SPICE Newsletter

August 2013 Charles Acton

No New Leap Second on December 31

The IERS has announced a new leap second will **NOT** be added at midnight on 31 December 2013. Thus the current SPICE leap seconds kernels (LSK) available from the NAIF server at the usual location, http://naif.jpl.nasa.gov/pub/naif/generic_kernels/lsk/, will remain effective. Separate versions for Unix/Linux/Mac (naif0010.tls) and for PCs running Windows (naif0010.tls.pc) are available.

New Planetary/Lunar Ephemeris Released (DE430)

JPL's Solar System Dynamics Group has announced a new planetary/lunar ephemeris for general use: DE430. Details are available at:
http://naif.jpl.nasa.gov/pub/naif/generic_kernels/spk/planets/AAREADME_Planet_SPKs.txt

Data Web Page Updates

"Kernel management is the Achilles heel of SPICE!" The venerable SPICE user who made this statement long ago had good reason to voice concern over finding "the right" data to use. Kernel management can still be a challenge, but NAIF has made a variety of efforts to improve the situation. The "Data" web page (http://naif.jpl.nasa.gov/naif/data.html), and those linked from it, have been updated substantially, or newly added, to make getting SPICE kernels more straightforward. Take a peak and let us know what remains confusing or problematic.

WebGeocalc

In partnership with the User Centered Design Group at NASA/Ames, NAIF is building a web-based graphical user interface to a SPICE geometry engine. WebGeocalc (WGC) will provide access to many of the observation geometry computations available from the SPICE system, including both traditional (parameter value as a function of time) and geometry finder (when something occurred or when a parameter has a given value). Some optional plots are also possible. A WGC user can perform SPICE computations without the need to write a program, needing only a standard browser. (But some knowledge of space geometry and of SPICE is still needed.) NAIF plans to release version 1.0 in October 2013.

Digital Shape Kernel

The new Digital Shape Kernel (DSK) subsystem will add two new methods for modeling natural bodies: a tessellated plate model and a digital elevation model. These will compliment the existing, tri-axial shape model. An alpha-test version of the tessellated plate model component was made available to interested users/projects long ago. The digital elevation model component is being developed right now, with JPL's Soil Moisture Active and Passive (SMAP) mission as the first user. DSK completion and formal release within a SPICE Toolkit will be at a future TBD date.

N65 SPICE Toolkit

NAIF had planned to release the next SPICE Toolkit–Version N65–long ago, but many other higher priority items always got in the way. We now think there is hope that N65 can be completed and made available within the next two-to-three months. Originally envisioned as a small increment to SPICE, we now see that N65 will contain a substantial amount of new and improved capabilities, including some performance enhancements! Some new environments

will be added, and some obsolete ones will be dropped. As is the usual case with new Toolkits, this one will be 100% backwards compatible with past versions, so you should have no fear of keeping current. Everyone who can is encouraged to install N65 once it is available.

Geometry Finder Subsystem

The beginnings of the geometry finder subsystem were first offered in the N63 Toolkit released in 2009. Substantial additions became available in the N64 Toolkit released in June 2010 (and still the current release). More capability will be added in the N65 Toolkit, and still more in a subsequent Toolkit. Some of these new capabilities will derive from work NAIF has recently been doing in support of the Rosetta project's Science Ground Segment. The Geometry Finder tutorial (file name "30_geometry_finder"), found here: http://naif.jpl.nasa.gov/naif/tutorials.html) provides lots of information about this subsystem's current capabilities.

JNI SPICE

Long ago NAIF released to those interested an alpha-test version of a Java Native Interface for SPICE. Since then a few additions have been made, but otherwise the product has not advanced towards becoming an official offering. With DSK, the N65 Toolkit and assorted other items still taking precedence, we cannot now predict when the JNI environment will officially join the SPICE Toolkit offerings.

Despite its not yet being an official product, we're confident that what is available does work correctly. We note that JNISPICE is the basis for the WebGeocalc geometry engine.

Python SPICE

Some work was done long ago, but there has been no advancement since then. Unfortunately we have no prognosis as to when a Python SPICE set of Toolkits will be completed and released. (Some SPICE users have made their own versions of a Python interface: you could inquire on the "spice_discussion" Mailman bulletin board if interested in finding one of these: http://naif.jpl.nasa.gov/mailman/listinfo/spice_discussion)

SPICE-Aware Tools List

A number of SPICE users have suggested NAIF (or another?) organize some sort of mechanism to facilitate the sharing of code and/or programs that make significant use of SPICE capabilities. One action taken in this regard is the assemblage and publishing of a new "SPICE-Aware" tools listing. http://naif.jpl.nasa.gov/naif/SPICE_aware_Tools_List.pdf. This is really just a list of examples of SPICE-aware tools for a variety of functional areas and from a variety of sources. It was assembled mostly to help make the case for continued NAIF funding in an upcoming NASA Senior Review (see below). But perhaps the list should grow and be a useful resource to the space science community? If you think this offering should be maintained, let us know. If you'd like to add a particular tool to the list, please send in the relevant information.

Generic SPKs Update

We have done some long overdue cleanup of the generic SPKs directories, including adding new AAREADME documentation. http://naif.jpl.nasa.gov/pub/naif/generic_kernels/spk/

SPICE Tutorials
A substantial update was completed on July 1, 2013.
http://naif.jpl.nasa.gov/naif/tutorials.html

SPICE Training
The last domestic training class was held in April 2013. At that class we tried using a somewhat simplified version of the SPICE tutorials. (Perhaps we should say "reduced" or "edited down" as opposed to "simplified.") If you'd like to make use of these special tutorials, you will find them here in a zip file:
http://naif.jpl.nasa.gov/pub/naif/misc/tmp/WS2013_Final/MSOffice/.
(Sorry, available only in Microsoft Office PowerPoint format.)

We have no current plans for the next domestic class, and are not sure if current NASA travel restrictions would interfere. If there were to be a next class, it would probably be at least a year from now, and would probably be focused (again) on new SPICE users. (We've made no progress on developing an advanced class.) Perhaps a next domestic class could be held on the East Coast if a sponsor could be found there.

There are currently no plans for foreign training classes, given the NASA travel restrictions and also given that, except for Mars Express, there are no currently active "Participating Scientist" or similar funding arrangements that NAIF could use. That said, it's better to ask and get turned down than not to ask at all–let us hear of any suggestions for such a class.

Planetary Flight Projects Status
Ongoing planetary projects using SPICE include MESSENGER, Venus Express, Lunar Reconnaissance Orbiter, Mars Odyssey, Mars Reconnaissance Orbiter, Mars Express, Mars Exploration Rovers, Mars Science Laboratory, Juno, Cassini, New Horizons (Pluto), DAWN, Deep Impact and Rosetta.

Upcoming flight projects set to use SPICE include LADEE, MAVEN, SMAP (earth science) and Osiris REx.

ISRO's Mars Orbiter Mission (MOM) will not use SPICE. (Although apparently one or more Indian Remote Sensing earth satellites do use SPICE.)

JAXA's Akatsuki mission may use SPICE if a second try at Venus orbit insertion is successful.

Presumably NASA's Mars 2020 and Europa Clipper missions will use SPICE.

Other possibilities include: ExoMars 2016, ExoMars 2018, BepiColombo, JUICE and Luna Glob. For these we have heard of some interest in using SPICE, but nothing formal has been put in place.

U.S. Government regulations continue to prohibit NAIF cooperation with China.

We believe a number of solar physics and astrophysics missions also make some use of SPICE. Solar Probe Plus (NASA) and Solar Orbiter (ESA) could be two such future possibilities.

NASA Senior Review
Most major projects and programs within NASA are subject to something called a Senior Review, intended to judge the effectiveness of the project/program, and resulting in a NASA determination about if, and to what extent, to continue funding. NASA's Planetary Data System will undergo a Senior Review in a few months. Both the NAIF Node of the Planetary Data System and development of the core SPICE system will be a part of this review.

Those being reviewed must demonstrate effective use of NASA funds in the past five years, and reveal a plan for meeting NASA–and presumably planetary science community–needs over the next five years. If you have suggestions about what NAIF should do in the coming years to best meet the needs of the worldwide planetary science community (maybe even space science, in general), we'd be happy to hear your suggestions.

We don't believe there is a threat to the continuation of the NAIF Team, but in an era of extremely tight and even decreasing funding, coupled with the current travel restrictions and the absence of agreements for future cooperation with foreign partners, we'll need every good reason imaginable to make the best case for keeping NAIF healthy on the world stage.

Just a Recommendation
As a reminder, the use of SPICE is not a requirement of NASA's Planetary Science Division, NASA's Planetary Data System, the International Planetary Data Alliance, or any other governing body: using SPICE is only a recommendation. NASA planetary flight projects and researchers may choose any means of dealing with, and archiving, "ancillary data."