

# Re: approximation by series expansion

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- *From:* Robert Israel <[israel@xx](mailto:israel@xx)>
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rembremading <[rembremading@xxxxxxx](mailto:rembremading@xxxxxxx)> writes:

@Robert Israel

Sorry, for my delayed response. Time shift between Germany and Vancouver seems to be considerable.

And sorry for my inexactness. But your interpretation was right.

I wanted to approximate

$1/(a-x) = 1/(a-\cos(\theta))$  in the region  $x=[0..1]$ , where  $a>1$  is a parameter.

And I wanted a reasonable good approximation for arbitrary  $a$  in the entire interval of  $x$ .

The taylor expansion usually fails on one end of the intervall and when you

fix it to both ends it fails in the middle ...

Chebyshev approximation is really quite good. (I remeber, that I did consider it before)

However I will face the problem that I have to evaluate the integral for the coefficient.

I will have to do this in each step of my numerical simulation, since a changes everytime.

But maybe I can use this Clenshaw-Curtis quadrature formulae for the coefficients ([http://en.wikipedia.org/wiki/Clenshaw-Curtis\\_quadrature](http://en.wikipedia.org/wiki/Clenshaw-Curtis_quadrature)).

Then I can even get a simple algebraic expression in terms of parameter  $a$ .

Up to now I don't understand how I can calculate the "Nyquist frequency" for

my problem, that is what  $N$  will be in this formula on wikipedia.

I have a formula for the coefficients (obtained with the help of Maple):

$$c_j = \frac{1}{\pi} \int_{-\pi}^{\pi} \frac{2}{2a-1-\cos(t)} \cos(j t) dt$$

$$= \frac{2}{(-1+a)^{1/2} a^{1/2} ((2*a-1)*((-1+a)*a)^{1/2} + 2*a^2 - 2*a)^j * ((-8*a+1+8*a^2)*((-1+a)*a)^{1/2} + 8*a^3 + 4*a - 12*a^2)^{-j}}$$

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Re: approximation by series expansion

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