Subject: Re: WHERE problems (longish)
Posted by Paul Van Delst[1] on Tue, 22 Jul 2003 16:45:54 GMT
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David Fanning wrote:
>
> Benjamin Panter writes:
>
>> The values which have -1 certainly exist - and were generated in exactly
>> the same way as the others. I've put the array online if anyone fancies
>> looking at it - http://www.roe.ac.uk/~bdp/where_problem.idl
>>
>> Am I being stupid again? What is special about 2980,3000 and 3020??
>
> There is nothing special about *those* numbers, but those
> are not the numbers you are using in your WHERE statement.
> You are using 2980.0, 3000.0, and 3020.0. While there isn't
> a big difference between integers and floats to you, there
> is a HUGE difference to a computer. Better read these articles:
>
> http://www.dfanning.com/math_tips/sky_is_falling.html
> http://www.dfanning.com/math_tips/razoredge.html

Hmm. Reading that razor's edge article made me dig out a little f90 program I wrote to determine the real number spacing.

Given some number, A, one can do:

```
exponent=ceil(alog(abs(A))/alog(2.0d))
radix=2.0d  ; (machar(/double)).ibeta ??
epsilon=(machar(/double)).eps
spacing=epsilon * (radix^(exponent-1))
```

So for, say, A = 1.234568d+16
```
EXPONENT       LONG      =         54
SPACING        DOUBLE    =       2.0000000
```

For A = 1.234568d+01
```
EXPONENT       LONG      =          4
SPACING        DOUBLE    =    1.7763568e-15
```

For A = 1.234568d-01
```
EXPONENT       LONG      =         -3
SPACING        DOUBLE    =    1.3877788e-17
```

and for A = 1.234568d-16
```
EXPONENT       LONG      =        -52
SPACING        DOUBLE    =    2.4651903e-32
```

which agree with the outputs of my f90 code using the intrinsic functions EXPONENT and SPACING. The problem is, of course, what to do when A = 0.0. I would just use spacing = epsilon/2.0. I think that, in this case, doing something like

```
two=2.0d
radix=two
IF ( A .eq. 0.0 ) THEN $
  spacing = epsilon/two $
ELSE BEGIN
  exponent=ceil(alog(abs(A))/alog(two))
  spacing=epsilon * (radix^(exponent-1))
ENDELSE
```

where you are counting on the equality check .EQ. *not* to work for numbers that aren't represented as exactly zero (since exact zero can be represented). But I'm not sure. You may also need a check to limit the calculated exponent to the range allowed (the minexp and maxexp fields of the output from machar).

ANYway.... back to work....

paulv

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