Subject: Re: What are the errors in the FFT?
Posted by Vince Hradil on Thu, 08 Feb 2007 17:38:47 GMT
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On Feb 8, 10:53 am, m...@lanl.gov wrote:

> For a given function f(t) I am finding:

>

- > FFT(FFT(f(t),-1),1) -f(t) varies between about 10^-7 to 1-^-8 for
- > floating point
- > and about 10^-14 to 10^-16 for double precision

>

- > (I.e. the inverse transform of the transform deviates from the
- > original function)

>

- > Is this aproblem with the IDL implementation of the FFT, or is this a
- > more fundamental issue with the algorithm itself?

>

> -Monty Wood

Wow, one part in 10-100 million?? Why do you care?

Subject: Re: What are the errors in the FFT?
Posted by Kenneth Bowman on Thu, 08 Feb 2007 18:24:52 GMT
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In article <1170953635.505681.59040@v33g2000cwv.googlegroups.com>, monty@lanl.gov wrote:

> For a given function f(t) I am finding:

>

- > FFT(FFT(f(t),-1),1) -f(t) varies between about 10^-7 to 1-^-8 for
- > floating point
- > and about 10^-14 to 10^-16 for double precision

>

- > (I.e. the inverse transform of the transform deviates from the
- > original function)

>

- > Is this aproblem with the IDL implementation of the FFT, or is this a
- > more fundamental issue with the algorithm itself?

>

> -Monty Wood

That is simply roundoff error. Unavoidable with floating-point calculations, I'm afraid.

Ken Bowman

Subject: Re: What are the errors in the FFT? Posted by Haje Korth on Thu, 08 Feb 2007 18:37:45 GMT

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Monty,

Congratulations, you have just discovered you machine's precisions in doing floating point mathematics. :-)

BTW: I have uploaded an FFTW3 implementation to the ITTVIS codebank. Should be ready for grabs there in a few days. You can double check just for grins.

Cheers, Haje

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<monty@lanl.gov> wrote in message
news:1170953635.505681.59040@v33g2000cwv.googlegroups.com...
> For a given function f(t) I am finding:
>
> FFT(FFT(f(t),-1),1) -f(t) varies between about 10^-7 to 1-^-8 for
> floating point
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> original function)
>
> Is this aproblem with the IDL implementation of the FFT, or is this a
> more fundamental issue with the algorithm itself?
> -Monty Wood
>
```

Subject: Re: What are the errors in the FFT?
Posted by Paul Van Delst[1] on Thu, 08 Feb 2007 18:43:23 GMT
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monty@lanl.gov wrote:

>

- > For a given function f(t) I am finding:
- > FFT(FFT(f(t),-1),1) -f(t) varies between about 10^-7 to 1-^-8 for
- > floating point> and about 10^-14 to 10^-16 for double precision

What are the magnitudes of the original f(t)? If close to one, sounds like "simple" accumulation of precision errors.

- > (I.e. the inverse transform of the transform deviates from the
- > original function)

Depends on your definition of "deviates".

- > Is this aproblem with the IDL implementation of the FFT, or is this a
- > more fundamental issue with the algorithm itself?

Depending on your input function magnitudes, it's more likely a (the? :o) fundamental issue with floating point arithmetic. There are ways of minimising this sort of error accumulation (and I assume FFT algorithms do it already), but you can't remove it entirely.

cheers,

paulv

--

Paul van Delst Ride lots.

CIMSS @ NOAA/NCEP/EMC Eddy Merckx

Subject: Re: What are the errors in the FFT?
Posted by Paul Van Delst[1] on Thu, 08 Feb 2007 18:45:49 GMT
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Haje Korth wrote:

- > Monty,
- > Congratulations, you have just discovered you machine's precisions in doing
- > floating point mathematics. :-)

ha ha. but wouldn't

IDL> help, machar(),machar(/double),/struct

have been much faster? :o) Not as much fun, though.

paulv

--

Paul van Delst Ride lots.

CIMSS @ NOAA/NCEP/EMC Eddy Merckx