External Authoring Interface (EAI)

For communication between a VRML world and its external environment an interface between the two is needed. This interface is call an External Authoring Interface and it defines the set of

functions on the VRML browser that the external environment can perform to affect the VRML world.

Essence, the EAI provides a method for developing custom applications that interact with, and dynamically update a 3D scene. These outside applications "talk" to the VRML scene.