

# The expansion in ultraspherical polynomials: a simple procedure for the fast computation of the ultraspherical coefficients

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(Submitted on 23 Jun 2011 (v1), last revised 6 Jul 2011 (this version, v2))

We present a simple and fast algorithm for the computation of the coefficients of the expansion of a function  $f(\cos u)$  in ultraspherical (Gegenbauer) polynomials. We prove that these coefficients coincide with the Fourier coefficients of an Abel-type transform of the function  $f(\cos u)$ . This allows us to fully exploit the computational efficiency of the Fast Fourier Transform, computing the first  $N$  ultraspherical coefficients in just  $O(N \log_2 N)$  operations.

Comments: 7 pages, 1 figure, references added, typos corrected

Subjects: **Numerical Analysis (math.NA)**; Mathematical Physics (math-ph)

MSC classes: 42C10, 65T50

Cite as: **arXiv:1106.4718 [math.NA]**

(or **arXiv:1106.4718v2 [math.NA]** for this version)

## Submission history

From: Enrico De Micheli [[view email](#)]

[v1] Thu, 23 Jun 2011 13:48:18 GMT (10kb)

[v2] Wed, 6 Jul 2011 10:23:40 GMT (10kb)

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