

# Open Inventor, VRML and Related Technologies

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## What is Open Inventor?

Open Inventor is an object-oriented 3D toolkit offering a comprehensive solution to interactive graphics programming problems. It presents a programming model based on a 3D scene database that dramatically simplifies graphics programming. It includes a rich set of objects such as cubes, polygons, text, materials, camera, lights, trackballs and handle boxes.

Open Inventor also defines a standard 3D file format (ASCII and binary) for scene interchange, 3-D viewers are provided with Open Inventor allowing scenes to be developed as ASCII files and viewed without direct use of programming.

Open Inventor, significant characteristics:

- is built on top of OpenGL
- defines a standard file format for 3D data interchange
- introduces a simple event model for 3D interaction
- provides portable animation objects called Engines
- is window system and platform independent
- is a cross-platform 3D graphics development system
- supports PostScript printing
- encourages programmers to create new customized objects.

Further information can be found via pointers here:

<http://www.nag.co.uk/0h/visual/TGS/inventor>

Books available at present include: The Open Inventor Reference C++ Manual, the Open Inventor Toolmaker and The Open Inventor Mentor

## Standards

The library was originally developed by Silicon Graphics, Inc as the IRIS Inventor library but is

now licensed to a number of implementors and is appearing for a range of platforms including Sun, IBM, HP, Windows and Mac. The wide availability and use of the system, particularly in VRML (see below) will help to ensure stability in the definition of the system.

A proposal from ANSI was considered at the recent ISO graphics meeting of SC24 to create a 3D metafile standard based on the Open Inventor file format. This will be being progressed.

Converters for most 3D file formats to Open Inventor form have either been developed or are under development.

## **VRML**

VRML is the Virtual Reality Modelling Language, the 3D extension to the World Wide Web (WWW) which provides a 3D mark-up capability similar to the HTML (hyper-text mark-up language) style for text.

VRML is gaining rapid acceptance, both because of the amount of preexisting (Open Inventor) geometry and also because of the provision of a free viewer (WebSpace) from SGI and TGS. VRML is actually a subset of the Open Inventor ASCII file format with two extensions for the handling of WWW links.

A VRML object is downloaded over the web as a scene description and rendering takes place locally on the users machine, this greatly reduces the bandwidth requirements and enables the user to easily fly-through the scene on their local machine. Objects within the scene can be hot-links to other VRML, HTML (or other) WWW resources and a VRML 'include' capability is provided to allow libraries of objects to be created and used. VRML 1.0 is stable, work on defining the next revision is underway. The draft specification is at

<http://www.eit.com/vrml>

For further information see links from

<http://www.nag.co.uk/visual/IE/iecbb/VRML.html>

Some very interesting research and development using VRML, IRIS Explorer and the web can be seen here

<http://www.ch.ic.ac.uk/VRML/>

## **BEyond**

BEyond. an extension being defined by BEsoft that will allow 'behaviour engines' to be added to Open Inventor geometries. BEyond also adds an extension to HTML/VRML in the form of a single

`<BEHAVIOR>...</BEHAVIOR>` tag pair

Main web reference: <http://www.besoft.com/>

BE stands for 'Behaviour Engine'. The Behaviour Engine support the creation of a kind of active

document which embeds 3D interactive simulations. These documents are authored in an extension of HTML, and use Open Inventor for 3D representation and rendering. The documents, including their 3D simulation content, can be distributed on the World-Wide Web. The initial implementation of the system is based on Open Inventor though the system is not directly Open Inventor based.

## **Systems and Tools**

Open Inventor forms the basis of a number of systems including IRIS Explorer, the scientific visualisation and application building system from NAG. The Geometry datatype within IRIS Explorer is the Open Inventor scene language. This means that the standard ReadGeom and WriteGeom ( read and write geometry ) modules within IRIS Explorer can be used to import and export Open Inventor, the Render module renders Open Inventor and all geometry-based modules are Open Inventor compatible.

Showcase (the presentation system) from SGI includes Open Inventor generation, display and manipulation capabilities. The Ez3d modeller from Radiance Software International assists in the generation of Open Inventor scenes.

Open Inventor is always supplied with viewers that allow geometry files to be read and displayed. The scenes may be manipulated within the display to change viewpoint, lights, rendering and material properties.

## **Availability**

The library was originally developed by Silicon Graphics, Inc as the IRIS inventor library but is now licensed to a number of implementors and is appearing for a range of platforms including Sun, HP, IBM, Windows and Mac

SGI continue to distribute their own implementation of Open Inventor, implementations for other platforms are emerging from Portable Graphics (Sun, HP, IBM RS/6000, Linux, ? ), Template Graphics Systems (Sun, HP, DEC, IBM RS/6000, Windows NT, Windows 3.1, Macintosh, ?) and NetPower Inc ( Window NT ). The TGS products are available in teh UK through NAG Ltd.

A limited Fortran and C interface to Open Inventor is provided within the IRIS Explorer API so that user defined functions to manipulate geometries can be produced.

Robert Iles, June 1995