Fiber-optic Communication via the Nonlinear Fourier Transform
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Abstract

In this work we explore some of the potential fiber-optic data transmission applications of the nonlinear Fourier transform (NFT), a signal analysis technique introduced by mathematicians and physicists in the 1970s. Just as the usual Fourier transform converts linear convolution to multiplication, the NFT transforms the action of the ideal (noiseless, lossless) nonlinear Schrodinger equation (and other integrable evolution equations) to the action of a multiplicative filter in the nonlinear frequency domain. One potential application is a nonlinear analogue of linear frequency-division multiplexing that, unlike many other fiber-optic transmission strategies, deals with both dispersion and nonlinearity unconditionally, without the need for dispersion or nonlinearity compensation methods. (Joint work with Mansoor I. Yousefi and Siddarth Hari.)

Biography

Frank R. Kschischang is the Distinguished Professor of Digital Communication in the Department of Electrical and Computer Engineering at the University of Toronto, where he has been a faculty member since 1991. He received the B.A.Sc. degree (with honors) from the University of British Columbia, Vancouver, BC, Canada, in 1985 and the M.A.Sc. and Ph.D. degrees from the University of Toronto, Toronto, ON, Canada, in 1988 and 1991, respectively, all in electrical engineering. During 1997-98, he was a visiting scientist at MIT, Cambridge, MA; in 2005 he was a visiting professor at the ETH, Zurich, and in 2011 and again in 2012-13 he was a visiting Hans Fischer Senior Fellow at the Institute for Advanced Study at the Technical University of Munich.

His research interests are focused primarily on the area of channel coding techniques, applied to wireline, wireless and optical communication systems and networks. In 1999 he was a recipient of the Ontario Premier's Excellence Research Award and in 2001 (renewed in 2008) he was awarded the Tier I Canada Research Chair in Communication Algorithms at the University of Toronto. In 2010 he was awarded the Killam Research Fellowship by the Canada Council for the Arts. Jointly with Ralf Koetter he received the 2010 Communications Society and Information Theory Society Joint Paper Award. He is a recipient of the 2012 Canadian Award in Telecommunications Research. He is a Fellow of IEEE, of the Engineering Institute of Canada, and of the Royal Society of Canada.

During 1997-2000, he served as an Associate Editor for Coding Theory for the IEEE TRANSACTIONS ON INFORMATION THEORY, and since January 2014, he serves as this journal's Editor-in-Chief. He also served as technical program co-chair for the 2004 IEEE International Symposium on Information Theory (ISIT), Chicago, and as general co-chair for ISIT 2008, Toronto. He served as the 2010 President of the IEEE Information Theory Society.