

A 3D Visualization Tool for Operational Spacecraft Simulators

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ABSTRACT

We propose a solution for visualization of spacecraft simulation data as a virtual 3D environment that has been designed to be capable of receiving data from any simulation infrastructure.

The solution is a software tool which enables visualization of the simulated environment and spacecraft in an interactive 3D space. The tool displays a navigable three dimensional Earth globe with spacecraft and ground stations displayed and positioned according to the simulation parameters. The 3D model of the spacecraft is oriented according to the attitude data in the simulation. The orbital elements of the spacecraft are obtained from the simulation and propagated into the future in order to display a path representing the orbit. The propagated orbit data is used to determine the next ground station passes according to the ground station visibility masks. The time and location of acquisition and loss of signal events are displayed on the globe. Orbit propagation and ground station pass calculations occur at a high rate without user noticeable delays.

As a proof of concept, an adapter plugin has been developed to integrate the tool with the European Space Agency's SIMSAT simulation infrastructure. Integration with another simulation infrastructure can be done through the provided TCP/IP communication interface or by developing a dedicated adapter plugin.

The tool shows promise for users and developers of operational spacecraft simulators. The 3D visualization of orbit and ground station position provides an intuitive overview of the simulation. The orientation of the 3D model of the spacecraft can be used for understanding antenna pointing as well as sun incidence angle on solar panels. Visualizing the spacecraft and ground station positions, as well as where and when the next ground pass is going to take place is easy for the user when it is presented in a navigable 3D environment.

Future work will consist in improving current features and adding new ones according to user feedback.