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ABSTRACT

This document provides an introduction for document series TM-4857, A Survey of Digital Signal Processing Techniques for Speech Analysis.

1. INTRODUCTION

The analysis of speech characteristically involves the use of digital signal-processing techniques. Although analog methods are preferred for their speed, digital techniques can be modified more easily and can be quickly added to other software packages. Moreover, the computational efficiency of some digital techniques has increased so substantially over the past several years that these techniques have become more and more attractive to the researcher. In particular, the rediscovery in 1965 of the so-called Fast Fourier Transform (FFT) algorithm made the practical computation of the discrete Fourier Transform (DFT) a reality. Using the FFT algorithm and various properties of the DFT, it was later shown that autocorrelation functions, convolutions, and digital filters could be calculated efficiently. More recent interesting applications of the FFT have been directed to the problems of pitch detection and formant analysis of voiced speech.

In this document series we shall present different FFT algorithms and contrast them with respect to computation time, accuracy, storage requirements, and other restrictions. In addition, various applications of the FFT will be given, along with sample test cases. Complete FORTRAN codes will accompany the discussions. As new algorithms are developed, they will be tested as above, and the results will be published in future volumes in this series.

The objective is non-tutorial insofar as the description of the algorithms is concerned. Rather, this series will provide a clearinghouse for the algorithms so that each can be similarly tested and evaluated and the best can be chosen objectively.