ABSTRACT

To transmit information, pictures or images are the most convenient way as images describes about the size, actual positions and real time activities of different objects. In recent years satellite imaging is one of the most well-known technique for commercial and security purpose to transmit information. Humans receive about 70 percent of information through images so it is very essential to get better quality images.

Satellite images which are observed by researchers are very bulky in size. Hence they require extensive amount of storage capacity. This observed data needs to be transmitted on earth which is a very complex process. In remote sensing the challenging task is preserving the data and then transmitting the data. So this bulky data needs to be compressed in a suitable form. Satellite images consists of noise (unwanted signals) that are produced due to the surrounding sounds, sensors, vibrations and clouds as they travel from extensive distances. This can lead to loss of useful information.

Hence de-noising and decompression of these satellite images is the most vital issue faced in recent times. In order to overcome these drawbacks several techniques are used since last decade. But very few techniques are able to give suitable Peak Signal Noise Ratio (PSNR), Compression Ratio (CR) and Mean Square Error (MSE). These techniques are described in the literature survey of this thesis.

Hence to get better decompressed image and eliminate noise a Discrete Wavelet Transform (DWT) Lifting based scheme with Le Gall's 5/3 modified bilateral filter is proposed. This technique is much efficient in terms of PSNR and MSE values than the existing techniques. This proposed model specifically focuses on the compressed and decompressed images and elimination of unwanted signals from the satellite images. This proposed model describes about the 1-D and 2-D DWT techniques using lifting methods and modified bilateral filters.

The Parallelism process can be implemented on the FPGA using these modified bilateral filters. The existing bilateral filter is replaced with the modified bilateral filter. This modified filter can save a lot of computational time and can reduce complexity arises in the computation of bulky satellite data as it uses

summation computation rather than exponential in its methodology. Adopting the summation operation enables in reducing computational time required in practical runtime environments. This methodology can be very essential for the researchers to analyze the satellite data in an efficient way with minimum computational overhead.

The proposed model is evaluated on images obtained from INSAT satellites and UC-Merced satellite database. Compression, de-noising, and decompression operations are performed on the satellite data. Results presented considering the satellite data are described with effective PSNR, CR and MSE value using these techniques. The proposed architecture is superior in terms of power, area and frequency.

The proposed architecture is efficient, offers compression, de-noising and decompression capabilities coupled together making it readily acceptable for real time satellite image processing operations.