SESP 2010

Session: Session: Physics Modelling and 3D Visualisation (07)
Type: Concurrent Session
Date: Tuesday, September 28, 2010
Time: 11:30 - 13:00
Room: Einstein
Chair:
Co-chair:
Remarks:

Seq	Time	Title	Abs No
1	11:30	OpenIGS 2: A Non-intrusive Middleware Framework for the Integration of Application and Simulation Components Skluzacek, C[1]; van der Plas, P[2] [1]DutchSpace/Cesium Software, NETHERLANDS; [2]ESA/ESTEC, NETHERLANDS	

The OpenIGS Architecture is an initiative by Estec to develop a software framework for quickly and seamlessly integrating various simulation models with visualisation, user interface and networking functionality. OpenIGS2 is a continuation of the development of this project in an effort to make it more sustainable, modernise the interface, and add new features as well as improve performance.

This presentation will provide an overview of the OpenIGS architecture with a discussion of the most important design and functional concepts as well as their application. In particular, the following features will be highlighted:

- active reflection interface
- hierarchical structure management
- non-intrusive integration and decoupling capabilities
- functional components such as: visualisation, user interface, simulation access, and networking
- editor and application development workflow
- software distribution and support infrastructure

With the redesigned infrastructure and interface, Software Engineers can develop or reuse functional software components completely independently (ideally) of the OpenIGS API. Application Engineers can then integrate these functional components using a visual editor with ideally little knowledge of the OpenIGS API.

The OpenIGS kernel software implementation was and is being developed by a consortium of companies led by DutchSpace under the guidance from Estec. The OpenIGS software is the intellectual property of Estec, is implemented in C++, runs on Linux and Windows, and is available to members of the European Space industry under an open source agreement.

| 2 | 12:00 | HMI and Physics Engine Middleware Examples by Antycipsimulation
Waldron, C.
Antycip Simulation SAS, UNITED KINGDOM | |
| 3 | 12:30 | iMoted - 3D Virtual Reality Solution for Assembly, Integration and Test | |

of the Space Segment
Cadete, R.; Coutinho, P.; Duro, N.
EVOLVE Space Solutions, PORTUGAL

Assembly, Integration and Test (AIT) of the Space Segment is a crucial
activity for the System's Verification and Validation in the development
life cycle of Spacecraft Systems. AIT is present both in the System's
definition, with the development of the AIT Plan, and in Verification
phase with the actual development of the planned activities.

The iMoted solution aims to introduce **3D VR environments** and new
interactive control devices into Space and be an asset for:
- Early assessment and validation of AIT Plan;
- Assembly accessibility analysis;
- Path-planning for extraction/assembly of units.

The iMoted is a framework that makes use of a set of different
technologies to provide the necessary functionalities for the
development of **Virtual AIT** activities:

3D Software Engines: the 3D engines allow a fast, attractive and
intuitive graphical representation of geometries. They allow the user to
manoeuvre 3D objects and solve usability problems that are
characteristic of applications with complex user interaction. This is an
open solution that includes:

- Geometrical models
- Cameras, lights and shadows
- Physics
- Animations
- Particles systems
- Reflections
- Special effects

Innovative Interactive Devices: the interaction with the 3D
environments through the use of generic controllers allows the usage of
interactive devices that also address the referred usability issues.
iMoted provides the opportunity to experiment an immersion sense
(the feeling of "being there") with low-costs devices like the Nintendo's
Wii Remote or the Apple's iPhone. The 3D Space Navigator device
allows an easy and realistic manipulation of the 3D objects of the
environment.

The use of open-source is a reality in the iMoted solution that takes
advantage of Eclipse© Rich Client Platform (RCP) and Standard Widget
Toolkit (SWT) to provide an user friendly and configurable Graphical
User Interface (GUI). Making use of Open Source Software (OSS) is
considered an added value for the dissemination and consequent
collaboration of individuals or a set of entities on the development and
maintenance of a software tool. On the other hand, iMoted is compliant
with standard formats for displaying 2D and rendering 3D graphics, by
implementing the specifications of Scalable Vector Graphics (SVG) and
Extensible 3D (X3D), respectively. This last standard format provides a
clear advantage for exchanging 3D models between the different actors
involved in the design and development of a Spacecraft. Nowadays,
different tools that are used in this process to provide visualisation and
user interaction with 3D models, make use of proprietary formats and
have expensive licenses encumbering the Concurrent Engineering
tasks. With iMoted, engineers can cross-compare different versions of
3D CAD Spacecraft models and also validate these in front of 2D design
diagrams (e.g. SysML design diagrams) during the system verification
activities. This functionality also supports the execution of AIT
procedures since the user can concurrently follow the AIT flow through

the visualisation of activity diagrams.

The employment of physics (e.g. objects realistic collisions) and the use of animations in the 3D VR environment together with user interaction functionalities confer to iMoted the capability of allowing the the assembly of 3D Spacecraft elements. For this, three different options can be considered:

● Manually or automatically move the selected element to its target position and orientation (normally specified in the CAD)
● Free manipulation of 3D objects, visual detection of compatible interfaces (e.g. sphere) and automatic couple of the objects;
● Record of extraction activities and playback sequence in rewind (assembly).

The iMoted is a very useful solution that can be of added value for the Space sector and, in detail, for:

● Executing AIT procedures for the Electrical and Mechanical domain including facilities and GSE;
● Visualising real-time simulation data in the Spacecraft 3D Model;
● Testing Spacecraft, GSE and facilities mechanisms and kinematic pairs;
● Verifying real-human accessibility through the use of mannequins.