
Subject: Re: fix(4.70*100) is... 469
Posted by [James Kuyper](#) on Fri, 20 Apr 2007 16:43:36 GMT
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Paolo Grigis wrote:

> David Fanning wrote:

...

>> I guess I would argue that what is being displayed is EXACTLY

>> what is being stored:

>

> Is it?

> I always wondered if the garbage after the 16th digit does

> correspond indeed to the exact decimal representation of the

> double stored in memory in binary format, or is just a meaningless

> side product of the binary to decimal conversion...

>

> IDL> print,!DPI,format='(f68.64)'

> 3.1415926535897931159979634685441851615905761718750000000000 000000

The fractional part of a floating point number represented in binary format can always be written as an integer numerator divided by a larger power of 2:

numerator

2ⁿ

It can therefore be represented exactly by a decimal fraction as

numerator*5ⁿ

10ⁿ

There are known algorithms for converting a floating point number to a decimal string which will produce precisely that value, if you tell them to use enough digits. I don't know any simple way of testing this, but I would assume that IDL uses such an algorithm.

The extra digits won't make the decimal string a better representation of pi, but they will make it an accurate representation of the computer's best binary approximation to pi.
