PREFACE

The present dissertation entitled, ***"Multiresolution Analysis and Wavelet Algorithms"*** attempts to discuss theoretical aspects of wavelet analysis and to develop algorithms as well as computer programs for wavelets.

This dissertation contains in all five chapters. In chapter-0 we have given the notation, preliminary results and basic definitions which are subsequently used in the dissertation.

Chapter-1 contains definition of Fourier transform in $L^1(R)$ space and its some of its properties.

The formula for Fourier transform is quite inadequate to extract information about the signal *f* in a small neighborhood of some frequency value ω, full information about *f* in time domain must be acquired. In addition, a small change in signal would affect the entire frequency spectrum of the signal. To overcome above drawback, Gabor in 1946, introduced Gabor transform, which is discussed in chapter 2. The Fourier transform on $L^2(R)$ space is also discussed. At the end of the chapter we discuss a brief introduction to Fourier Series.

In Chapter-2 we start with time frequency localization. In this we define windowing Fourier transform with a gaussian function $g(t - b)$ as a "window function". For various reasons other functions may be used as window functions, and this motivates Short Time Fourier Transform (STFT). The Uncertainty Principle governs the size of the window.

In particular it will be observed that the time - frequency window of any STFT is rigid, and hence is not very effective for detecting signals with high frequencies and signals with low frequencies. This motivates the introduction to Integral Wavelet Transform (IWT). This allows room for dilation parameter that narrows or widens the time-frequency window according to high and low frequencies. Inverting the IWT is required for reconstruction of the signal from its decomposed local spectral information. Information on both continuous and discrete time observations will be considered. This leads to the study of frames at the end of this chapter.

Chapter-3 is devoted to the study of cardinal spline functions with emphasis on their basic properties. At the end of this chapter we develop "two-scale relation" for the cardinal splines of order m. Finally we develop an interpolatory graphical display algorithm.

Chapter-4 is mainly concerned with wavelets via scaling function using the theory of Multiresolution analysis. The main focus in this chapter is to describe some examples of scaling functions and their corresponding wavelets without proofs. The two scale reconstruction and decomposition relations are described. Decomposition and Reconstruction algorithms are also developed in this chapter. Examples of wavelets included in this chapter are Haar wavelets, B-Spline wavelets, and Daubechies wavelets on real line. Finally we develop PASCAL program on Haar wavelets.