DESIRE RadVis Features

Intended primarily for visualising results of Geant4-based DESIRE radiation predictions for ESA's Columbus module, part of the International Space Station
- Reads data from the DESIRE system in an open XML format

Presents user with interactive 3D virtual environment -Rapid, easily comprehensible, visual overview of results

Radiation flux and dose data produced by DESIRE
- RadVis makes no predictions about radiation flux or dose, but does calculate total effective dose based on input data

Supports ISO VRML and X3D 3D geometry

3D geometry of Columbus module included
- and background scene depicting earth, sun and stars

After opening a DESIRE "project file" containing data
- User can freely navigate in a virtual environment
- View the ESA Columbus module from any angle…
- …overlaid with 3Dvisualisation of flux or dose levels

Visualise alpha, beta, gamma-radiation, protons, neutrons, ionising particles and flux
- as individual radiation species
- as combined total effective dose rate
- and with relevant properties displayed

Virtual dosimeter
- Attached to camera or freely moveable independent of the view in the virtual environment

Select between three different visualisation strategies to gain a complete overview of a situation
- Edges/isosurphases
- Slice/cutting plane
- Volume/volumetric plot
- includes directional data and a de-cluttering method to improve visibility/usability

Predefined viewpoints (top bottom, left, right, front, back) to facilitate navigation

Configurable colour ranges for colour-coding data
- Linear, logarithmic, or exponential distribution

Select between maximum, estimated or minimum data values to visualize error margins

Save snapshots of the virtual environment
- Can be used to illustrate reports and presentations

User can manage a list of project files that can be easily loaded in sequence

3D geometry models referenced in project files can be located on remote web servers
- Geometry can reside on a password protected server

Online user manual facility

Work on most popular operating systems, including Microsoft XP, Apple Mac OS X, and most varieties of Linux.

Institute for Energy Technology (IFE)

With over 550 employees, the Institute for Energy Technology is Norway's second largest technological research institute. The institute's activities in Halden have a strong foundation in international scientific cooperation for over forty-five years. More than 100 organisations in 20 countries participate in the OECD Halden Reactor Project, which IFE administers under the auspices of the OECD. IFE is a major international R&D centre for information, safety, and environmental technology.

Halden Virtual Reality Centre (HVRC)

The Virtual Reality Centre at IFE was established in 1996 and builds on IFE's vast experience with advanced graphical visualisation technologies and human factors, accumulated since the early 1970s. Approximately half of HVRC's activities are research activities for the Halden Project. The remaining activities comprise of applied R&D, and consulting for individual customers.

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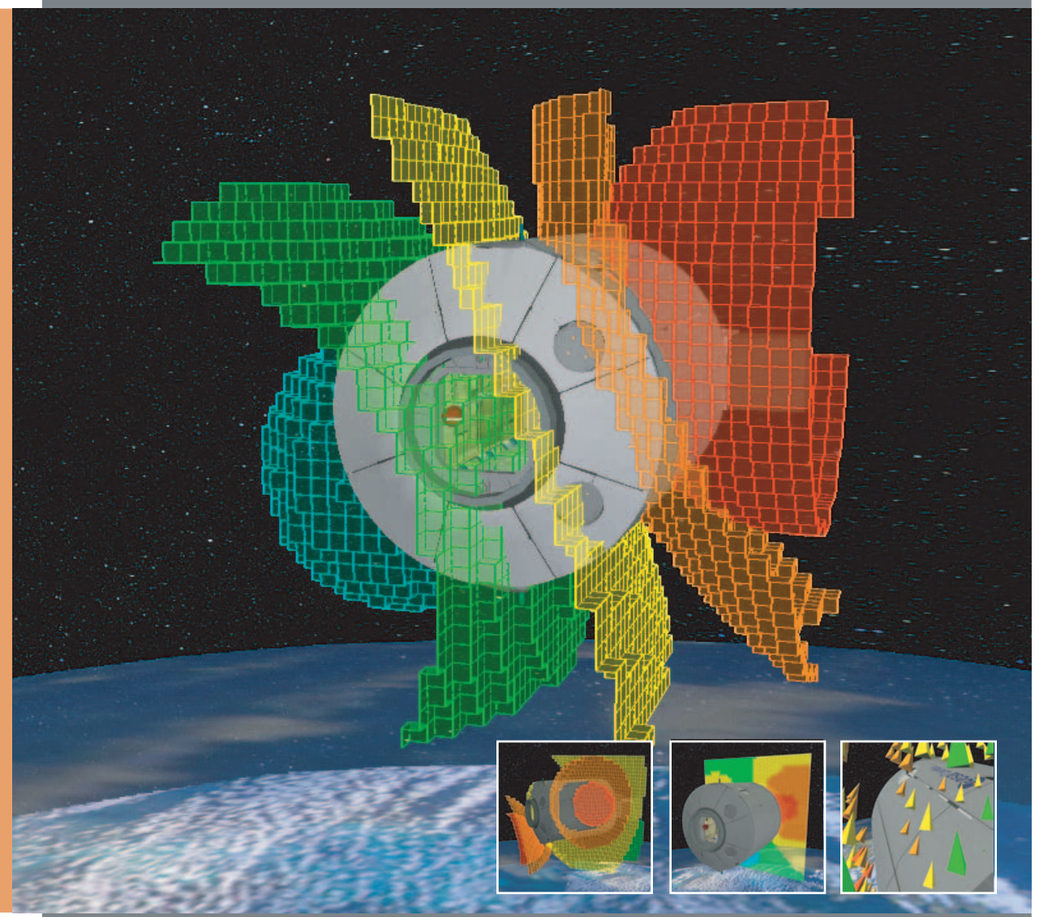
Institute for Energy Technology

HALDEN VR CENTRE

Halden Virtual Reality Centre

Applying advanced visualisation technologies and human factors to real world challenges



Cosmic Radiation Visualisation

DESIRE RadVis

Institute for Energy Technology

HALDEN VR CENTRE

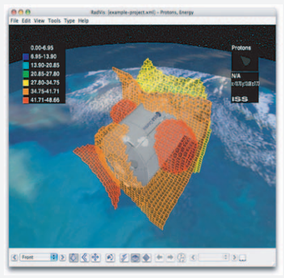
DESIRE RadVis is a software tool that displays predictions of cosmic radiation flux and dose levels for rapid assessment and visualisation

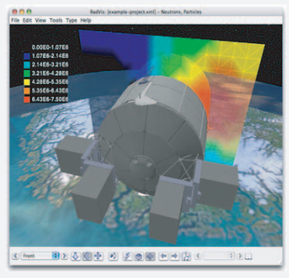
- Predictions are normally created using the Geant4-based DESIRE system, however RadVis can also be used to display measured data
- It is intended primarily for use by space engineers, doctors and scientists
- It can be used to enhance the radiation awareness of astronauts and ground personnel

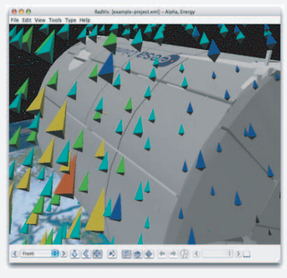
Background

Cosmic radiation permeates space, with sources located primarily outside our solar system. However, the sun is also a source of significant amounts of ionised radiation, reaching extreme levels during solar flares. Astronauts and equipment outside the protection of the earth's atmosphere are therefore at risk of exposure to severe radiation environments.

Of particular interest is being able to provide an overview of a radiation environment rapidly and effectively, which may be a predicted environment or one based on measurements from radiation sensors. The purpose of a visual overview is to enable users to rapidly assess a situation to provide better understanding of it, for design, training, or operations purposes. For example, providing astronauts with greater awareness of the shielding characteristics of a spacecraft under certain conditions can provide knowledge that astronauts can apply to limit their own exposure to radiation by avoiding areas where they know they are likely to receive the highest doses.







DESIRE RadVis Concept

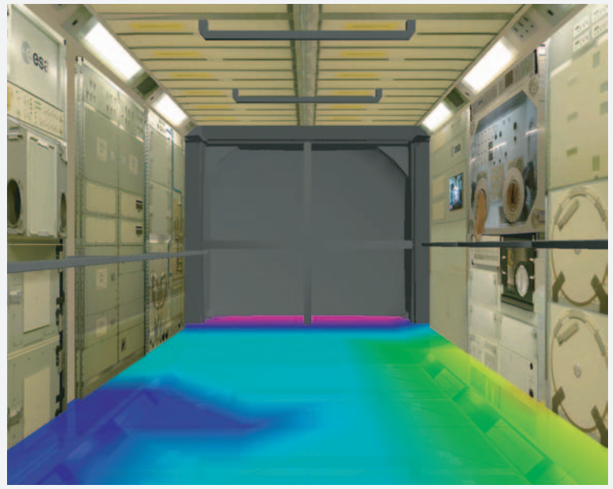
The European Space Agency's DESIRE (Dose Estimation by Simulation of the International space station Radiation Environment) project aims at accurate predictions of radiation fluxes inside the ESA Columbus module of the International Space Station.

DESIRE RadVis can be used to visualise radiation flux and dose data resulting from the DESIRE project. The software presents the user with an interactive three-dimensional virtual environment that combines a visually realistic model of the ESA Columbus module with 3D visualisation of radiation flux and dose levels in and around the module. It also calculates and displays the total combined dose contributions of the input data.

RadVis presents the user with an interactive 3D virtual environment, and provides a rapid, easily comprehensible, visual overview of the results. Its purpose is to support rapid assessment of radiation environments, and to enhance the radiation awareness of ground personnel and astronauts.

RadVis has been designed primarily for desktop PCs, but also supports stereoscopic rendering on more exotic display systems. It has been developed using Java™ and Java 3D technology and therefore runs on most common operating systems.

An open XML-based file format is used for radiation data, while the ISO VRML97 and X3D format are supported for 3D geometry data.



Credits

This project has been carried out by IFE for the Space Environments and Effects Section at ESTEC, as ESA ESTEC Contract 17494/03/NL/LvH/jd. It is funded by the ESA General Studies Programme.