A method for infinite impulse response (IIR) chromatic dispersion compensation in optical communications systems that employ homodyne detection, by means of digital signal postprocessing.

The advent of fiber optic communications has enabled a great deal of the connectivity we enjoy in our modern age. Fiber’s ability to carry information around the world at the speed of light has placed a great pressure on, and incentive for, research into devices and processes that pack more information through these threads of glass. One such development is known as wavelength division multiplexing (WDM) and is comprised of sending many different wavelengths (colors) of light – each encoded with unique information – down a single optical fiber. Due to their physical nature, photons, unlike electrons, have no packing limit and therefore no physical limit to the number of wavelengths of light one may send down a fiber. There are, however, logistical limits to such a system (e.g. wavelength resolution and chromatic dispersion). The elimination of these limits has become the goal of researchers around the world, and researchers at UCF have developed a means to beat one of them, chromatic dispersion.

Technical Details

Chromatic dispersion is a result of the optical refraction process, and can be seen as a prism effect. If white light (a continuum of colors bundled together) hits a prism, or a fiber, each color refracts at a slightly different angle which creates a timing and pulse spreading problem in optical fiber signals. This physical result leads to a problem for systems that decode incoming signals from optical fibers, and the invention herein offers a solution through the signal processing techniques of infinite impulse response (IIR) filtering.

Benefits

• More efficient than finite impulse response (FIR) alternatives (fewer operations necessary to achieve compensation)
• Less power consumption and smaller footprint on chip do to better efficiency than existing systems

Applications

• Optical signal processing chips
• Telecommunications

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Inventors

Guifang Li, Ph.D. • Gilad Goldfarb

For more information, contact:
John Miner | 407.882.0342 | john.miner@ucf.edu | Tech ID #31078
UCF Office of Technology Transfer | 12201 Research Parkway, Suite 501, Orlando, FL 32826