
Subject: Local solar time

Posted by [David Oesch](#) on Mon, 28 Jun 2004 09:01:06 GMT

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Hi folks...

Has anyone already written a program to convert Julian to "local solar time" ? Just before I re-invent the wheel..

Cheers, Dave

Subject: Re: Local solar time

Posted by [Haje Korth](#) on Mon, 28 Jun 2004 15:07:36 GMT

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Check the ESRG IDL library. Maybe zensun.pro does what you want.

Haje

"David Oesch" <oesch@giub.nospam.unibe.ch> wrote in message
news:40dfde52\$1@news.unibe.ch...

> Hi folks...

>

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> time" ? Just before I re-invent the wheel..

>

> Cheers, Dave

Subject: Re: Local solar time

Posted by [Craig Markwardt](#) on Tue, 29 Jun 2004 03:46:55 GMT

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"Haje Korth" <haje.korth@jhuapl.edu> writes:

> Check the ESRG IDL library. Maybe zensun.pro does what you want.

I don't think this is the right thing, but it's close. Local solar time would be the hour angle (=longitude) of the sun, not the zenith angle.

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> news:40dfde52\$1@news.unibe.ch...

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I didn't find any with a quick search. Just a word of caution if you
are new to time systems. You need to be clear what time system you
are starting in. Julian days is just a way of counting days, not a
time system. I am quite certain that one could express local solar
time in Julian days. Presumably you mean that the starting time is a
civil time like UTC?

Craig

--

Craig B. Markwardt, Ph.D. EMAIL: craigmnet@REMOVEcow.physics.wisc.edu
Astrophysics, IDL, Finance, Derivatives | Remove "net" for better response

Subject: Re: Local solar time
Posted by [David Oesch](#) on Tue, 29 Jun 2004 06:31:22 GMT
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Craig Markwardt wrote:

> "Haje Korth" <haje.korth@jhuapl.edu> writes:
>
>
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>>
>>
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Yes.. I stummbled over zensun in ESRG already..it ain't that what I'm
looking for...

>
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>> "David Oesch" <oesch@giub.nospam.unibe.ch> wrote in message
>> [news:40dfde52\\$1@news.unibe.ch](news:40dfde52$1@news.unibe.ch)...
>>
>>
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> time system. I am quite certain that one could express local solar
> time in Julian days. Presumably you mean that the starting time is a
> civil time like UTC?
>
>

Yes I'm working with UTC...

> Craig
>
>
>

Subject: Re: Local solar time
Posted by [Craig Markwardt](#) on Tue, 29 Jun 2004 09:48:04 GMT
[View Forum Message](#) <> [Reply to Message](#)

David Oesch <oesch@giub.nospam.unibe.ch> writes:

> Craig Markwardt wrote:
>
>> "Haje Korth" <haje.korth@jhuapl.edu> writes:
>>
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With some massaging, I think you can get what you want by using the
IDL Astronomy Library routines SUNPOS to compute the (RA, DEC)
position of the sun, and CT2LST, to compute the local mean sidereal

time, and then use the definition,

local hour angle of the sun = local sidereal time - RA of sun

[in the proper units of course]

Craig

--

Craig B. Markwardt, Ph.D. EMAIL: craigmnet@REMOVEcow.physics.wisc.edu
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Subject: Re: Local solar time
Posted by [James Kuyper](#) on Tue, 29 Jun 2004 11:51:00 GMT
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Craig Markwardt wrote:

```
>> "Haje Korth" <haje.korth@jhuapl.edu> writes:
>>
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This is the kind of Julian day that is used by many of IDL's time-oriented functions such as JULDAT, CALDAT, and TIMEGEN, and SYSTIME(/JULIAN), the "C()" format code, the LABEL_DATE function and the "LABEL_DATE" option for [XYZ]TICKFORMAT, and idlGRaxis.

The other way I've seen the term used, is as a term for any system that simply counts consecutive days from a fixed starting point; the most popular starting point seems to be January 1st of the current year. However, as a pendant I'm pretty sure that this is a mis-use of the term, or at least a confusingly over-generalized extension of it.

Subject: Re: Local solar time
Posted by [Haje Korth](#) on Tue, 29 Jun 2004 12:09:25 GMT
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Craig,
Zensun.pro was a pure guess and there was that "local" keyword that I thought might help. To be honest, I wasn't sure what David was looking for. Maybe we can start with a definition!?

Cheers,
Haje

--

Dr. Haje Korth
Space Physics Group
The Johns Hopkins University
Applied Physics Laboratory
MS MP3-E128
11100 Johns Hopkins Road
Laurel, MD 20723-6099
USA
Phone: 240-228-4033 (Washington), 443-778-4033 (Baltimore)
Fax: 240-228-0386 (Washington), 443-778-0386 (Baltimore)
e-mail: haje.korth@jhuapl.edu

"Craig Markwardt" <craigmnet@REMOVEcow.physics.wisc.edu> wrote in message
news:oneknzrpow.fsf@cow.physics.wisc.edu...

>
> "Haje Korth" <haje.korth@jhuapl.edu> writes:
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> Craig
>
> --
> -----
> Craig B. Markwardt, Ph.D. EMAIL: craigmnet@REMOVEcow.physics.wisc.edu
> Astrophysics, IDL, Finance, Derivatives | Remove "net" for better response
> -----

Subject: Re: Local solar time

Posted by [Haje Korth](#) on Tue, 29 Jun 2004 12:12:02 GMT

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Craig,
never mind my other message, you gave a definition. But does "RA" in "RA of sun" stand for?

Haje

"Craig Markwardt" <craigmnet@REMOVEcow.physics.wisc.edu> wrote in message news:onk6xq1yqz.fsf@cow.physics.wisc.edu...

```
>
> David Oesch <oesch@giub.nospam.unibe.ch> writes:
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>>
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> time, and then use the definition,
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> local hour angle of the sun = local sidereal time - RA of sun
>
> [ in the proper units of course ]
>
> Craig
>
> --
> -----
> Craig B. Markwardt, Ph.D.    EMAIL: craigmnet@REMOVEcow.physics.wisc.edu
> Astrophysics, IDL, Finance, Derivatives | Remove "net" for better response
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```

Subject: Re: Local solar time

Posted by [David Oesch](#) on Tue, 29 Jun 2004 12:12:31 GMT

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I got the Sun Azimuth and Sun zenith already, and use the LMST routine from the Johns Hopkins University/Applied Physics Laboratory to calculate the local mean sidereal time. Is the "local mean sidereal time" the same as "local solar time"?

> local hour angle of the sun = local sidereal time - RA of sun

>
>

> [in the proper units of course]

>

> Craig

>
>
>

Subject: Re: Local solar time

Posted by [Haje Korth](#) on Tue, 29 Jun 2004 15:00:45 GMT

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well, according to Craig's definition it is not; the difference is this RA of sun thingy that I wanted to know what it is.

Cheers,
Haje

"David Oesch" <oesch@giub.nospam.unibe.ch> wrote in message
news:40e15caf\$1@news.unibe.ch...

>

>> With some massaging, I think you can get what you want by using the
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>
>> [in the proper units of course]
>>
>> Craig
>>
>>
>>

Subject: Re: Local solar time

Posted by [Michael Wallace](#) on Tue, 29 Jun 2004 15:28:02 GMT

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> astronomy, to allow them to correlate observations recorded by ancient
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> Greenwich time was a reflection of the fact that for European
> astronomers, noon GMT was a time when they were usually making very few
> astronomical observations, because there's usually only one or two
> objects (the Sun and sometimes the Moon) that you can be observing at
> that time.

Just to throw another two cents on this, there is also Modified Julian

Date. In fact, I'd say that I use MJD more than JD. The conversion between the two is simple: $MJD = JD - 2400000.5$

The differences between MJD and JD should be obvious in the formula. MJD begins at midnight rather than noon which is more in line with our current timekeeping systems. Also, the first two digits of the JD are dropped. For ~300 years after 17 November 1858, the JD is between 2400000 and 2500000.

I should say that for processing of data, JD is used since that's what all of IDL's routines use. For display, MJD tends to be what people like to see.

- > The other way I've seen the term used, is as a term for any system that
- > simply counts consecutive days from a fixed starting point; the most
- > popular starting point seems to be January 1st of the current year.
- > However, as a pendant I'm pretty sure that this is a mis-use of the
- > term, or at least a confusingly over-generalized extension of it.

It is a misuse of the term, but I have seen many cases where the term is misused and abused. A more appropriate phrase would be something like "days past the such-and-such epoch," but I guess "Julian Date" has a better (although incorrect) ring to it. ;-)

-Mike

Subject: Re: Local solar time

Posted by [Craig Markwardt](#) on Tue, 29 Jun 2004 18:54:59 GMT

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David Oesch <oesch@giub.nospam.unibe.ch> writes:

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- >> IDL Astronomy Library routines SUNPOS to compute the (RA, DEC)
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- > from the Johns Hopkins University/Applied Physics Laboratory to
- > calculate the local mean sidereal time. Is the "local mean sidereal time"
- > the same as "local solar time"?

No, that's why I supplied the formula below. The local hour angle of the sun is effectively the local solar time, plus a constant:

>> local hour angle of the sun = local sidereal time[1] - RA of sun[2]

and local apparent solar time = local hour angle + 12 hours

[1] is calculated with CT2LST

[2] is calculated with SUNPOS

Craig

--

Craig B. Markwardt, Ph.D. EMAIL: craigmnet@REMOVEcow.physics.wisc.edu
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Subject: Re: Local solar time

Posted by [Craig Markwardt](#) on Tue, 29 Jun 2004 18:58:02 GMT

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"Haje Korth" <haje.korth@jhuapl.edu> writes:

> Craig,
> never mind my other message, you gave a definition. But does "RA" in "RA of
> sun" stand for?
>

Haje, RA is "Right Ascension," a common astronomical term. RA measures the longitude of a point on the sky in the celestial (equatorial) system. It is commonly measured in units of hours by convention, and since it is useful to astronomical observatories (360 degrees = 24 h).

Craig

--

Craig B. Markwardt, Ph.D. EMAIL: craigmnet@REMOVEcow.physics.wisc.edu
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Subject: Re: Local solar time

Posted by [Craig Markwardt](#) on Tue, 29 Jun 2004 19:13:53 GMT

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James Kuyper <kuyper@saicmodis.com> writes:

>
> I know of at least two different things that are referred to as Julian
> days. The first of these is indeed a time system; it is a single number
> for every single day, starting at Jan. 1, 4713 B.C.E. at 12:00:00, a
> time when three different cycles associated with three ancient calendar
> systems were all synchronized. Nobody was using any of those three

James, as a mini-tutorial on julian day numbers, your post was great.

However, I will take issue on your claim that Julian days is a "time system." In fact, Julian day numbers are simply a means of counting whole and fractional days, referred to some offset, but it is the definition of those days that are important!

For example, we could define a day as

number of solar meridian crossings + (local solar time)/(24 hr) [LAST]

or

number of solar meridian crossings + (Greenwich solar time)/(24 hr) [GAST]

Both have meaning, and both are Julian day numbers, but one is a local solar time, one is a the Greenwich solar time. [and both will have irregular lengths]

But why stop there? "Day" could be mean solar days. UT1 is close to this, with the exception of leap seconds, and the fact that the length of day varies.

"Day" could also be 86400 seconds, as defined by atomic clock standards [TAI], in which case every day is a fixed length. In fact there are systems where the clock is placed at different locations (barycenter time, TDB), or even ticks at slightly different rates (coordinate times TCG, TCB).

So, in addition to saying "Julian days," which provides the unit of time we also need to specify the time system in use, such as UTC, TAI, solar time [local vs. Greenwich], etc.

Why is this important? The original poster did not specify which system he was converting from, so there was some ambiguity at the time of what conversions would need to be done.

Craig

--

Craig B. Markwardt, Ph.D. EMAIL: craigmnet@REMOVEcow.physics.wisc.edu
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Subject: Re: Local solar time

Posted by [James Kuyper](#) on Tue, 29 Jun 2004 20:19:41 GMT

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Craig Markwardt wrote:

> James Kuyper <kuyper@saicmodis.com> writes:

>

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>> Julian days. The first of these is indeed a time system; it is a

>> single number for every single day, starting at Jan. 1, 4713 B.C.E.

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> However, I will take issue on your claim that Julian days is a "time

> system." In fact, Julian day numbers are simply a means of counting

> whole and fractional days, referred to some offset, but it is the

> definition of those days that are important!

According to the US Naval Observatory,

<<http://aa.usno.navy.mil/data/docs/JulianDate.html>>, Julian days are defined in terms of Universal Time, and each one starts at Noon GMT.

Subject: Re: Local solar time

Posted by [Craig Markwardt](#) on Tue, 29 Jun 2004 23:36:08 GMT

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James Kuyper <kuyper@saicmodis.com> writes:

> Craig Markwardt wrote:

...

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> defined in terms of Universal Time, and each one starts at Noon GMT.

Uhh, I'm sorry this is spilling out into the newsgroup. I still disagree. Whether or not the USNO "definition" includes mention of GMT or Universal Time, there are in practice enough different ways to

assign days that one needs to explicitly name the time system being used. My biggest concern for the original poster was whether he meant Julian days expressed in local time or in UTC, which obviously makes all the difference in the world for his application.

Craig

--

Craig B. Markwardt, Ph.D. EMAIL: craigmnet@REMOVEcow.physics.wisc.edu
Astrophysics, IDL, Finance, Derivatives | Remove "net" for better response

Subject: Re: Local solar time
Posted by [kuyper](#) on Wed, 30 Jun 2004 12:59:56 GMT
[View Forum Message](#) <> [Reply to Message](#)

Craig Markwardt <craigmnet@REMOVEcow.physics.wisc.edu> wrote in message
news:<on1xjyrI7b.fsf@cow.physics.wisc.edu>...

> James Kuyper <kuyper@saicmodis.com> writes:

>

>> Craig Markwardt wrote:

> ...

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>>> system." In fact, Julian day numbers are simply a means of counting
>>> whole and fractional days, referred to some offset, but it is the
>>> definition of those days that are important!

>>

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> assign days that one needs to explicitly name the time system being
> used. My biggest concern for the original poster was whether he meant
> Julian days expressed in local time or in UTC, which obviously makes
> all the difference in the world for his application.

I don't believe that this definition of "Julian Day" is specific to the USNO. I believe that they're merely reporting on an international standard definition. As such, anyone who's using the term correctly is inherently implying use of UTC, not local time.

Subject: Re: Local solar time

Posted by [David Fanning](#) on Wed, 30 Jun 2004 13:29:55 GMT

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James Kuyper writes:

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- > the USNO. I believe that they're merely reporting on an international
- > standard definition. As such, anyone who's using the term correctly is
- > inherently implying use of UTC, not local time.

Boys! How about this as a Solomonic definition we can all live with?

Julian Day has a specific meaning spelled out on the USNO web page. But since no one reads it or remembers what it is, and uses it ten ways to Sunday differently, you assume that definition in your programming at your own peril.

Does that help? :-)

Cheers,

David

--

David Fanning, Ph.D.

Fanning Software Consulting, Inc.

Coyote's Guide to IDL Programming: <http://www.dfanning.com/>
