Review

Principles and Applications of Random Noise Theory by Julius S. Bendat,
pp.*i-xxi*+431, John Wiley & Sons, Inc., New York, 1958.

The author is to be congratulated on a really good book. The theory of random noise is of recent origin. Rice's pioneer work, first published in *Bell System Technical Journal*, 1944 and 1945, has laid a solid foundation to the theory of random noise which, in later years, has proved extremely useful in various branches of system analysis. Dr. Bendat has made exhaustive use of Rice's deductions and has extended further the theoretical considerations. As is well known, statistical considerations are of primary importance in the theory of random noise and in fact such considerations are to be well-understood before one can proceed to the theory and applications of random noise. These considerations have been exhaustively dealt with in each chapter.

The book contains ten chapters and the summaries of all these chapters have been given in the beginning. This is a nice way of presenting the book since a reference-man would like to know quickly in what chapter his subject has been discussed; the table of contents sometimes does not deal with the contents in each chapter in sufficient detail. Chapter 1 deals with Random Processes, Engineering Systems and Correlation Functions. The elementary statistical considerations of random processes are well described in this chapter. Chapter 2 deals with Power Spectra and Relationships. This chapter will be of interest to workers in the field of stationary time series. Chapter 3 describes the Probability Theory and Random Noise Analysis. This is again an important chapter dealing with probability theory as applied to random noise analysis. One would have liked a little more discussion on the Central Limit Theory and the derivation of the various statistical distributions of Pearson from this theorem. Chapter 4 is on Optimum Linear Prediction and Filtering. Chapter 5 deals with Exponential Cosine Autocorrelation Functions. The Analogue Computer Techniques are dealt with exhaustively in Chapter 6. This is a good chapter describing the experimental technique together with relevant statistical considerations in the design of an analogue computer. Chapter 7 is on Statistical Errors present in measurements of auto-correlation function and as the name implies, this chapter will be a valuable reference to the workers in the field of all types of time series. Envelope Detection and Correlation of Random Noise is described in Chapter 8. Formulae are derived in this chapter for predicting quantitative measurements of the cross correlation function of two separately obtained envelopes of random noise mixed with extraneous noise. With the help of these formulae it is possible to state how one might locate any point on the correlation curve and what parameters are needed to achieve a good signal to noise amplitude ratio. Chapter 9 deals with optimum Time-Variable Filters and presents exact integral equation solution and synthesis for a large class of optimum time-variable linear filters characterising many physical problems. Engineering designs in radar, meteorology and automatic control can be developed from equations described in this chapter.

The last chapter is an interesting one on Zero-Crossing Problem and as the author states , "contains some advanced analysis on the zero-crossing problem of random noise, either by itself, or combined with sine waves".

It is perhaps not appreciated by the majority of workers in the engineering field that statistical considerations, formulae and analysis are extremely useful tools in understanding the various characteristics of random noise problems. These theories are also equally helpful in the design of more complicated, but more accurate, instruments in the various field of electronics. The author in this book has maintained a careful balance between complicated mathematical analysis and the application of these analytical solutions to the system designs. This book will be appreciated by students as well as the workers in the field of information theory, statistical communication theory, system analysis, automatic control, meteorology, aeronautics, radar etc. Each chapter ends with useful references and an exhaustive list of bibliography to the various published literature is given at the end of the book. The production of the book is also of a very high standard in keeping with the high standard of its Publishers, John Wiley & Sons.

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