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IEEE BDA Tutorial Series: Big Data & Analytics for Power Systems

How the Fast Taylor-Fourier Transform (FTFT) will change the basic concepts of Power Systems?

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9:00 am-11:00 am, Thursday, May 26, 2022, Pacific Time
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Abstract: After showing the strong limitations of the Fourier transform to deal with oscillatory signals, the signal model of the Taylor-Fourier transform is presented. This transform is obtained by the inversion of the Taylor-Fourier basis matrix. Its theoretical solution leads to the O-splines, and their derivatives, which help to reduce the computation complexity, and to obtain the solution for any Taylor order. The factorization of the Taylor-Fourier operator into two operators, leads to its fast implementation when the number N of samples per period is an integer power of 2 ($N = 2^m$). This is very useful when the *states* of the full set of harmonics needs to be estimated. Examples of applications of the DTFT filters to analyze power oscillations with variable frequency; to assess synchrophasor, frequency and ROCOF estimates from real signals; and to obtain the *analytical signals* of the harmonic components. De la O wavelets obtained from the O-splines are also illustrated for future applications. A list of power system basic concepts to review is provided at the end, to promote future research in power systems using the FTFT.

Bio: José Antonio de la O Serna (SM'03) received his Ph.D. degree from Telecom ParisTech, France, in 1982. In 1987 he joined the Ph.D. program in electrical engineering at the Autonomous University of Nuevo León (UANL), where he was a member of the Doctoral Committee. Currently he is research professor at the UANL, Monterrey, Mexico. He was also professor at Monterrey Institute of Technology from 1982 to 1986. From 1988 to 1993, he was with the Electrical Department at the Polytechnic School in Yaounde, Cameroon. Mr. de la O Serna is a member of the Mexican Research System.

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