Qeios

Peer Review

Review of: "Tutorial on Fourier and Hankel Transforms for Ultrafast Optics"

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Open Peer Review

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Title: Tutorial on Fourier Transform for Ultrafast Optics

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This tutorial provides an introductory guide to ultrafast optics, focusing on the Fourier transform beyond the conventional flat-phase description. The following provides some remarks:

It seems that the manuscript is at a higher level than the tutorial, perhaps at the research article level.

Typo: Feel me --> Feel free

Why does the equation numbering start with an S?

Although it might be obvious to some readers, it would not hurt to explain the meaning of asterisk, Re, etc.

The symbol of the Fourier transform sometimes uses fraktur F, while other times uses S.

After S6, start a new sentence appropriately. Alternatively, use a comma and follow with "where".

I think some symbols in S7 are hard to comprehend.

In Section 1, why not use a subsection instead of parts A and B? You did that in Section 2.

Capitalize FFT.

Fill and reformat the empty space on page 16.

What is the meaning of double asterisks?

Where is the text containing the footnote? If readers cannot find it within 5 seconds, it would be better to be absorbed in the text.

The literature study can be enriched with the application of the Fourier transform to find the spectrum of the soliton solutions of the NLS equation, for example, https://doi.org/10.3390/math10234559 and https://doi.org/10.1002/mma.8803.

The abstract can be improved. Here is a suggested version:

This tutorial is designed for individuals who are new to the field of ultrafast optics. It was written in response to the apparent lack of comprehensive introductions to the basic Fourier transform, extending beyond the flat-phase description. Additionally, there is a need for complete derivations of several relations involving the Fourier transform, maintaining its most general formulation. This approach avoids the arbitrary selection of Fourier-transform constants and ensures a complete understanding. It shows the importance of having Fourier-transform constants as parameters.
Most importantly, there has been misuse of the Fourier transform from my observations, which cannot be easily detected by checking the smoothness of the result of a numerical implementation or by seeing if the simulation duplicates the "overall physics." This problem should be easily solved by a simple tutorial (see Sec. 2.2). I hope that this tutorial can help people understand more about the Fourier transform, especially in the context of ultrafast optics. In addition, a tutorial on the Hankel transform, which arises from the two-dimensional spatial Fourier transform of a radially symmetric function, is provided. Its numerical implementation based on the fast Hankel transform with high accuracy is also provided, which is the core element of fast radially symmetric full-field ultrafast propagation.

Declarations

Potential competing interests: No potential competing interests to declare.