

Optics and Communication Theory

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Journal of the Optical Society of America Vol. 43, Issue 4, 232 pp. 229- (1953) · <https://doi.org/10.1364/JOSA.43.000229>



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Abstract

The purpose of this paper is to illustrate the application to optics of some mathematical techniques originally developed for the analysis of electric networks and other communications problems. Two general aspects of communication theory may be so applied.

The first of these is electrical network theory. This may be further subdivided. First there is the standard treatment of the response of networks to individual signals by means of Fourier analysis. The optical analogue of this is the analysis of images, also by Fourier transform techniques. Second, there is the statistical network theory initiated by N. Wiener and developed by Y. W. Lee. One aspect of this theory is the design of optimum linear systems for separating a signal from a noise. This is relevant to the problem of the removal of grain from photographs.

The second aspect of communication theory which is relevant in optics is the general statistical information theory of Shannon and Wiener. This is especially valuable in the analysis of scanning systems treating signals and noise.

The autocorrelation function of a picture is useful in both kinds of analysis, and will be discussed.

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