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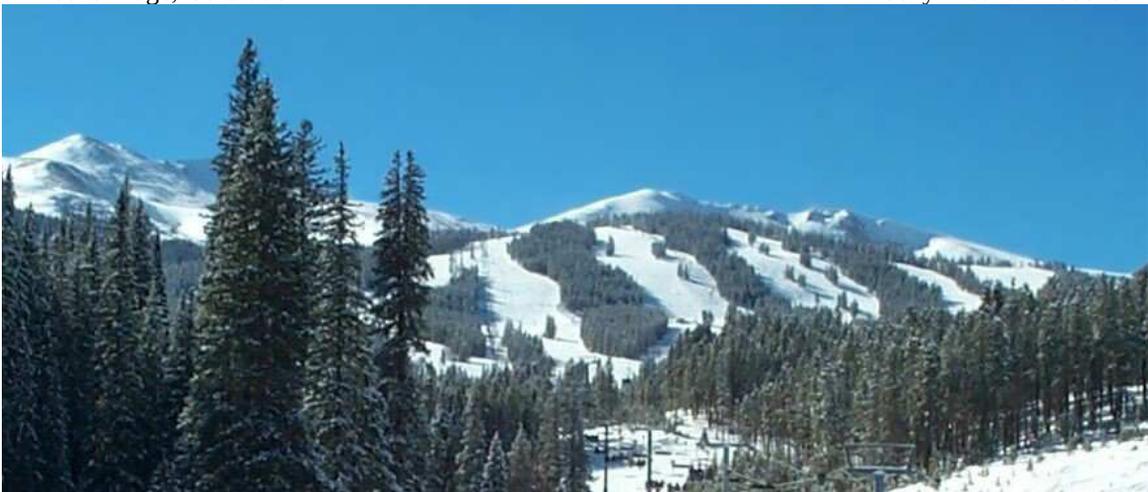
Validation of IAU2000A/IAU2006 Frame Transformations Implementations

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Abstract

Celestial to terrestrial frame transformation is a topic thoroughly covered in basic astrodynamics and used extensively in spacecraft navigation and reference problems. The transformation is typically modeled with equations for precession, nutation, Earth rotation, and polar motion (which is often ignored). For many analysis and trades, simplifications are often sufficient.

For systems requiring precision reference or performance analysis, accuracy of the transforms, and often consistency, is held to a higher standard. The International Astronomical Union (IAU) resolutions and associated International Earth Rotation Service (IERS) conventions provide both an adopted set of standards and code, and the basis for precise very long baseline interferometry (VLBI) measurements used by models in the convention standard transformations.

The IAU2000A and IAU2006 resolution standards for transformations that relate the International Celestial Reference Frame to the International Terrestrial Reference Frame (ITRF) update standards based on the IAU1976/IAU1980 precession-nutation. Fully and properly implemented, these new standards provide the means to obtain the Geocentric Celestial Reference System (GCRS) to a specified consistency. Improvements in both measurement observation techniques and theory, as well as the dependency of precise measurement observations on the newly adopted theory, motivate users to migrate to the newer standards.

For systems migrating from earlier theory to IAU2000A or IAU2006, challenges include 1) sorting through the numerous methodologies presented in literature and achieving proper implementation, and 2) validation of the selected implementation. The current literature has not always been consistent and can cause confusion.

This paper will briefly summarize the progression of the contemporary frame transformations standards, discuss and reference the current state of literature that defines the standards, illustrate the variety of methods available to choose from, discuss potential implementation traps found in the literature, and discuss implementation validation options available to developers.

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