

# **DATA COMPRESSION**

**TECHNIQUES  
AND APPLICATIONS**

**THOMAS J.  
LYNCH**

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THOMAS J. LYNCH, Ph.D.

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## *TECHNIQUES AND APPLICATIONS*



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## Preface

Data compression is no longer a theoretical curiosity—it is now a practical requirement in many data systems. With the advances in electronic technology, it is now possible to implement in hardware many data compression techniques that formerly were executed only on large-scale general-purpose digital computers.

In the last few years there has been a growing interest in applying data compression techniques to actual data and communication systems in the commercial sector (compression of newspaper page masters for transmission), in the military (video compression for remotely piloted vehicles), and in many government agencies, such as NASA (image compression from spacecraft). In each potential application there is a need to learn what compression techniques are available, how they operate, and what the implementation considerations are for each technique.

This book is intended to provide this information and serve as a reference source for practicing communication engineers, computer scientists, information scientists, and data systems managers.

No experience in data compression is necessary in order to use this book since each compression technique is described separately and fully, and the necessary theoretical background is developed so that outside references are not needed.

The book is organized into three parts: Theoretical Background, Techniques, and Applications. Under *Theoretical Background*, the necessary theory is presented that allows the reader to understand the concepts and terminology used in later chapters. In addition, the fundamental data compression techniques of quantization and optimum source coding (e.g., the Huffman code) are described. Under *Techniques*, transform coding, predictive coding, nonredundant sample coding, and binary source coding are covered. Included also under *Techniques* are the practical implementation considerations of time coding, buffer control, error control, and system design. Under *Applications*, the use

of data compression in the real world of speech transmission, telemetry, television, pictures, and data bases is described. The examples of specific applications are meant to be typical and illustrative, but certainly not exhaustive.

Examples and exercises have been included under *Theoretical Background* and *Techniques* for study and self-practice by the reader. Annotated references are given at the end of each chapter that guide the reader to more theoretical developments and examples of practical implementations. These references have been carefully chosen so that they reinforce the presentation in the individual chapter, but as such they do not constitute a complete bibliography on data compression.

The material in this book has been used in a course of the same name given by the author as part of the George Washington University Continuing Engineering Education Program.

*Thomas J. Lynch*

To my family:  
Corinne, Maura and Brian

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