
Subject: Re: Accuracy problem

Posted by [David Fanning](#) on Sat, 11 Mar 2006 05:43:38 GMT

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Juan Arrieta writes:

```
> I am preparing a simple code to transform between cartesian vectors
> and Keplerian elements (semimajor axis, inclination, eccentricity, and
> so forth). This is a simple problem in astrodynamics.
>
> At some point in my code, I need to obtain unit vectors. For instance,
> a line of the code is:
>
> U0 = ACOS( (TRANPOSE(NDVCT) # R) / ( NORM(NDVCT) * NORM(R) ) )
> % Program caused arithmetic error: Floating illegal operand
> print,U0
> NaN
>
> Any comments as for what would the problem be? This seems like a
> roundoff error somewhere in the program, but I am not doing anything
> "fancy" here.
```

Getting errors with computers (alas!) doesn't require much "fancy" programming. I don't know exactly what the problem is here, but clearly you need more precision. I'd start by doing everything in DOUBLE precision. You don't tell us what datatype NDVCT and R are but the NORM function is being done as a FLOAT, since you haven't set the DOUBLE keyword.

I'd step back a couple of steps before you introduced us to the problem and make sure everything is done in double precision values. Then, after you have convinced yourself you've done everything humanly possible, I think you might be justified in confining the arguments to ACOS to the proper range:

```
arg = ACOS(0.0 > expr < 1.0)
```

Cheers,

David

P.S. I will say that I run into a LOT of floating underflow errors when I am working with astronomy data. Mostly when values get close to 0. (I see a -0.000000 value in your example.) Maybe these are generated when images are flat-fielded, or processed in other ways. I've even resorted to cleaning

these "close to zero" values up before I work with the images.
It tends to keep the blood pressure down a little.

```
I = Where(image GT -1e-8 AND image LT 1e-8, count)
if count GT 0 THEN image[I] = 0.0
```

I just checked my pulse, and look at that, my blood pressure
is rising just *thinking* of those damn floating underflow messages!

--

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