Gaia Sky VR

Sagristà Sellés, Toni
Universität Heidelberg (Germany)

Monchhöfstr. 12-14 60120 Heidelberg
tsagrista@ari.uni-heidelberg.de

Abstract

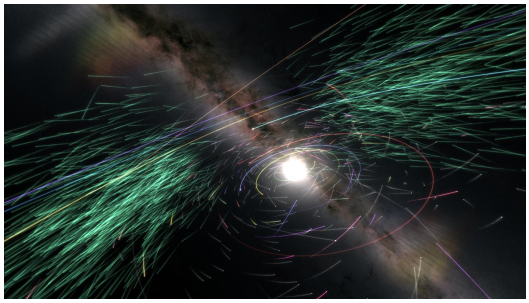
In this talk, I present Gaia Sky, an open-source multiplatform 3D Universe system developed in the context of the Data Processing and Analysis Consortium of ESA's Gaia mission. Gaia's successive data releases represent the largest and more precise star catalogs of our Galaxy available to date, comprising 1.4 billion star positions, with parallaxes, proper motions, magnitudes and colors. This tool offers an off-the-shelf visualization of these catalogs and many others, and enables seamless navigation along the high dynamic range of distances in our Universe.

Gaia Sky employs advanced computer graphics techniques, like sparse virtual texturing, screen-space reflections, real-time shadow maps, ray-marched distance fields, terrain tessellation or dynamic resolution, in order to represent the scene in a visually appealing way while being as scientifically accurate as possible. It integrates tools to explore and manipulate astronomical catalogs in real time, like slicing/filtering and the integration with the SAMP protocol, which enables interoperability with other astronomical software packages.

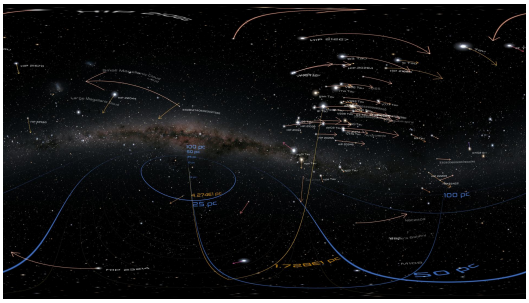
The data repository of Gaia Sky, accessible via the built-in dataset manager, includes not only different cuts of each Gaia catalog (up to the full 1.4 billion star set), but also variable stars, white dwarfs, open clusters, asteroids and other solar system objects, different SDSS data releases, the NEARGALCAT, local nebulae, iso-density mesh maps based on different criteria, and spacecraft like Gaia or JWST.

Last but not least, Gaia Sky also offers a Virtual Reality experience built on the OpenXR API, where the user can explore and interact with the virtual Universe in an immersive fashion. In this mode, the user employs the VR controllers to move about freely in space, with the aid of an in-scene control panel that enables the manipulation of the different visual and functional settings from within the virtual world.

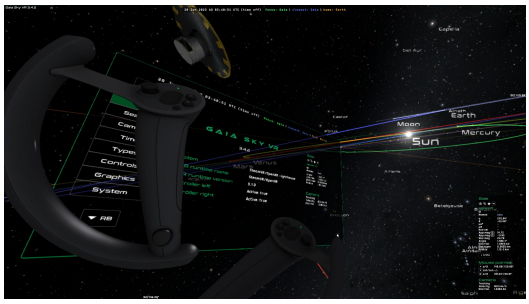
Keywords
Real-time rendering, 3D universe, Gaia, Virtual Relatiy, OpenXR, Planetarium



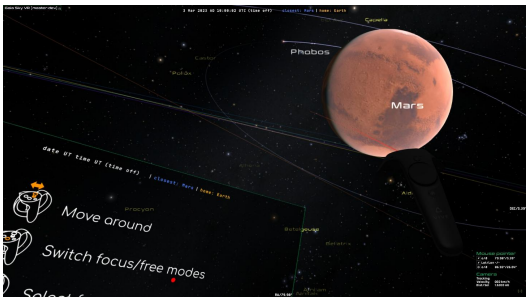
The different asteroid populations in Gaia Sky



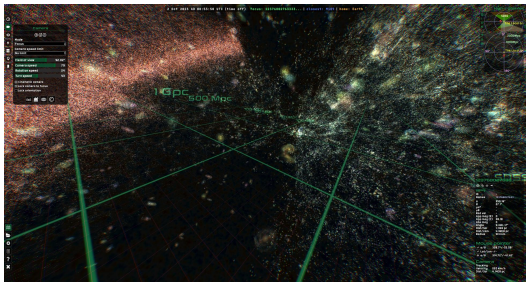
Representation of the proper motions of stars in the Hyades star cluster.



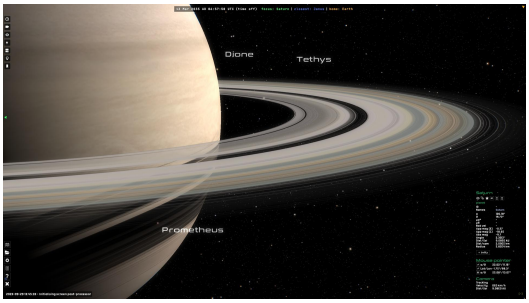
Gaia Sky in VR mode, with the control panel and the Gaia spacecraft in view.



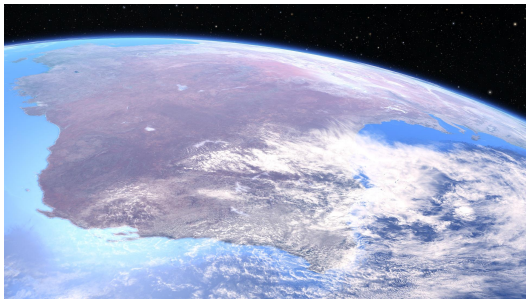
The vicinity of Mars in VR.



The SDSS galaxies.



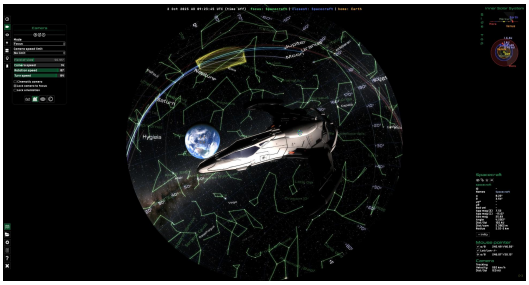
A view of Saturn and its rings.



A view of the Earth from orbit.

The Earth from within the atmosphere, with a sparse virtual texture.

A view of a ray-marched black hole.



Gaia Sky in planetarium mode