

## Re: how to simplify a summation of exponentials symbolically/analytically?

**Source:** <http://sci.tech-archive.net/Archive/sci.math.num-analysis/2004-08/0244.html>

---

**From:** Magnus Sundberg (*nisse\_at\_manpower.sg*)

**Date:** 08/17/04

Date: Tue, 17 Aug 2004 10:12:08 +0200

Hi!

I doubt it is possible to do this analytically unless the a's and b's have some fixed relationship (such as equidistant integers), where you could transform your sum into a summation over powers of some constant.

Also, in matlab, if u and v are not scalars it is difficult/costly to avoid a loop unless you have vast amounts of memory.

Fortunately, with the new just-in-time compile (from matlab version 6.5 and later), a well designed loop over the summation will not be that costly in terms of execution speed – with the added benefit of much more readable code compared to a fully vectorized solution (which some wizard will undoubtedly suggest).

(Of course if u and v are scalars you can just write  $SUM = 1 + \sum(\exp(-j*(a*u+b*v)))$  where a and b are vectors of your coefficients).

HTH,  
Magnus

"networm" <networm8848@yahoo.com> wrote in message  
news:cfsced\$rv4\$1@news.Stanford.EDU...

> *Hi all,*

>

> *I have a summation of exponentials:*

>

>  $SUM = 1 + \exp(-j*(a1*u+b1*v)) + \exp(-j*(a2*u+b2*v)) + \exp(-j*(a3*u+b3*v))$

> + ...

> +  $\exp(-j*(a1000000*u+b1000000*v))$

>

> *where "j" is the imaginary sign. a1, a2, ... a1000000, b1, b2, ...*

*b1000000*

> *are known constants... u, v are frequency variable in 2D case.*

>

> *Do you think it is possible to compute the close-form of the above SUM*

sci.math.num-analysis: Re: how to simplify a summation of exponentials symbolically/analytically?

> *symbolically/analytically?*

>

> *If not, is there any simple/efficient way to compute it ? In Matlab and*

> *Maple...*

>

>