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Tutorial

Optical Coding Theory

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Abstract

With the advancement of technology, recent progress in optical code-division multiple access (O-CDMA) is tremendous and O-CDMA systems are closer to deployment than ever before. Since 1980's, optical codes having been designed for various O-CDMA schemes, leading to the birth of Optical Coding Theory. This new field includes constructions of optical codes for various O-CDMA applications, improvement in analytical techniques on code performance, development and demonstration of novel coding techniques supported by latest hardware technologies. In the tutorial, we first present the development and important results of Optical Coding Theory. Afterwards, we study the research of quality-of-service (QoS) control and service prioritization in multirate, multimedia O-CDMA systems by means of specially designed optical codes. Finally, we discuss how the theory can be applied to other disciplines, such as preventing four-wave-mixing in WDM systems.

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Wing C. Kwong received his Ph.D. degree in electrical engineering from Princeton University, Princeton, New Jersey, in 1992.

After graduation, he joined the faculty of Hofstra University, Hempstead, New York, where he is presently a professor in the Department of Engineering. His research interests are centered on optical communication systems, optical multiple-access networks, and ultrafast all-optical signal processing techniques. He co-authored the first-of-its-kind technical book on optical CDMA, "Prime codes with applications to CDMA optical and wireless networks" (Artech House, 2002) and contributed one chapter on Optical Coding Theory to another optical CDMA book, "Optical Code Division Multiple Access: Fundamentals and Applications" (Taylor & Francis, 2006). He has published over 120 professional articles, and chaired technical sessions and served technical program committees in international conferences. He has given invited seminars in various countries and tutorials on optical CDMA. He is an editor of the IEEE Transactions on Communications.