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Subject: Re: Accuracy problem

Posted by [mmeron](#) on Sat, 11 Mar 2006 06:52:55 GMT

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In article <MPG.1e7c116c2aa1c294989bd5@news.frii.com>, David Fanning <davidf@dfanning.com> writes:

> 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!

> --

Well, they're a nuisance, or rather used to be one. I've a little  
routine in my library (called FPU\_FIX) which is killing them on sight  
so nowadays I hardly ever see them.

Mati Meron | "When you argue with a fool,  
meron@cars.uchicago.edu | chances are he is doing just the same"

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