Subject: Re: Overplot nice looking globe on 2d satellite images
Posted by James Kuyper on Mon, 29 Jan 2007 17:02:44 GMT
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David Fanning wrote:
> Brian Larsen writes:
>
>> I imagine this is not too hard but I haven't been able to figure it
>> out. What I want to do is in the center of a polar contour plot
>> overplot a nice looking globe that can be turned and tilted to the
>> correct perspective and shaded to show where the sun is.
>
> In my experience, any map projection that overlaps the pole
> and includes the sun is trouble:
>
> http://www.dfanning.com/map_tips/terminator.html
>
> But maybe this is because I don't understand spherical
> geometry worth a damn. :-)

I've just taken a quick look at that code. My initial impression is that you shouldn't have a problem if you check whether a give point is inside or outside the terminator polygon, by performing the check in projection coordinates, rather than latitude/longitude. However, that depends upon the details of the Inside() subroutine, about which I know nothing that isn't implied by it's name.

Another, more direct approach is possible. Convert both the ground location and the sub-solar location into unit vectors in earth-centered rotating coordinates (if you want to take into consideration the fact that the earth isn't perfectly spherical, the equations get more complicated):

<cos(lat)*cos(lon), cos(lat)*sin(lon), sin(lat)>

There are many different definitions of the day/night distinction, depending upon whether you want nightfall to occur when the center of the sun is on the horizon, or when the entire sun is below the horizon. It also depends upon whether you want to use the geometric position of the sun, or the shifted position due to atmospheric refraction. All of these issues can be covered by choosing a suitable value for the terminator_angle, the angle between the sun's position and the terminator; if you're using the center of the sun with no correction for refraction, the terminator_angle should be pi/2 radians, or 90 degrees..

If the dot product of the ground position unit vector and the sub-solar point's unit vector is greater than cos(terminator_angle), then

the ground position is on the day side of the terminator. If it's less, then it's on the night side.