CHAPTER-2

LITERATURE SURVEY

C. K. Yeo et.al [38]: This paper defines a technique based on a neural network to wrapping lossless images of multispectral Satellites Pour I'Observation Dela Terre (SPOT) satellite. In order to exploit the spectral and spatial redundancy a property of pattern recognition is used that is nothing but a hidden layer back propagation of the neural network. Initially, the networks are trained on SPOT images samples for each band with a unique network. To forecast the target SPOT images, the resultant nonlinear trained predictors are used. Predicted errors use multi-symbol arithmetic coding to code the entropy. This technique attains 3.2 times compression ratio for rural SPOT images and 2.1 times compression ratio for urban SPOT images respectively which is beyond 10% better than JPEG lossless compression techniques. In compression, the proposed techniques are 5% better than lossless JPEG2000 compression techniques.

V. Soni et.al [39]: In this paper, an upgraded evolutionary algorithms-based method is proposed for de-noising of satellite images. In this method, the global stochastic optimization techniques for instance Cuckoo Search (CS) algorithm, Particle Swarm Optimization (PSO) and Artificial Bee Colony (ABC) technique and their different alternates are exploited for optimum performance for learning the parameters of thresholding, adaptive functions are required. The de-noising method based on ABC and CS algorithms provide better performance in relation of Edge Keeping Index (EKI) or Edge Preservation Index (EPI), Signal-to-Noise Ratio (SNR) and PSNR as compared to PSO based de-noising method. This technique was tested on satellite images. The visual (de-noised image) and quantitative (SNR, PSNR and EPI) results demonstrate advantage of the proposed techniques over state-of-art and conventional image de-noising techniques.

M. W. Mwaniki et.al [40]: In this paper ,availability of hyperspectral and multispectral remote sensing data and improvements of digital signal processing have greatly profited fault pattern, structure geology mapping, mineral investigation, and landslide studies including landslide quantification and site-specific landslide

assessment. Remote sensing techniques are used to map Kenya central region. Geology is the key objective of this research to support rainfall-induced landslide quantification. The study area is disposed to geological hazards landsides and it was essential to examine geological characteristics in a highly rough hilly terrain in terms of river channel, faults, and structural pattern. Methodology includes filtering applications, such as False Color Composition (FCC), Intensity Hue Saturation transformation (IHS), Independent Component Analysis (ICA), thresholding, application of Principal Component Analysis (PCA), and performing classification based on knowledge on imagery and Landsat EMT. Facilitated with choice loaded by PCA factor for FCC and band rationing with best geological information. Band ratios (5/1, 5/4, 3/2, and 7/3) had improved input variables in geological classification based on knowledge and contrast on geological features. This has compared classification based on knowledge by using PCs 5,2, and IC1, where the classification of band ratio better performed for representing matched FCC and geology [PC5,IC1, saturation band of HIS (5,7,3)]. Lineament and fault extraction was accomplished by thresholding and filtering of ratio 5/1 and pan-band8 and overlaid on the geology map. Moreover, the best geology and lineaments visualization was in the FCC [PC5, IC1, saturation band of HIS (5, 7, 3)], where sedimentary rocks (organic and eolian), fluvial deposits, volcanic extrusions, and igneous were well distinguished.

Andreadis et.al [41]: In this paper, a new brainy hardware module is presented for the first time which is suitable for the calculation of an adaptive median filter. Detecting impulse noise existence in neighborhood image and applying median filter operator is the proposed circuit function. The procedure of noise detection could be controlled so that pixel values are measured as impulse noise. In this way, detailed information and edge integrity is preserved and image blurring is avoided. Real images with experimental results show the improved performance. Gray-scale images of 8-bit resolution are processed by the proposed hardware structure which is fully pipelined, while to minimize computational time, parallel processing is used. Moreover, the system can be simply extended to accommodate larger sizes windows. Altera Corporation use the MAX PLUS II Programmable Logic Development System to compile, simulate and design the proposed digital structure. One of the devices of the FLEX10KE device family

EPF10K200SRC240-1 Field Programmable Gate Array (FPGA) device is utilized for the system implementation, in industrial imaging applications. It is also used where fast processing is required. The usual clock frequency is 65 MHz.

Q. Liu et.al [42] In this paper, an economical and efficient solution is provided by a technique called pan-sharpening technique which is used to generate Multi-Spectral (MS) and high resolution by combining spatial information in Panchromatic (PAN) image and spectral information in MS images. In this paper, authors propose adaptive PCA and a new pan-sharpening method which is based on Weighted Red Black (WRB) wavelets, to remove spatial details in PAN image. WRB wavelets are second generation data-dependent wavelets. A better de-correlation of data is shown by WRB based Multi-resolution analysis (MRA) as compared to linear translation-invariant MRA, which makes it appropriate for required applications that manipulates image details. To reduce spectral distortions and artifacts effects, a local processing plan is introduced in pan-sharpened images. The proposed method is compared with existing methods and assessed on datasets developed by Landsat-7 ETM satellites, IKONOS, and Quick Bird. With high-spatial resolution the author's method can provide encouraging merged MS images which are proved by Experimental results.

J. Ji et.al [43]: In this paper, a new method of de-noising is proposed for Synthetic Aperture Radar (SAR) image. The previous information of statistical speckle model can be applied to judge its distribution. Independent Component Analysis |(ICA) can estimate the basis of SAR image, through a linear classifier, these bases can be divided into two dissimilar subspaces (real signal and noise subspaces). At that time the distribution of real images can be estimated by the nonparametric Bootstrap on the real signal subspace and the parameters of statistical speckle model can be estimated by parametric Bootstrap on noise signal subspace. According to bootstrap that estimates different results, corresponding to this a MAP filter for image de-noising will be selected for adaptive filtering by using the noise model's parameters. This new method processes image and achieves better objective evaluation results and visual perception is shown by experiments.

C. Hu et.al [44]: In this paper, authors has proposed Geosynchronous Earth Orbit(GEO) which explains that the movement of the earth by a single satellite at the lower orbit. Moreover, standard algorithms developed for SAR imaging such as Low-Earth-Orbit are insufficient for GEO, where the "stop-and-go" transmit/receive propagation and typical assumptions of quasi-linear path break down because of very long range between the earth and the satellite and long integration time. A curved path model is proposed in this paper to overcome these considerations and limitations of ''go-and-stop'' assumptions. As stated by the proposed model range, an accurate 2-D analytical spectrum is assumed based on a series reversion method under the curved path model, prominent to an improved frequency domain imaging algorithm involving arrange migration correction function and high-order-phase coupling function. The space variance is overcome by an azimuth adaptive compression function for large-scene focusing. Over the predictable range of applicability, improved imaging algorithm performs better for GEO SAR as shown by simulation results.

M. Pesaresi *et al* [45]:In this paper, in support of a Global Human Settlement Layer(GHSL),a general framework is presented for very-high resolution imagery and high processing on the first operational test result of the production workflow. Data ranges of input image resolution varies from 0.5 to 10 meters and collected by heterogeneous set of stages including airborne sensors, Ikonos 2, Quick Bird 2, Geo Eye 1, Worldview (1 and 2), Rapid Eye (2 and 4), CBERS 2B, and SPOT (2 and 5). Various imaging approaches were tested including pan-sharpened, multispectral, and panchromatic images. A fully new automatic image information generalization, mosaic workflow and extraction is presented which is based on feature extraction of morphological image and multiscale textural. New feature image optimization and compression are introduced with new classification and learning techniques using thematic layers of low-resolution as reference to allow processing of VHR/HR data image. A new systematic method is applied and proposed that allow thematic consistency and global spatial checking for validation and quality control. The results quality is discussed by eco-regions, resolution, band and sensors. Critical points, next steps and learned lessons are highlighted

L. Santos et.al [46]:In this paper, Graphics Processing Units (GPU) have a extensive tool for general purpose scientific computing and due to enormous parallel computations performing ability they are used for onboard future satellite image processing contents. This paper defines an algorithm in which GPU is implemented for hyper spectral lossy image compression and architecture is proposed by parallelizing it on the GPU that allows compression task to accelerate. The selected algorithm was agreeable to parallel computation due to its operation based on block, and optimized to enable GPU implementation experiencing a negligible overhead regarding the original single-threaded version. Especially, for both decompressor and compressor, a parallelization strategy is designed and by using NVidia's CUDA parallel architecture it is implemented on GPU. With different spectral and spatial dimensions, experimental results are presented on various hyperspectral images, significant speed-ups showing a single-threaded CPU implementation. The major benefits of GPUs are highlighted by these results for mainly image compression and Image processing, as a future hardware platform the potential of GPUs representing for instruments of very high data rate.

E. Luo et.al [47] :In this paper, an adaptive learning method is proposed by author for image de-noising to learn image priors based on patch. This algorithm is known as Expectation-Maximization (EM) adaptation algorithm. It learns from external generic database and produces a specific priority for a noisy image. Proposed algorithm is thoroughly derived from a Bayesian hyper-prior perspective while Existing methods combine both external and internal statistics in ad hoc method. The two contributions in this paper are, Firstly to improve computational complexity, authors demonstrates the method and full derivation of the EM adaptation algorithm. Second, based on pre-filtering, authors demonstrates that how EM adaptation can be modified in the absence of the hidden clean image. The proposed adaptation algorithm performs better de-noising results that are superior to various state-of-the-art algorithms.

K. Q. Dinh et.al [48]: In this paper, image de-noising can reduce the perturbation generated during image signal acquisition and its subsequent processing. The performance of the state-of-the-art de-noising methods can be enhanced by utilizing non-local properties, a heavy computational load is incurred mainly for color images. First,

this letter offers de-noising the luma channel, and then patch-wise linear prediction is performed for other two channels to transfer the texture information of the de-noised luma channel, for a reduction of the computational load, which is inspired by high correlation over color channel in the texture information. The transferring of texture is modified to variance of the local patches (i.e., local characteristic) for color spreading reduction produced by large prediction error mainly along edges. The outcome of the proposed system proves that the performance improvement is considerable compared to state of art method of image de noising but in terms of complexity it slightly increases.

K. Sarawadekar et.al [49]: In this paper, the Embedded Block Coding With Optimized Truncation (EBCT) is the main algorithm in JPEG 2000 image compression system. Several applications, for example digital cinema, satellite imagery, medical imaging and others, require high speed and high performance EBCOT architecture. The hardware requirement of EBCOT architectures is very high and throughput of existing architecture is low. Authors examined rate of simultaneous context generation to solve this problem. This paper proposed that four or more than four context pair generation rate is around 68.9% in an image. Thus, a new technique is created called compact context coding when all samples are encoded in a strip-column. As a result, hardware requirements are cut down and high throughput is achieved. Byte out stages and operating renormalization simultaneously improves the performance of the matrix quantize coder. On the FPGA platform, the whole design of encoder is tested. Throughput of the proposed architecture is 163.59 M Samples/s equal to encoding 1920p (1920 $\times$ 1080, 4:2:2) at 39 f/s HD TV picture sequence which is shown by implementation results. Moreover, at 315.06 MHz only BPC (bit plane coder) architecture operates which indicates that BPC is faster than available fastest BPC, 2.86 times so far. Additionally, it is possible that digital cinema size (2048 $\times$ 1080) is encoded at 42 f/s. Hence, it satisfies the applications requirements such as satellite imagery, medical imaging, cartography, and others that demand real-time high speed image compression system.

M. Rizkinia et.al [50]: In this paper, authors propose a technique for component decomposition of local spectral which is based on featured line of local distribution. On

multichannel images, noise is reduced by using the linear correlation in local region spectral domain. First, a linear feature is calculated by authors over spectral component of an M-channel image, which call the spectral line, author decompose the image by using line into three components. Two gray-scale images and one M-channel image. The noise is concentrated on the two images, so only two gray-scale images are de-noised by this algorithm, irrespective of number of channels, it is a feature of decomposition. Consequently, correlation can be avoided due to inequality of spectral components of image deterioration. Image quality is improved by this method with less deterioration while maintaining vivid contrast shown by experimental results. Mainly For hyperspectral images, the method is effective. With the other state-of-the-art de-noising methods, the proposed method is complete which is proved by the experimental results.

S. Suri   et.al [51]:In this paper, remote sensing high resolution satellite like Ikonos, Worldview, and TerraSAR-X, has helped the combined application of optical imageries tremendously and SAR .Definitely, decision makers can use an old archived optical with newly post disaster (acquired) SAR image in case of disasters or natural calamities, While, the end user is provided by the latest satellites orthorectified and georeferenced data products, registration differences exist between different data sets. Through automated quick registration method, these differences are taken care in different applications before using the images. In detail, MI (mutual information) has been used for complex optical-SAR registration problem. This metric computation directly contains joint histogram intensity values of images, that capacity have generated from modalities (e.g., optical and SAR) and different sensor geometries. Ikonos and TerraSAR-X are two remote sensing high-resolution sensors carried by satellite generate huge data volume with detail earth observation that lead to MI (mutual information) failure for correct registration parameters detection. In this study, only histogram-based method is analyzed within Ikonos and TerraSAR-X to achieve automatic registration over urban areas which is specially acquired. Techniques like segmentation and compression have been analyzed due to optical characteristics of image acquisition and taking future sensors into a viewpoint for handling incompatible radiometry and enormous data volume. The proposed technique has successfully indicated by findings in large global

shifts estimating acquired over dense urban areas, for high-resolution images by a fine registration parameters refinement.

S. Zheng et.al [52]: In this paper, multiscale mapped Least-squares Support Vector Machine (LS-SVM) an MS Pan- sharpening method is presented. The Support Value Transforms (SVT) is developed for removal of image information and salient features are underlying the images under the LS-SVM framework represented by support values. The low-resolution MS bands are resampled to Pan Image. It is fine scaled and sharpened by introducing detailed features that are removed from high-resolution Pan image. The analysis of SVT is implemented by using a series of multiscale filters that are gathered with radial basis multiscale Gaussian function kernels. Experiments are approved on Pan Data and very high resolution Quick Bird MS. Fusion simulations show the proposed MS Pan-sharpening techniques on spatial degree data performs similar to state-of-the-art, whose original MS bands are available for reference in terms of concerned quantitative quality evaluation indexes, like quality index (Q4), modulation-transfer-function-based tool, relative dimensionless global error in synthesis (ERGAS), and Angle Mapper. The support value transform (SVT) is an operational tool for fusion of remote sensing image.

Y. Dar et.al [53]: A novel post processing method is proposed by author in this paper for reduction of compression-artifact. This task is posed by the method with regularization as an inverse problem that influences on existing de-noising algorithms of state-of-the-art image. Authors trust on newly proposed play-and-plug prior framework. An important feature is linearization of the decompression- compression process in this scheme, so that the design can be optimized. Additionally, authors presents a detailed analysis of this linear approximation for various basic compression procedures. For various compression techniques, the proposed techniques are suitable that trust on transform coding. Especially, authors proves impressive gains for various leading compression methods- HEVC, JPEG2000, and JPEG in image quality.

Sangbum Lee [54]: The subpixel analysis of data and Landsat ETM is tested by this paper to guess the percent cover of resistant surface, woody tree cover and lawn in

typical suburban/urban landscapes. The later probability of several land cover components were projected by combining Gaussian Mixture Model (GMM), Learning Vector Quantization (LVQ) and Self-Organizing Map (SOM) for each pixel as an income of subpixel analysis. The key objective of this paper is the differentiation of urban vegetation- woody tree versus grass cover and the estimation of resistant surface. Generally, the output estimates positively compared with traditional hard classification techniques and IKONOS satellite image and aerial photograph of higher spatial resolution as independent reference. A moderate degree of similarity is presented by the GMM-SOM-LVQ model in the estimates of resistant surface.[Root Mean-Square(RMS) errors of 18% for the IKONOS classified results and 12% for the aerial photo reference plots at 3X 3 pixel scale]. The vegetation components of grass cover and woody tree has a RMS error of 22% and 15% for the IKONOS classified results and 11% and 10% for the reference plots of aerial photo respectively at a 3X 3-pixel scale. The GMM-SOM-LVQ method was sufficient to successfully distinguish between those areas controlled by woody tree cover versus those with grass cover. A more attractive view of urban ecosystem provided in urban vegetation analysis is the ability to separate the woody tree versus grass components.

Wen-Nung Lie et.al [55]: In this paper, through stegnography analysis is focused on modifying, extracting, tracking, and detecting (main goal of research) secret messages in contradiction. The statistical property analysis based feature classification technique is proposed in DCT and spatial domain to determine the presence of hidden messages without the knowledge of the steganographic schemes (blindly) in an image. The neural nonlinear classifier was accepted in class separation. A database composed of stego images (using six different embedding schemes to generate) and 2088 plain was established for evaluation. To prove the diversity and feasibility of the proposed system, wide experiments were conducted based on this database. The proposed system consists of a positive-detection rate, the detection of a particular steganographic scheme is not restricted, detecting capability of stego images with a low embedding rate as 0.01 bpp and considering plain images test incurred JPEG compression, sharpening, and low-pass filtering.

C. Nguyen et.al [56]: In this paper, the compression standard of JPEG 2000 image is designed for extensive range of applications of data compression. The new standard is based on layered coding and wavelet technology so that a rich feature stream of compressed image is provided. For computer-induced soft errors, the JPEG 2000 codec implementations are susceptible. Remote-sensing satellites is fault tolerance required by a situation, where single event upsets are produced by radiation and high energy particles corrupting the operations of data compression which is highly susceptible. Fault tolerance capabilities of detecting-error are developed in this paper for most important subsystems that establish a JPEG 2000 standard. The fault realistic model dictated by the nature of subsystem where some parts correctly modeled while other numerical error effect using bit-level variables have. The dangerous operations of subunits like quantization and DWT compared to numerical errors are protected. To accommodate the numerical operations and data type, parallel error detection methods are applied in each processing unit. Alternatively, the bit stream function and EBCOT units are protected in contradiction of error-soft effects using Cyclic Redundancy Check (CRC) and binary decision variables parity values respectively. A small increment in complexity achieves superb detecting-error capability by these techniques. The design schemes are presented after testing using simulation results and Matlab programs.

Delgorge *et al* [57]: A new operated-tele robotic-chain is presented in this paper for medical diagnosis and ultrasound image acquisition. In the frame of Mobile Tele-Echography, this system has been established using European ultralight robot project. Six degree-of-freedom light-weight serial robot has been designed with a remote motion center for these applications. According to the expert gesture, it moves and holds a real probe and permits an image acquit ion on a distant patient using a standard ultrasound device. The mechanical structure combination is excellent for detected control law and the robot, mostly the singular configuration allows robotized gesture accuracy and following good path. The compression techniques enable a compromise between quality and flow for image transmission. The combined methods enable the specialist medical to receive good quality and stable ultrasound images and to better control the ultrasound probe remote holder system for image processing and robotics to make a judgment from

terrestrial to satellite through any type of communication link. Since April 2003, Clinical tests have been performed. It uses Integrated Services Digital Network (ISDN) and satellite lines with 384 Kb/s theoretical bandwidth. The tele-echography system helps to identify 83% of symptomatic pathologies and 66% of lesions.

C. D'Elia et.al [58]: In the compression of SAR data, there is always an increasing interest due to the massive resources required for transmission and storage. This is particularly true for born space sensors that have limited capacity of the downlink channel. The useful properties are lacked by SAR data on which compression algorithm trust; actually, these are existing in the focused images but for on-board implementation, focusing is too complex now. An algorithm that focuses on low-complexity range proposed by Poggi et al. (2000) to perform on satellite that concentrates their energy in a better way and increases the data correlation. These properties were misused by accepting a vector quantizer of variable-rate with respect to reference techniques with a clear progress of performance. Moreover, authors replace Vector Quantization (VQ) with trellis-coded VQ because for on-board implementation, VQ is too complex. Small vectors are only used to limit complexity, to feat data dependencies, ability of VQ's reduces alternatively, large blocks of data are encoded by allowing trellis coding and used for input space to obtain better portion of it. The overall performance is equivalent to Poggi et al shown by experiments on real SAR data in which on-board implementation is possible but complexity is much lower.

O. Egger et.al [59]: This paper presents an important source of information is digital images in the present world of communication systems. A great amount of memory is required by digital images in raw form. In last decades, the efforts of various researches have been dedicated to the image compression problem. Two different compression types like lossy and lossless must be renowned. If no distortion is introduced, then lossless compression is achieved in coded image. For a high compression ratio, some loss of information is allowed for multimedia applications and video telephony in exchange. The major part of the paper describes the coding building block. Image coding is covered in first part and sequences of motion picture covered in second part. Image coding schemes have been classified into multiresolution approach

and block transform in first part. Predictive methods are suitable for low-compression and lossless applications. Higher compression ratios are achieved by coding scheme based on transform for loss compression but at high-compression ratios suffer from blocking items. In case of lossless and loss compression, Multiresolution approaches are suitable. The typical item is ringing effect that visible in reassembled images at high loss compression ratios. New functionalities of image coding schemes are driven by new applications that are present in multimedia environment. For that purpose, Coding techniques of second generation fragment the image into meaningful pairs. Thus, to work for randomly shaped regions, parts of these methods have been modified. With the intension of adding functionality like specific quantization algorithms, progressive transmission of the information must be defined. The code word assignment achieves last stage in compression scheme. Lastly, state-of-the-art techniques are compared by coding results for lossless and lossy compression. The different items of each technique are discussed and highlighted. The possibility of progressive transmission is also explained.

P. Hou et.al [60]: An upgraded version of JPEG coding is proposed by the authors obtained by onboard microsatellites optical sensors for the compression of remote sensing images. The approach involves increasing cloud features to contain their land-cloud transitions, in this manner subsequent compression and their coding simplify. The system is appropriate and fully automatic for onboard implementation. A large number of bits in coding are used for its progress from the realization that contains transition areas between bright clouds for coding the blocks, if it is existing in dark background and the image. For detecting external boundaries of the clouds, a cloud-segmentation algorithm is consequently used which automatically smoothens the corresponding blocks earlier to coding. By changing the quantization table, more gains are also achieved which is used for coding the cosine discrete transform coefficients. The new method can achieve progress in compression ratio at the same level of renewal quality in comparison to standard JPEG that depend on amount of cloud and context existing in the particular image. The results are proved with the support of various real image that are achieved by satellite in U.K. at University of Surrey.

C.Basile et.al [61]: The main concerns are addressed by the authors in the preparation of high-definition television (HDTV) system. The initial point is the deviation of resolution parameters basic definitions of television systems. The authors talk over baseband decoding and encoding techniques in terms of temporal and spatial filtering of source image having resources of representing the dynamic and static resolution of television system as resources of effective bandwidth reduction. A technique is detailed through satellite for the delivery of high-definition television (HDTV) and a broadcast technique is presented in a terrestrial environment for transmission of HDTV. A high- definition system provides filtering, transmission packing, sampling and subsampling for the North American HDS/NA. Primary alarm is interference issues exploited in HDS/NA when utilizing techniques for minimizing their effects and a taboo channel for terrestrial broadcast are discussed.

V. D. Vaughn et.al [62]: In this paper, MS image compression has been developed for limited band communication problems into a variable solution in future or current remote sensing system. MSI compression technology identifies characteristics multispectral exploitation tasks and compression distortion relation when developed as research. For a larger usage base, sensitivity to distortion (errors) must be addressed so both exploitation techniques and compression items must be continuing in parallel. An introduction is provided in this article to gain experience from the Advanced Land Remote Sensing System(ALRSS) compression development, and compression algorithm design based on space and a vision into MS image challenges. An initial look is provided by the ALRSS studies at compression system in which MS images are evaluated and designing challenges. These study results have presented that compression rates between 1.3 and 2.2 are feasible and visible for applications based on space. MS image systems are designed without varying the importance of final image product to include compression.

J. C.Tilton et.al [63]: In this paper, latest improvement in imaging technology is used to obtain remotely sensed image data of the earth at radiometric resolutions, spectral, and high spatial. Data collected at a particular rate from this satellite can go above the channel capacity of downlink data. Decreasing data rate regularly need painful

trade-offs within the channel capacity in which definite scientific returns are lost for the sake of others. The authors concentrate on the case in which radiometric resolution is lost from every data pixel by releasing a definite number of LOB (lower order bits). The remaining bits are also compressed to bounds the released numbers of lower order bits (LOBs) using lossless compression. This method is called "Truncation followed by Lossless Compression"(TLLC). They prove the sub optimality of this TLLC method by linking it with shortest application of more effective JPEG algorithm based loss compression techniques. This compression shows that loss compression techniques based on JPEG algorithm better reserves radiometric resolution as compare to TLLC.

N. Coppisetti et.al [64]: In this paper, the transmission of HDTV (high-definition television) signals on satellites and digital networks needs implementation of sophisticated compression methods to provide reliable and high-quality service to customers and to bound the bit rate requirements. Without visible degradation a low-complexity codec is wanted for transmission and processing of image signals. A low-complexity sub band intra frame image coding algorithm is established. PCM (pulse code modulation) encoded as a high bands and DPCM (digital pulse code modulation) encoded as low band. To reduce the complete bit rate, an effective entropy coder is designed. At low bit rate as 45 Mb/s or less, HDTV images of high-quality can be obtained with very low-complexity encoder. For filtering, a new class of QMFs (quadrature mirror filters) called GQMFs (generalized quadrature mirror filters) is used when dividing the images into sub bands. SKFs (short kernel filter) need very less computations and easily implemented so performance is calculated by using it.

G. R. Canta et.al [65]: A new VQ based (vector quantization based) method is proposed by this paper for multispectral images encoding with very low bit rates. Spatial generic block shapes do not change pointedly from band to band so author trust on assumption in the case of high spectral-resolution image. In this assumption, a 3-D (three-dimensional) block calm of homologous 2-D (two-dimensional) blocks drawn from various bands as the Kronecker-product of a spectral-gain code vector and a spatial-shape code vector is possible to quantize correctly with important computation saving regarding conventional VQ. When each 3-D block is represented in its minimum-square-

error Kronecker-product by quantizing the gain vector and shape of component then higher complexity reduction is achieved. This encoding approach is over 10 times more efficient as compared to direct gain-shape VQ and over 100 times more efficient as compared to unconstrained VQ for the measurement of block sizes. The proposed techniques are clearly suboptimal regarding VQ, but massive complexity reduction allows it to use larger blocks than better and usually exploits both psychovisual and statistical redundancy of the image. In the case of hyperspectral images, completely satisfactory results are shown by numerical experiments when invariance-shape hypothesis goes to accurate sufficient. Especially, for image quality and complexity level, the compression ratio is greater than that provided by other techniques and up to five times greater than that provided by ordinary VQ designed especially for multispectral image coding.

Z. Arnavut et.al [66]: A shorting permutation based reversible remapping techniques are introduced in this paper. The developed algorithm services predictive linear operators and utilizes remapping techniques for TM images on a couple of band. It is presented that the algorithm produces considerable improvements than earlier reported results in compression ratio.

R.Pajarola et.al [67]: The maintenance of big raster images is still main performance block under spatial operations. Images in group like satellite images in geographic information systems are maintained for storage space reasons in compressed form. Author suggests that execute queries directly on compressed version of images, rather than performing a selective operation on an image by decompressing the compressed version. For successive use of a spatial index structure, a compression technique is allowed to monitor a spatial search which is suggested by author. In case of window enquiry, the exact uncompressed demanded image region and a compressed incomplete image are delivered in the algorithm. Other than the spatial queries support on continuous compressed tenor images, the new compression algorithm is inexpensive compared to other typical lossless compression techniques.

J.A.Saghri et.al [68]: An implementable 3-D (three dimensional) adaptive land transform for multispectral images is presented by the authors which is based on bandwidth compression methods. The spatial correlation and inherent spectral components are defined in this method. For spectral decorrelation, the standard JPEG algorithm follows Karhunen-Loeve transformation based compression methods for coding the spectrally resultant de-correlated Eigen images. The algorithm is suitably parameterized to accommodate restored image loyalties fluctuating from visually lossy at about 30:1 CR to near-lossless at about 5:1 CR. The characteristics of the spectral correlation transformation as the local terrain variation function, the innovation of this method lies in its unique ability. A spatial alternate coding procedure changes the JPEG allowed by the spatial and spectral modularity of the architecture of algorithm. The applied important advantage of this proposed method is based on JPEG compression technology which is highly developed.

J. Wang et.al [69] A new method of spatial and spectral decorrelation are presented by this paper in lossless data compression of images at all sensed. These methods based on the statistical properties of Landsat-TM data provide approaches to efficiently calculate the best band ordering and band combination. The results of remotely sensed data using both the spatial and spectral nature only in major improvement in excess of spatial decorrelation which is shown by experiments on various Landsat-TM images. These methods result are computationally low-cost in higher compression ratio.

S.R.Tate et.al [70]: A lossless image compression model is considered by authors, in which each multispectral image band is examined and how the possible compression is affected by bands ordering and coded by using forecast function including values from earlier coded compression band. For a multispectral image, an effective algorithm is presented by author for calculating the optimal band ordering. The naive algorithm takes time /SpL Omega/ (n!), while for an n-band image, this algorithm has complexity time O (n/sup -/). NP-hard shows a small variation in optimal ordering problem which is inspired by some practical anxieties, so, in all cases it is computationally infeasible except for the most unimportant possibility. Furthermore,

author use the designed algorithm and report on experimental results applied to existent multispectral satellite data. The methods defined in this paper hold great potential shown by the results for application of real-world compression.

R. Hopkins et.al [71]: An introduction of papers submitted in November 1991 meeting of the CCIR (International Radio Consultative Committee) Task Group on HDTV (high-definition television) is given. The purpose of digital high-definition television (HDTV) radio document is to answer the queries posted in the International Radio Consultative Committee (CCIR). Coordination of imaging high resolution values are important issues among modulation techniques, channel coding, source coding, compression algorithms, spectrum strategy, and applications. Block diagram of the proposed systems did not contain by the CCIR provided information so, Block diagram of typical decoder and encoder are provided. The diagrams are mostly expressive of all of them but not exactly expressive of one of the proposed system.

Q.Guo et.al [72]: In this paper, substantial interest has been attracted by nonlocal self-similarity of images in the field of image processing and has directed various modern image de-noising algorithms, like patch-based locally optimal Wiener, PCA with local pixel grouping, Spatially Iterative Adaptive Singular-Value Thresholding, 3-D and block matching. In this paper, a simple computationally de-noising algorithm is proposed by authors using Low-Rank Approximation (LRA) and nonlocal self-similarity. Three basic steps are used in the proposed method. First, the block-matching method uses to classify similar image patches to form the similar patch groups, which results to be low rank in the similar path groups. Next, Singular Value Decomposition (SVD) factorize each similar patch groups and estimates by taking only singular vectors and a few largest singular values. Lastly, all processed patches are combined to generate an initial de-noised image. In the last square sense, the optimal energy compaction can be provided by SVD for low-rank matrices. The optimal energy compaction property of SVD is exploited by the proposed method to lead an LRA of similar patch groups. Other than SVD based methods, the local basis learning is avoided by the LRA for representing image patches in SVD domain, which is computationally expensive. The experimental

result shows that the proposed method defines state-of-the-art de-noising algorithms and successfully reduces noise in terms of both visual quality and quantitative metrics.

N.C.Arrais et.al [73]: This paper presents the demand, availability, continuing growth combined with human impossibility for remote sensing data in individual and manual analysis of these data need to be examined with new techniques and tools for remote sensing databases and semi-automated or automated analysis. To explore large database of remote sensing images, images removal is an alternative method to find out patterns in the image source. The multi-agent systems have correctly implemented features that can take important improvements in satellite images analysis. A multi-agent system of satellite image mining with multiple images is able to perform the classification process at a time. The target of this paper in this context is to present the Agent Geo. To mine the satellite images, the Agent Geo implements functions like use of agents mining, creation and selection of environments, and selection and edition of agents. This system uses features from Geo DMA and Terra View and developed in Java. If the developed agents had more than 90% accuracy, then the classification process results are acceptable when compared to Google Maps images.

D.Chaudhuri et.al [74]: This paper presents an open research topic in automatic building removal in remote sensing and digital photogrammetry. For building extraction, several algorithms have been proposed but none have completely solved the problem. Due to scene complexity and high-object density, this is a better challenge in urban areas. Satisfactory performance is not achieved by standard methods, mainly with high-resolution satellite images. A novel framework is presented by this paper from high-resolution panchromatic images for accurate and reliable building removal. The spectral and spatial properties (domain knowledge) are exploited by proposed framework in the scene about nature of object, their impact and optical interaction on the resulting image. This method contains steps, a) morphological directional enhancement; b) clustering techniques based on multi seed using IGV (internal gray variance); c) detecting shadow; d) false alarm reduction for both shadow and edge building using positional information; and e) segmentation techniques based on adaptive threshold. The algorithm has been calculated by author using different types of images from QuickBird and IKONOS

satellites. The proposed algorithm is both efficient and accurate, which is shown by the results.

D.Cerra et.al [75]: This paper presents the estimated parameters and expected data models may hire image-understanding procedure for earth observation on which they are always dependent. First, the quality of analysis may affect the parameters definition negatively. The parameters could not correctly have tuned and not captured in all aspects, so resulting superfluous may introduce irritation in data. In addition, the variety of data in respect of sensor type, radiometric, spectral, and spatial resolution, and regularity and variety of observed scenes faces difficulty to create robust and valid statistical model to define them. This document proposes effective solution like theory based analysis of algorithmic information to overcome these limitations. Different applications will be presented by author on satellite images, i.e., artifact detection, classification, time series image mining, and clustering, which show the generalization power of these parameter allowed computational complexity analysis based data-driven methods.

S.Ramaswamy et.al [76]:Here the authors proposes a fast indexing technique based on clustering with weight varying matrix to extract nearest-neighbour search that familiarizes with the Mahalanobis distance in content-based recovery from image databases, which is motivated by relevance feedback of user need completely control. A basic property of Mahalanobis distance is developed by author that allows efficient recalculation of such distances is varied as a Mahalanobis weight matrix. This property is exploited on cluster-query distances to recalculate bounds through projection on well-known separating hyper planes, to retrieve clusters from the query in the increasing order of distance and to eliminate noncompetitive clusters effectively from the search. Performance designed to observe considerable gains and relevance feedback compared by author with current variation of indexing of VA-File.

C.Yang et.al [77]: Here authors present PCA technique which is a preferred multivariate statistical method for image compression and image enhancement. Moreover, it is known that the classical PCA is sensitive for missing data and outliers.

For processing these types of data, an effective theory known as fuzzy statistics is used. The significant characteristics of remote-sensing images data is random city and fuzziness. In this paper, a novel method is proposed by introducing fuzzy statistics variables into classical PCA methods for multispectral image processing called Fuzzy-Statistics-based PCA (FS-PCA). The FS-PCA and classical PCA are applied to verify the proposed method for image enhancement to the data and multispectral Landsat ETM. The experimental results demonstrate that the accuracy of surface feature recognition is improved greatly and the differences among characteristics of surface are extended sufficiently.

W.Chen et.al [78]: This paper describes about 2-D numerical remote sensing data using consistent image format can efficiently have compressed and lossless for distribution and archiving. One usual method contains compressed data files for distributing and archiving data using file compression utilities like bzip2 and gzip, which are commonly available on Linux and UNIX operating systems. Bzip2-compressed files and gzip-compressed files must be uncompressed before a scientific application (IDL, MATLAB) can read them. An image format used to store data, alternatively that format supported by a scientific application to read it directly, so data can be stored in saving disk space and compressed form. However, image format is widely supported by scientific applications and widely used by data providers can reduce the requirement for users to maintain or develop or install and download customized software and reduce the requirement for geophysical data providers to maintain and develop this software. This paper shows the utility of consistent image formats for 2-D geophysical data distribution, archiving, and lossless compression on various kinds of remote sensing data by comparing them on old compression utilities file bzip2 and gzip. The study of this format includes JPEG2000, JPEG-LS, lossless JPEG, TIFF, and PNG. The commonly supported format is TIFF and PNG. JPEG-LS and JPEG2000 format can be commonly supported in future. It shows that compression ratio can be comparable or superior than the result comes from compression utilities file when the suitable image format is selected. Especially, JPEG2000, JPEG-LS and PNG show potential for the kinds of data studies.

A.K.RAO et.al[79]: This paper describes about the introduction of high spectral and spatial resolution sensors has increased on-board remote-sensing spacecraft, the data rates on the cross-link or down-link transmission channels sustained by orders of magnitude. These channels are always limited in capacity, so to reduce the volume of data it performs on-board compression which would require down-link. In this paper, refinement and development of low complexity lossy spatial/spectral compression method have been discussed, at low levels of distortion it provides high compression ratios. In the contiguous bands, the developed method is used to calculate the pixels intensity in the band that compressed through a simple linear calculation model. When this calculation method combined with a low-distortion DCT (discrete cosine transform) block coding method produces performance similar to block-adaptive KLT (Karhunen-Loeve Transform) DCT methods without experiencing the complexity consequence of the KLT. Performance of this method suffers under miss registration. In the case of miss registered band, a fractional-pixel interpolation development towards basic method improves the performance.

I.Zachesky et.al [80]: Natural Stochastic Textures (NST) introduced by the combined effect of noise and blur during the image acquisition process, are disposed to corruption by artifacts, and characterized by their fine details. The statistical model based textured images and natural textures restoration need to improve further, because several successful algorithms are present for image enhancement and restoration, the statistical properties of NST are observed by author using three image databases. The Gaussian distribution is appropriate for several NST shown by author, while image separation model can be representing the other natural textures which separates into two layers; one contains the Gaussian textural details statistically, while other contains the structural elements of smooth edges and area. An algorithm based on this statistical property is proposed by means of anisotropic diffusion for the de-noising of natural images that contain NST using Brownian fractional motion model based on patch. It is proved that this algorithm describe natural images recovers both structural attributes and missing textural details successfully.

J.Slater et.al [81]: Satellite TV broadcasting was allowed by digital compression method with broadband cable. Digital TV converts each pixel that creates TV pictures into a coded message rather than transmitting a continuously varying analogue electrical voltage to represent the picture. It is provided that the digital message can be decoded by a receiver, and completely new pictures can be build up by it with perfect results on the screen, dot by dot. The provided channel bandwidth could be varied dynamically for each programmer that transmits over a satellite transponder according to the data rate required by each scene, and variable compression rates in real time may be applied to different scenes. These several features of channel coding and data compression are disused by author.

M.Guarnieri et.al [82]: The concentrating quality of SAR processor significantly depends on the accuracy of geometry estimate system. Sometimes sufficient accuracy is not provided by ancillary data, so auto focusing has been implemented to achieve possible best quality. How a mono dimensional local operator can compensate a defocused image, to show this a "residual" azimuth compression is introduced. Then, the residual transfer function is derived to generate defocusing. The defocusing effects are presented on both SAR interferogram and single SAR image. Moreover, SAR interferograms are more sensitive than single SAR image for defocusing. For defocusing in both SAR interferometric and single SAR image, two algorithms have been established to compensate and estimate it. The appropriate data is selected by the processors from the entire images by exploring kurtosis or coherent interferometric auto focusing for estimating focusing parameters. Then, to retrieve the focusing parameter values, the residual short time-domain operator is exploited and finally gets the focused image. The accuracy and limitation of this algorithm are examined in terms of parameter estimation. Experimental results are obtained from different SAR operations.

B. Pradhan et.al [83]: One of the most critical natural disasters is floods globally. Flood mapping is the first step in flood disaster management programs. An efficient methodology is proposed by this research to map and identify flooded areas by using Terra SAR-X images. First, during a flood event, a Terra SAR-X satellite image was captured to map the flooded areas in Malaysia, Kuala Terengganu. Then, multispectral

Landsat images were used before the flooding to detect water bodies. Since, the flood locations and water bodies appear in black in SAR (synthetic aperture radar) images so both objects categorized as one. The class of water bodies was removed from the Landsat image and then and there subtracted from that removed from the Terra SAR-X image to overcome this drawback. The flooded locations are represented by the remaining water bodies. Taguchi method and object-oriented classification were applied for both images. The Landsat images were classified into three classes, viz., water, vegetation, and urban bodies. Water bodies are removed from the Terra SAR-X image by difference. Then, a confusion matrix is used to calculate the classification results. Iterative Self-Organizing (ISO) data analysis technique classification method results were compared and implemented to inspect the efficiency of proposed method on Terra SAR-X after using the segmentation process in the course of object-oriented-rule-based method. The whole accuracy values of the categorized maps resulting from Terra SAR-X by using the Landsat images and rule-based method were 93.04 and 86.18, respectively. When the two classes of water bodies are subtracted from these images then flooded locations were mapped and recognized. The acquired whole accuracy was significantly low for Terra SAR-X at 57.98 using ISO data. The present research combines the optimization techniques and methods that are used as an innovative flood detection application. The efficiency of the methodology is confirmed by the successful production of accurate and reliable inventory flood map. Thus, the proposed method can support planners and researcher in expending and implementing flood inventory mapping.

B.Banerjee et.al [84]: This paper addresses the problem of unsupervised land-cover classification of remotely sensed multispectral satellite images from the perspective of cluster ensembles and self-learning. The cluster ensembles combine multiple data partitions generated by different clustering algorithms into a single robust solution. A cluster-ensemble-based method is proposed here for the initialization of the unsupervised iterative expectation-maximization (EM) algorithm which eventually produces a better approximation of the cluster parameters considering a certain statistical model is followed to fit the data. The method assumes that the number of land-cover classes is known. A novel method for generating a consistent labeling scheme for each clustering of

the consensus is introduced for cluster ensembles. A maximum likelihood classifier is henceforth trained on the updated parameter set obtained from the EM step and is further used to classify the rest of the image pixels. The self-learning classifier, although trained without any external supervision, reduces the effect of data overlapping from different clusters which otherwise a single clustering algorithm fails to identify. The clustering performance of the proposed method on a medium resolution and a very high spatial resolution image has effectively outperformed the results of the individual clustering of the ensemble.

B.Banerjee et.al [85]: This paper reports the problems of unsupervised land-cover classification of remotely sensed multispectral satellite images from self-learning and viewpoint of cluster bands. Different clustering algorithms generate the multiple data partition into a single robust solution which is combined by the cluster bands. For the initialization of the unverified iterative EM algorithm, a cluster-ensemble-based technique is proposed which ultimately produce a better estimate of the cluster parameters including a certain statistical model is followed to fit the data. The number of land-cover classes are assumed by the method is known. For cluster bands, a novel method is introduced for creating a consistent labeling arrangement for each clustering of the agreement. A maximum possibility classifier obtained from the EM step trained on updated parameter set and again used to categorize rest of the image pixels. The self-learning classifier from different clusters reduces the effect of data overlapping if a single clustering algorithm fails to recognize, while trained without any external management. The clustering performance of the proposed method has successfully performed the results of separate clustering of the ensemble on very high spatial resolution and medium resolution image.

S.Saha et.al [86]: In the intensity space, an image classifying problem is viewed as a task of the pixels clustering into different homogeneous regions. In this paper, a recently developed genetic clustering method for automatically segmenting remote sensing satellite images is used. To represent the overall clustering, each cluster is divided into small hyper spherical sub-clusters, and the centers of these sub-clusters are determined in a chromosome. These local sub-clusters are separately considered for

different clusters to assigning points. To create a variable number of global clusters, these sub-clusters are properly combined for the purpose of objective function evaluation. A recently proposed point-symmetry-distance-based cluster Sym index, validity index is used for the validity measurement of the corresponding segment. Sym index-based method with a newly proposed GAPS clustering, a fuzzy c-mean clustering method compared with the efficiency of proposed method, and subtractive clustering method is established for recognizing different land cover regions from a remote sensing image and two numeric image data sets of a part of Kolkata city.

C.Doukas et.al [87]: In this paper an overview of advance ROI coding method has been provided by authors which are applied for medical images. According to applied image type, these methods are classified; in first class ROI coding schemes are included which is established for 2-D (two-dimensional) medical images while in the second class ROI coding is included in case of volumetric images. In the third class, a sample of ROI encoder is presented for the compression of angiogram video series. In diagnostically critical regions, ROI coding reserves image quality by enabling better image inspection, talking issues about image transmission and handling, and performing advanced image compression in telemedicine systems. The ROI mapping from spatial domain to wavelet domain is simplified for circular and rectangular regions, and on the used wavelet filters, it is dependent. Hence, in networked and distributed electronic healthcare, ROI coding is considerably less important.

Turiel et.al [88]: It is assumed that the detection of precipitation can be supported by thermal satellite infrared images, an interesting option with thermal IR sensors enable a good temporal and spatial tracking of storms and rain due to presence of geostationary satellites. In this paper, the application of multifractal/multiscale method is explored by author for the tracking and assessment of pluviometry in the design of new methods. First, the main streamlines are identified by author by using a singularity analysis of the wavelet projections of the infrared record. A proxy scalar image is driven by author from the streamlines, which represents the result of pure horizontal advection. By comparing proxy and original images, authors confine the places where horizontal advection fails, that places identify with convection places. Authors explains the methodology from

metaset with thermal IR images acquired during heavy tropical rainfall, and compares the results from the Tropical Rainfall with some data measuring mission satellite.

Heung-Yeung Shum et.al [89]: Authors survey the methods for compressing image-based representations and for Image-Based Rendering (IBR) is proposed. IBR method directly reduces novel views from input images rather than old 3-D (three-dimensional) computer graphics, where 3-D geometry of the scene is known. According to use of geometric information, IBR method can be categorized into three groups: rendering with implicit geometry, rendering without geometry, and rendering with explicit geometry (either with accurate or approximate geometry). The representative techniques and characteristics of these groups are discussed by author. IBR method shows geometry for representing 3-D scenes and a surprising diverse range in their extent of use of images. Author explores the problems in use of geometry and images by reconsidering preoptic-sampling analysis and geometric proxies and ideas of view dependency. Lastly, compression methods designed specifically for image-based representations are highlighted by author. In making IBR methods practical, such compression methods are important.

S. Kasaei [90]: A novel compression algorithm is introduced for fingerprint images. An accurate model based new vector quantization scheme is presented for the distribution of wavelet coefficients by using lattice vector quantization and wavelet packets. This model is based on the generalized Gaussian distribution. For both piecewise-uniform and uniform pyramidal lattices, a new method is also discussed by author for determining scaling factor and largest radius of the lattice. Achieving best rate-distortion function is the purpose of the proposed algorithms by adapting characteristics of sub images. In the proposed optimization algorithm, no multi-quantizing and training are required, and no assumptions are made about the lattice parameters. Author also demonstrates that sharply distributed random sources encountered with wedge region issue in the proposed algorithm are resolved. The proposed algorithms adapt to specified bit rates and to inconsistency in input images. The proposed algorithms result for similar bit rates in higher quality recreated images, in the compression of other available image compression algorithms.

M.B.Martin et.al [91]: Here the authors introduce an algorithm produced by the improvements in quantization method and wavelet transform capable of surpassing the current image compression standards such as JPEG (Joint Photographic Experts Group) algorithm. Wavelet transform need filters in image compression for best performance that combine a number of required properties like symmetry and orthogonality. Moreover, the design possibilities are limited for wavelets because all the required properties can be processed simultaneously. In avoiding some limitations of wavelets, the comparatively new fields of multi wavelets show potential. Multi wavelets are capable to combine various desirable transform features and offers more design possibilities. The few results of Image compression based on multi wavelets have small performance generally decreases and appreciated by the present wavelet algorithms. This paper introduces multi wavelet packets and offers quantization method and new multi wavelet transform. Wide experimental results show that our method exhibit performance superior to present wavelet filters in various cases and equal to present wavelet filters in some cases.

S.Chen et.al [92]: A post processing method for the improvement of image quality is discussed. In this method, multiresolution edge features are removed by a distortion-recovery model from the decompressed image and to estimate the image difference between decompressed image and original uncompressed image, these visual features are used as an input. Model output is added in decompressed image to compensate the coding distortions. The proposed method is common and can be applied to key coding methods rather than several present post processing methods, which are specially designed for vector quantization or transform coding and smooth blocking artifacts. Both in terms of subjective visual assessment and objective distortion measure, the proposed method achieves major improvements on the quality of recreated images demonstrated by experimental results including post processing coding system.

Subramanya [93]: Digital images mostly contain major amounts of spectral and special redundancy. Spectral redundancy is created due to correlation between different color planes, and spatial redundancy is created due to correlation between neighboring pixel values. By taking advantage of these redundancies, the number of bits needed to represent an image is reduced by image coding (compression) method. To get the

recreated image, an inverse process known as decoding (decompression) is applied for compressed data. The main aim of compression is keeping the visual quality and resolution of recreated image to the original image as close as possible, while decrease as much the number of bits as possible. This object gives a summary of the main image compression method. The decoding steps are usually quite intuitive and the reverse of the encoding steps for most of the coding steps.

T.Ozcelik et.al [94]: This paper presents a number of applications created by video and image coding algorithm whose range varies from Public Switched Telephone Networks (PSTN) to High Definition Television (HDTV) on video telephony. Moreover, current standards like MPEG-1, H.261, and JPEG as well as most of the current methods in the recreated images produce highly visible degradation because quantization process may lose information when bit rate is lowered. In this paper, an iterative method keeping the essential detail existing in original image is produced by author to decrease the unwanted degradation like mosquito and blocking artifacts. The proposed method creates priori information through a nonstationary Gauss-Markov model about the original image. Mean field annealing is used to obtain a MAP (maximum a posteriori) estimate by using this model. An implementation of paradigm is represented by the proposed solution, according to which the decoder solves the estimation problem based on previous knowledge and available bit stream, but does not simply defeat the operations performed by encoder about the source image. The performance of proposed algorithm was verified on an H.261 and JPEG type video codec. The coding artifacts are effectively removed by it, which is present in low bit rate compression.

Yung-Gi Wu et.al [95]: A visual information dominance and moment preserving method are presented in this paper to achieve the low-bit rate Block Truncation Coding (BTC). Conventional BTC has the advantage of fast and simple computation, when compared with other present strategies as vector quantization and transform coding. But, its low efficiency limits the compression ratio. By information extraction and moment preservation algorithm, the aim of simple computation is achieved by our proposed technique with variable bit rate selection. The proposed method does not need complex mathematical computations and it has advantage of simple operations. Hence, the whole

computation in compression of ordinary BTC does not increase the burden. The simulations are accepted to calculate the performance with natural images. The created decoded images with a bit rate of 0.5-1.0 bit/pixel have moderate quality.

G.R. Kuduvalli et.al [96]: The performance of compression, reversible algorithm based on number of block is suitable in comparison of a novel two-dimensional predictive linear coder to compare very large format images (4096*4096 pixels or more) developed by extending the multichannel version of the Burg algorithm to two dimensions. The applied compression schemes are: linear interpolative coding, two-dimensional linear predictive coding, arithmetic coding, Lempel-Ziv coding, Huffman coding, transform coding using discrete Fourier- discrete wales transforms discrete cosine, and combinations thereof. The performance of these coding methods is discussed for chest radiographs and a few mammograms digitized to increase the size up to 4096*4096* 10 b pixels. Without any loss of information, compression from 2.5-3.0 b to 10 b /pixel has been achieved on these images.

R.Atta et.al [97]:In this paper, a satellite image contrast enhancement method base on SVD (singular value decomposition) and DCT (discrete cosine transform) pyramid is presented, compared to SVD and wavelet decomposition based methods which flop to produce suitable results for some low-contrast images. An input image reserved L-shape blocks containing the high-frequency coefficients of the discrete cosine transform (DCT) pyramid and it is decomposed into a low sub-band image with the proposed method. Then, singular value matrix of the equalized low sub-band image estimated .The quantitative and qualitative performance of proposed method are compared with conventional image equalization like local histogram equalization and general histogram equalization, in addition to some advanced methods like singular value equalization method. However, the proposed method is compared with DCT-SVD based method as well as SVD and DWT (discrete wavelet transforms) based method. The experimental result demonstrates that both advanced and conventional methods are beaten by the proposed method.

L. Chang et.al [98]: In this paper, an equivalent compression method based on region and a novel group is proposed for hyperspectral images. Both MCBC (maximum correlation band clustering) and CSSP (clustering signal subspace projection) algorithms are contained by the proposed method. First, the high dimensional image data are transformed into one dimensional projection length by CSSP for dividing images into suitable regions. The spectral bands are divided by MCBC into various groups for each image regions according to their associated band correlation. The image data are collected in groups with high degree correlation in spectral/spatial domains. Then, the collected image data is again compressed by spatial/spectral hyper-spectral image compression methods based on PCA. Moreover, an equivalent architecture of the proposed compression method is presented by author to accelerate the calculating efficiency by using parallel cluster computing methods. Simulation results have shown that the proposed region and group based method performs better in compression of standard 3-D hyperspectral image compression, which is performed on a VIRIS images. Furthermore, under the same compression ratio, the proposed method achieves better calculation efficiency in compression of direct combination of JPEG2000 and PCA.

H.Demirel et.al [99]: In several fields of research, Satellite images are used. Their resolution is the major problem of these kinds of images. In this paper, a new satellite image resolution improvement method is obtained by input image and DWT based on interpolation of the high-frequency sub bands proposed by authors. To decompose the input image into different sub bands, DWT is used by the proposed resolution improvement method. Then, the low-resolution input image and high-frequency sub band images have been introduced by using inverse DWT, and a new resolution-enhance image is generated by combining all these images. To achieve sharper image, an intermediate stage has been proposed for estimating the high-frequency sub bands. The proposed method on standard satellite images has been verified. The visual and quantitative (root mean square error and peak signal-to-noise ratio) results over the state-of-art and conventional image resolution improvement method show the advantage of proposed method.

H.Demirel et.al [100]: In this paper, interpolation of the high-frequency sub band images based satellite image resolution enhancement method is proposed, which is obtained by DT-CWT (dual-tree complex wavelet). A low-resolution input satellite image is decomposed into different sub bands by using DT-CWT. Then, the input image and high-frequency sub band images are introduced by using inverse DWT, and a new high resolution image is generated by combining all these images. The CWT provides directional selectivity which is used to achieve the resolution improvement, where the high-frequency sub bands present in six directions donate edges i.e. the sharpness of high-frequency. The advantage of proposed method is shown by the visual and quantitative PSNR results over Peleg and Irani based image resolution enhancement method, wavelet zero padding, and bicubic interpolation.

Shaorong Chang et.al [101]: The Set Partitioning in Hierarchical Trees (SPIHT) algorithm is an advanced image-compression method based on efficient wavelet, which is designed to minimize the MSE between decoded and original images. Moreover, measurement of distortion based on MSE is generally not well correlated at low bit rates with image recognition quality. In detail, low-amplitude wavelet coefficients are assumed with low priority by using conventional SPIHT, which may be important for classification. In this paper, the Kernel Matching Pursuits (KMP) used by authors to estimate the importance of each wavelet sub bands separately with textural segmentation performed through a hidden Markov tree for differentiating between different textures. Based on importance of sub band which is determined through KMP, The wavelet coefficients are measured by the authors previous to SPIHT coding with the aim of minimizing Lagrangian distortion based on classification error and MSE. Bay's Tree-Structured Vector Quantization (B-TSVQ) considered by authors for compression, to obtain a tradeoff between classification error and MSE. The performance of B-TSVQ, the modified SPIHT and the original SPIHT are compared.

S.Ramakrishnan et.al [102]: In this paper quantization of multiple vector sources are required by several image compression methods, with significantly different distributions. These sources are quantized optimally with VQ by using separate codebooks, in which a huge memory space may be required jointly. A suitable way is

required for storage and performance, because in most applications, storage is limited. A universal limited-size codebook based on new solution is proposed by the authors, which can be seen as the combination of overlapping source codebooks. This framework provides greater design flexibility that develops the storage-constrained performance and allows each source codebook to contain any desired subset of the entire code vector. The main feature of this method is that two source codes do not require encoding at the same time. Its close relation to classified, finite-state, adaptive, and universal quantization is an addition advantage of the proposed method. Required conditions are derived for optimality of removed source codebooks and the universal codebook. An iterative design algorithm to achieve a solution that satisfies these conditions is introduced. Possible applications of the proposed method are counted and its effectiveness is demonstrated for images coding using tree-structured vector quantization, multistage vector quantization and finite-state vector quantization.

Research Gap:

Literature presented proves that satellite image processing is complex / bulky and limited work is carried out till date. Lossless satellite data compression is critical to derive knowledge at ground stations. Use of DWT is preferred when compared to DCT to achieve lossless compression. Lifting mechanisms are beneficial when compared to convolution based implementation techniques. Multiplier free architectures are proposed to reduce hardware complexity and improve performance. Transmission and image acquisition systems on board the satellite induce noise, hence de-noising is a critical operation. The use of bilateral filter exhibit promising results.

To the best of our knowledge there exists no architecture reported till date that incorporates compression, de-noising and decompression. Performance of the existing DWT implementations can be further improved. The complexity of bilateral filter implementations can be further reduced to enhance efficiency.

In this literature survey, several existing techniques are described for de-noising and decompression of satellite image. Some existing papers [55],[56],[78],[79],[99] and [100] specifies the DWT technique which is used in the proposed model .In this existing

papers several techniques such as CWT, KLT, WAVELET and 2-D geophysical data distribution are used with DWT scheme. But these techniques are much concerned about either decompression or resolution improvement but in our proposed model Le Gall's 5/3 DWT lifting technique is used. This technique not only eliminates the noise but also decompress the satellite image in a suitable manner. The PSNR for different images such as airport and port image is 29.81db and 24.43db respectively which are highly efficient.MSE values for airport and port images are very less such as 79.81 and 234.24.

The simulation results on FPGA has proved that clock frequency achieved is 251.4 MHZ with total power consumption of 384.22mW and the resources utilization proves to be efficient in terms of area and power.