

Audio Signal Compression using DCT and LPC Techniques

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Abstract—Audio compression is designed to reduce the transmission bandwidth requirement of digital audio streams and storage size of audio files. Audio compression has become one of the basic technologies of the multimedia age to achieve transparent coding of audio and speech signals at the lowest possible data rates. This paper presents a comparative analysis of audio signal compression using transformation techniques like discrete cosine transform and linear prediction coding. Performance measures like compression ratio, signal to noise ratio (SNR), peak signal to noise ratio (PSNR) and mean square error (MSE) etc are calculated for analysis.

Key words— Discrete Cosine Transform (DCT), linear prediction coding (LPC), compression ratio (CR), SNR, PSNR, MSE.

I. INTRODUCTION

In digital signal processing data compression involves encoding the information using fewer bits than the original representation. Compression reduces the usage of resources like storage space and transmission capacity. Audio Compression is a process of lessening the dynamic range between the loudest and quietest parts of an audio signal. This is done by boosting the quieter signals and attenuating the louder signals. Audio compression basically consists of two parts. The first part, called encoding, transforms the digital audio data (.WAV file) into a highly compressed form called bit stream. However, the second part, called decoding takes the bit stream and re-expands it to a WAV file[1].

Compression Types

There are mainly two types of compression techniques: Lossless Compression and Lossy Compression techniques. Lossless data compression algorithms allow exact reconstruction of original

data from the compressed data. Lossy compression techniques does not allow perfect reconstruction of data but offers good compression ratio values relative to the lossless compression techniques.

B. General Audio Compression Architecture

The most common characteristic of audio signals is the existence of redundant information between adjacent samples. Compression tries to remove this redundancy and makes the data de-correlated. Typical audio compression system contains three basic modules to accomplish audio compression. First, an appropriate transform is applied. Second, the produced transform coefficients are quantized to reduce the redundant information; here, the quantized data hold errors but should be insignificant[1]. Third, the quantized values are coded using packed codes; this encoding stage changes the format of quantized coefficients values using one of the suitable variable length coding technique.

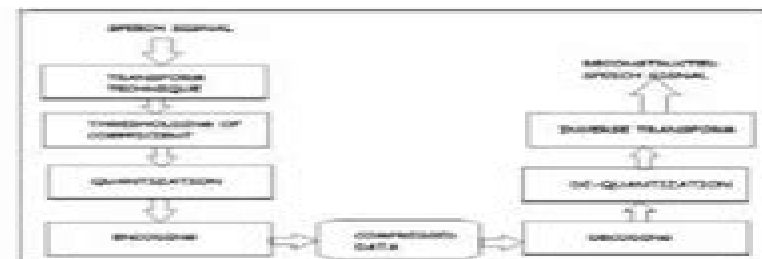


Fig1: General block diagram

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A red circular graphic with a gradient, appearing as a partial circle or a stylized arrow pointing to the right, located to the right of the EduGorilla Prep Experts text.

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volumes that collectively cover basic digital signal processing in a practical and accessible manner but which nonetheless include all essential foundation mathematics As the series title implies the scripts of which there are more than 200 described in the text and supplied in code form available via the internet at <http://www.morganclaypool.com/page/isen> will run on both MATLAB and LabVIEW The text for all volumes contains many examples and many useful computational scripts augmented by demonstration scripts and LabVIEW Virtual Instruments VIs that can be run to illustrate various signal processing concepts graphically on the user's computer screen

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Tomasz P. Zieliński, 2021-01-29 This hands on laboratory driven textbook helps readers understand principles of digital signal processing DSP and basics of software based digital communication particularly software defined networks SDN and software defined radio SDR In the book only the most important concepts are presented Each book chapter is an introduction to computer laboratory and is accompanied by complete laboratory exercises and ready to go Matlab programs with figures and comments available at the book webpage and running also in GNU Octave 5.2 with free software packages showing all or most details of relevant algorithms Students are tasked to understand programs modify them and apply presented concepts to recorded real RF signal or simulated received signals with modelled transmission condition and hardware imperfections Teaching is done by showing examples and their modifications to different real world telecommunication like applications The book consists of three parts introduction to DSP spectral analysis and digital filtering introduction to DSP advanced

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Multimedia Signals and Systems Mrinal Kr. Mandal, 2012-12-06 Multimedia Signals and Systems is primarily a technical introductory level multimedia textbook including problems examples and MATLAB codes It will be a stepping stone for readers who want to research in audio processing image and video processing and data compression This book will also be useful to readers who are carrying out research and development in systems areas such as television engineering and storage media Anyone who seeks to learn the core multimedia signal processing techniques and systems will need Multimedia Signals and Systems There are many chapters that are generic in nature and provide key concepts of multimedia systems to technical as well as non technical persons There are also several chapters that provide a mathematical analytical framework for basic multimedia signal processing The readers are expected to have some prior knowledge about discrete signals and systems such as Fourier transform and digital filters However a brief review of these theories is provided Additional material for this book including several MATLAB codes along with a few test data samples e g audio image and video may be downloaded from <http://extras.springer.com>

Introduction to Audio Analysis Theodoros Giannakopoulos, Aggelos Pikrakis, 2014-02-15 Introduction to Audio Analysis serves as a standalone introduction to audio analysis providing theoretical background to many state of the art techniques It covers the essential theory necessary to develop audio engineering applications but also uses programming techniques notably MATLAB to take a more applied approach to the topic Basic theory and reproducible experiments are combined to demonstrate theoretical concepts from a practical point of view and provide a solid foundation in the field of audio analysis Audio feature extraction audio classification audio segmentation and music information retrieval are all addressed in detail along with material on basic audio processing and frequency domain representations and filtering Throughout the text reproducible MATLAB examples are accompanied by theoretical descriptions illustrating how concepts and equations can be applied to the development of audio analysis systems and components A blend of reproducible MATLAB code and essential theory provides enable the reader to delve into the world of audio signals and develop real world audio applications in various domains Practical

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