Conclusion and Future Work

In this dissertation, we have proposed design methodologies to design the linear phase, 1D and 2D, FIR and IIR digital filters. Due to the simplicity of the procedure and excellent magnitude and phase characteristics, filters designed in the present work have a broad range of applications [2]. Most standard methods deal only either on the magnitude or phase characteristics, whereas, we have proposed algorithms which produce digital filters with user defined magnitude characteristics with the linear phase. The methods discussed give us unique design in terms of magnitude characteristics. Method to design zero group delay IIR filters is also discussed.

The proposed 1D and 2D Chebyshev FIR filter design methodology can be used to realize filters having equiripple side bands, and for designing narrow to very narrow band filters with side band level defined by the user. Narrow band filters are very useful if we want to remove a particular frequency (it may be due to noise or in case of image representing a particular color or gray level) from the signal spectrum. The bandwidth of the filter can be controlled by using the modified approach to design the Chebyshev filters. When a satellite image is passed through this type of high pass filter edges (high frequency components of an image) were well retained.

We have proposed 1D and 2D FIR and IIR filter design based on orthogonal polynomials. It can be used for designing digital filters with linear phase and used specific magnitude characteristics. This type of design technique can be used to design multiband, notch, low pass, high pass, band pass and band reject digital filters. Depending on the application requirements we can design required type of filters.

We have passed different types of images through proposed 2D filters and shown the simulated results. Medical images, satellite images, text as images, everyday life images, and other type of images are passed through these digital filters. The filtered images show the quality of our filters. When an ultrasound image is passed through our 2DIIR digital
filter, it is enhanced by fairly good amount. If one realizes application specific digital filter, the results will be promising. Satellite images were passed and a better and enhanced outcome was received. The filter design parameters are less in number, therefore, computational requirements are less.

There are various fields where present approach can be extended. Adaptive filters have various applications [81], one can extend the concept presented in the present thesis to design such filters. Development of video processing filters is another area where present technique can be extended. One can design a wavelet filter bank, designing wavelet using polynomials, which can be used to generate very narrow band to wide band filters. The discussed 2D filters can be used in conjunction with edge detecting algorithm to enhance edges of an image.