SPICE Newsletter

January 2020
Updated February 18, 2020
Provided by NASA's Navigation and Ancillary Information Facility

Topics:

Financial Outlook for NAIF

NAIF's financial situation appears to be sound. We believe we have good relations with our various sponsors: NASA's Planetary Data System (our primary sponsor) and about eighteen flight projects. But this condition should and does depend on the opinion of SPICE users: "you." See the next item in this newsletter describing how you can provide NASA management with feedback on NAIF and SPICE.

NASA Questionnaire for PDS Users

NASA will soon announce a questionnaire requesting anonymous feedback from users of the Planetary Data System's nodes. NAIF is one of these nodes. NASA will use the results to help guide future PDS functions and operations. The questionnaire will contain both generic questions and questions pertaining to the individual nodes.

NASA will use a variety of methods to announce availability of the questionnaire. NAIF will use its "spice_announce" system to alert the SPICE user community. Once it is released NAIF encourages you to take a few minutes to respond to this questionnaire, whether evaluating the SPICE system or NAIF Node operations.

~~**NASA Senior Review of the PDS Nodes**~~ **Posponed to 2021**

The six science discipline nodes of the Planetary Data System will participate in a NASA-mandated Senior Review of past performance and future plans and budgets. This is likely to occur in April, 2020. A similar review of the two remaining nodes, the NAIF and the PDS Engineering support nodes, will be scheduled later ~~in 2020~~.

SPICE Usage

NAIF strives to make using SPICE a very attractive approach to dealing with observation geometry. In case it's interesting, a summary listing most missions that used or are using SPICE may be found here: https://naif.jpl.nasa.gov/naif/SPICE_Users.pdf (Please let us know of any corrections needed.)

Those faced with making a decision about an approach to handling observation geometry on a new mission might find it useful to read a set of charts prepared by NAIF about this topic: https://naif.jpl.nasa.gov/naif/Ancillary_Data_Production.pdf

SPICE Development

SPICE 2.0

NAIF's efforts at re-implementing the SPICE Toolkit using the C++11 language (SPICE 2.0) are continuing. This new instance of the SPICE Toolkit will offer opportunities for employing multithreading and object-oriented architecture in user's applications. Greater data capacity, a variety of new data input mechanisms, and higher-precision time computations are also expected. No SPICE 1.0 (current) capabilities will be lost, and all current Toolkits will continue to be supported.

SPICE 1.0

Efforts to produce the next release of the SPICE 1.0 (current) toolkit, version N0067, will ramp up once further progress is made towards a prototype of SPICE 2.0. Current thinking is that we could release version N0067 sometime in the Fall of 2020… we hope.

Digital Shape Kernel, Type 4

Efforts to complete and release the Type 4 Digital Shape Kernel (DSK), the type meant to hold traditional digital elevation model shape data for large, regular bodies such as the Moon and Mars for which good shape datasets exist, remain on hold due to the other development work mentioned above. The Type 2 DSK, based on tessellated plates and particularly useful for small, irregularly shaped objects such as Phobos and comet Churyumov–Gerasimenko, is part of the currently released (version N66) Toolkits. More information about the DSK subsystem may be found in the DSK tutorial.

WebGeocalc On-line Geometry Engine Tool
With the help of one of our contractors, ODC Space, work on the WebGeocalc tool continues. NAIF expects to have some new releases of WGC during the next several months, announced using the "spice_announce" notification system. https://naif.jpl.nasa.gov/naif/webgeocalc.html

Cosmographia 3-D Mission Visualization Tool
With the help of one of our contractors, Fifth Star Labs (the original author of Cosmographia), work on adding new features continues. New versions will be announced using the "spice_announce" notification system. https://naif.jpl.nasa.gov/naif/cosmographia.html

NAIF Webpages
NAIF has worked on adjusting our webpages to accommodate persons with visual impairment (ADA Section 508 compliance). This applies to the primary NAIF website as well as to both instances of the WebGeocalc tool.

NAIF has made a number of other small changes to our website, hoping to improve navigation. We solicit your suggestions about other changes–big or small–that could make this website easier to use or more informative.

Using Google to Find SPICE Documentation - A User Tip
Almost all SPICE-related documentation is available as HTML, and since it exists on NAIF's open server, it has been indexed by all the major search engines. As a result, if you wish to very quickly bring up some documentation, just Google the name. This applies to all Toolkit APIs as well. Try some of these in the Google (or other) search panel…

Spice spk
Spice spkezr
Spice most useful subroutines
Frames required reading

Yes, since "spice" refers to many other things, as does "naif," you may have to sort through a number of hits if you've not been very specific in your search term.

SPICE Data
Three categories of SPICE data are maintained on the NAIF server.

PDS Archives

Production and ingest of SPICE archive increments for NASA's planetary missions is up to date, typically lagging real-time by six-to-nine months. These archives are the best source of SPICE data as long as you don't need the most recent data, or don't need predicted data used in planning activities. Archives for three ESA missions are also found here.

Operational Kernels

This category comprises operational SPICE data produced by JPL-managed planetary missions. New kernels might be added as much as multiple times per day. Also available are some kernels from past missions that have not been organized into an official archive, and kernels from several foreign missions. Operational kernels from missions managed at other NASA centers are not available here.

Generic Kernels

This category comprises so-called generic kernels that are not unique to just one mission, but rather are used in support of many missions. Included here are planetary ephemeris data and the very latest satellite ephemeris data produced by JPL's Solar System Dynamics group. Also available are the locations and topocentric reference frames for DSN and many other ground stations. Ephemerides for a small number of asteroids and comets are also provided, but in general users are advised to generate new ephemerides for these kinds of objects using JPL's Horizons system (look at the bottom of the page).

PDS3 versus PDS4 archives

The Planetary Data System as a whole is has updated its archive architecture from the long-used PDS3 standards to PDS4 standards. NAIF, too, has done this for "new" missions–those initiated after the switch to PDS4. For the majority of missions, those for which the archive standards were PDS3-style when archiving started, NAIF anticipates continued use of PDS3, but will consider conversion to PDS4 at the appropriate time. Most SPICE users will see no practical difference between PDS3 and PDS4 since SPICE kernels are identically the same under both standards.

Broadening the Use of SPICE

SPICE is already broadly used in the worldwide solar system exploration arena, covering most major lunar and planetary missions, but in addition, some heliophysics, earth science and even astrophysics missions. SPICE is being introduced now to the Korean space agency for use on their upcoming lunar mission (KPLO). The Laboratory for Atmospheric and Space Physics (LASP) is deploying SPICE in support of the United Arab Emirates space agency's upcoming Mars mission (Hope).

NAIF is making efforts to acquaint the SmallSat/CubeSat community about SPICE. This is a bit of a challenge in that that community is so diverse. If/where you think it appropriate, we encourage you to help with this effort. (We are aware of a few such spacecraft that are placing the CSPICE Toolkit on-board, something NAIF had never anticipated.)

NAIF is also trying to inform the lunar Gateway program about possible uses of SPICE in support of lunar (orbital and landed) and solar system science investigations. Your suggestions or help in this regard would be appreciated.

SPICE Training

NAIF conducted a "beginner's" SPICE training class this past June, in a hotel near Pasadena, California. This class had only 30 students, whereas most previous classes had nearly 60. Maybe everyone who wishes to learn about SPICE in detail has already done so? We have not yet thought about when or where to hold the next such public class.

The European Space Agency (ESA) is sponsoring a SPICE training class in June 2020. Check the "Training" link on the ESA SPICE website for details: https://www.cosmos.esa.int/web/spice

There has been some discussion about possibly conducting a somewhat shortened version of the class at some universities/institutions. It is now decided that Arizona State University will host a class on May 26/27.

In November, with NASA backing, NAIF conducted a training class at the Korean Aerospace Research Institute, supporting scientists and engineers working on Korea's upcoming Korean Pathfinder Lunar Orbiter mission.

A self-training package is available, consisting of the tutorials and programming lessons used in the "live" classes. https://naif.jpl.nasa.gov/naif/self_training.html

The notion of preparing and presenting an advanced SPICE training class has been floating around for some time, but NAIF has so far not taken any action in this direction.

Leap Seconds Kernel

The International Earth Rotation Service announced there would **NOT** be a new leap second declared at midnight on July 01, 2020. As a consequence, the current SPICE leap seconds kernel, naif0012.tls or naif0012.tls.pc, will remain current until at least January 01, 2021.

SPICE Announcements and SPICE Discussion

If you haven't already done so, consider signing up to the "spice_announce" Mailman system to receive the occasional announcements about new Toolkits, new generic kernels, new or changed services, bugs, etc. https://naif.jpl.nasa.gov/mailman/listinfo/spice_announce.We use this rather sparingly to avoid spamming you.

Rather more frequently, announcements are also placed on NAIF's "Announcements" webpage. The date a new announcement has been placed there is shown at the top of the NAIF home page.

You could sign up to the "spice_discussion" Mailman system to exchange SPICE-related questions, offerings or ideas with other SPICE users. https://naif.jpl.nasa.gov/mailman/listinfo/spice_discussion

Getting Help

Perhaps your problem is already addressed on the NAIF website:
https://naif.jpl.nasa.gov/naif/gettinghelp.html

or in the "Backup" pages of a relevant SPICE tutorial (most particularly SPK and CK), or in the "common_problems" tutorial.

If you have a SPICE question best answered by someone at NAIF, please send email to just one of the NAIF Team members: https://naif.jpl.nasa.gov/naif/contactinfo.html.

European SPICE users might wish to email the ESA SPICE team: esa_spice@sciops.esa.int

Japanese SPICE users might wish to email the JAXA SPICE team: darts-admin@ml.isas.jaxa.jp

Providing Feedback

In addition to or in place of providing feedback via the NASA HQ survey mentioned earlier in this newsletter, SPICE users should feel empowered and encouraged to provide any kind of feedback, including complaints or suggestions for improvement, to any of the responsible officials. Please provide sufficient detail to make your comments as clear as possible. You can request any inputs be treated as anonymous. Names and contact information for managers are listed below.

Charles Acton, NAIF Node Manager	charles.h.acton (at) jpl.nasa.gov
Carole Boyles, official in charge of PDS nodes at JPL	carole.a.boyles (at) jpl.nasa.gov
Timothy Mcclanahan, PDS Project Manager	timothy.p.mcclanahan (at) nasa.gov
Louise Prockter, PDS Chief Scientist	prockter (at) lpi.usra.edu

When providing feedback it might be helpful to be aware of the perceived responsibilities of the NAIF Team, found here: https://naif.jpl.nasa.gov/naif/about.html
and here: https://naif.jpl.nasa.gov/naif/support.html