Chapter 2

LITERATURE REVIEW

2.1 Background

This chapter presents the details of the previous work developed by various researchers for Intra frame coding using existing Rate Distortion Optimization (RDO) and fast mode decision intra prediction algorithms of H.264/AVC.

In Advanced Video Coding standard (AVC)/H.264 using intra prediction process achieves a better coding efficiency for intra frame compared to other previous video coding standards. To achieve coding efficiency of intra frame in H.264/AVC uses existing the Rate Distortion Optimization (RDO) technique with full search method.
An extensive literature review was conducted on Intra frame coding in AVC in order to know coding performance such as computation complexity, quality of picture i.e. PSNR, bit rate, encode time and compression.

Brief literature was reported which gives preamble for further study on research work. The existing contribution for intra frame using fast intra mode decision prediction algorithms are reducing the computational complexity with loss or degradation of picture quality, increment in bit rate.

The exiting intra prediction algorithm of H.264/AVC for Intra frame coding uses existing Rate Distortion Optimization (RDO) technology to examine all possible 17 optional prediction modes of intra prediction. The number of mode combinations for each macro block will be \( N_8 \times (16 \times N_4 + N_16) \), where \( N_16 \) is number of modes of 16x16 of luma block, \( N_8 \) is number of modes of an 8x8 chroma block and \( N_4 \) is number of modes of 4x4 of a luma block. The number of mode for each macro block is 4 x (16 x 9 + 4) = 592. Therefore, to select the best mode for one macro-block in the intra prediction, H.264/AVC encoder takes 592 RDO calculations [8]. This results the computational complexity of H.264/AVC encoder is drastically increased, which makes that difficult for real time applications, so a fast mode decision intra prediction algorithms were developed to reduce the computational complexity with degradation of quality of picture and increment of bit rate.

Many methods/techniques have been proposed by various researchers to reduce the computational complexity of intra frame in AVC. These methods contribute to reducing computation complexity at the cost of degradation of picture quality with increase in bit rate.

**The following are previous work has been carried by researcher for intra frame coding using different approaches.**

Bojun Meng et al [9] developed fast intra prediction mode selection algorithm. This algorithm reduces computational complexity. Methodology is based on partial computation of cost function, early termination and selective computation of highly probable modes. The experimental results of algorithm are compared with RDO technique of H.264/AVC. This algorithm can reduce the complexity considerably while maintaining similar PSNR and bit rate of Full Search (FS) algorithm of AVC.
Meng B. et al [10] developed multidirectional spatial prediction method to reduce spatial redundancy by using neighbouring samples as a prediction for the samples in a block of data to be encoded. Experimental results of this algorithm show that the encode time of the intra prediction reduce by 60% while maintaining similar bit rate and picture quality of JM reference algorithm.

Chan-Ling YANG et al [11] developed fast Intra prediction algorithm using macro blocks properties to select prediction modes and find best mode which can save computation complexity 40% maintaining similar PSNR and bit rate of JM 7.3 reference algorithm of H.264/AVC. Methodology based on macro block properties (16x16 intra prediction suitable for smooth area and 4x4 for highly detailed area) Mean Absolute Deviation (MAD) of macro block, selecting a threshold value. If the MADs are smaller than pre-defined threshold value, macro block is smooth then 16x16 prediction modes are used to find best mode. If MADs are larger than threshold value, macro block is detail then 4x4 prediction modes are used to find best mode.

Jun Xin et al [12] developed efficient macro block coding-mode decision for H.264/AVC video coding, which is based on transform-domain processing in the macro block coding is achieved with significantly reduced computational complexity.

Changsung Kim et al [13] proposed a fast mode decision method for Intra prediction in H.264 to reduce the encoder complexity. This proposed algorithm adopts a multi-stage sequential mode decision process. The experimental result of this scheme saves encoding time of 10-15% as compared with the current RDO optimized mode decision with little quality degradation.

Yang et al [14] addressed a fast intra prediction algorithm using macro block properties, based on macro block properties it can selects prediction modes and experimental result can save 10 to 40% of encoding time compared JM reference algorithm of AVC.

Pan, F. Rahardja, L.S. et al [15] presented a fast mode decision algorithm for H.264 intra prediction, based on local edge information. Based on the distribution of the edge direction histogram can select prediction modes. Experimental results show that the proposed scheme increases the speed of encoding time significantly with loss of PSNR.
F. Pan, X. Lin et al [16] developed fast mode decision algorithm for intra prediction in H.264/AVC video coding, this algorithm is based on the local edge information and adopts the edge direction to predict the possible modes. This algorithm is compared with JM 6.1 reference software. This algorithm reduces computational complexity of encoder is about 60%, the average loss of PSNR is about 0.24dB with slight increment in bit rate of about 3.7%.

Cheng et al [17] proposed a three step intra prediction algorithm, which can save encoding time is about 30% compared with JM reference algorithm.

Chang sung Kim et al [18] developed fast H.264 intra/inter mode decision algorithm based on three features and mapped into one three region such as risk free, risk-tolerance and risk intolerance. The experimental results can save 30% encoding time compared to reference software. It also degrades rate-distortion performance.

E. Arsura et al [19] developed fast macro block intra and inter modes selection based on the typology of the video, the quantization level and characteristics of the video. The proposed method reduces computational complexity 40% with slight reduction in PSNR.

Jongho Kim et al [20] presented Fast intra-mode decision in H.264 video coding using simple directional masks and mode information of neighbouring blocks used to select the probable modes. This algorithm gives better coding performance than the JM reference algorithm.

LIU Qiong et al [21] proposed an improved fast intra prediction algorithm which is based on analysis of edge feature of a block. Methodology was analyses of edge information and the computing information in edge histogram. If Histogram of macro block larger than the threshold T selects 4x4 block type otherwise 16x16 block type and find best mode with minimum cost for selected block. Experimental results of this algorithm can reduce the computation complexity 52.90%, degradation of PSNR is about 0.04 dB with 2% increase of bit rate. Limitation is increased in bit rate and loss in picture quality i.e. PSNR.

Chun-Lung Hsu et al [22] presented fast intra prediction mode selection algorithm for H.264, based on block type selection 4x4, 16x16, edge information and sub sampling for mode selection. This proposed method compared with JM 9.3 reference algorithm, the results are
obtained for QCIF and CIF sequences with various quantization parameter values. This algorithm achieved reduction in encoding time with small degradation in PSNR.

Song J.B et al [23] developed fast intra prediction algorithm in H.264 to improve compression efficiency of intra frame by prediction block size and sliding window to select appropriate prediction modes. The experimental results of this algorithm achieves compression efficiency and decrease slightly picture quality compared to JM algorithm.

Zhengguang Xie et al [24] developed early detection of all zero DCT coefficient blocks in AVC based on Gaussian distribution model. In proposed method reduce the computation complexity of DCT and quantization by detecting all zero DCT coefficients blocks using Gaussian distribution model.

Kebin Jia et al [25] presented intra frame prediction algorithm based on auto correlation to according to the feature of intra frame. The experimental result reduces coding time with little quality degradation.

Jinheng Yang et al [26] proposed Intra frame prediction algorithm for H.264/AVC based on block matching properties and DC hybrid mode. This algorithm is compared with JM 9.0 reference. The experimental results show that the proposed method can improves coding performance compare with JM reference algorithm.

Jun Sung Park et al [27] developed intra frame prediction algorithm based on the directional information of macro block. This proposed algorithm is compared with JM 9.0 reference. Experimental results are presented to show that the proposed schemes reduce the complexity considerable, maintaining the similar PSNR quality with about 1.46% bit rate increase in average.

Jhing-Fa Wang et al [28] presented fast intra mode decision algorithm, the methodology of the work were dominant edge of macro block, and Experimental results shows that the computation time of the proposed fast intra prediction algorithm is averagely reduced to 40% of the full search method with slight PSNR degradation and 3.2% bit rate increase.
Jing Xie et al [29] proposed fast intra frame prediction algorithm for H.264 based on 2D histogram according to the feature of intra frame. This proposed algorithm is compared with JM 5.0 reference algorithm. The results show that the coding time of is 16.26% less than reference software with expense of small degradation of PSNR.

Jiheng Yang et al [30] developed intra frame prediction algorithm for H.264/AVC based on block matching algorithm, the result of this method improves coding performance i.e. PSNR slightly higher than full search algorithm of AVC.

An-Chao Tasi et al [31] proposed fast mode decision algorithm based on direction detection algorithm. This algorithm has been compared with JM10.0 reference software. The experimental results of the proposed algorithm can show that reduces computational complexity is average about of 59.34% and bit rate is increased averagely 1.733% with loss of 0.053dB.

Chengdu et al [32] proposed a novel fast mode decision algorithm to improve the encoding process by predicting the mode of the current macro block based on the motion activity of the neighbouring macro blocks. Experimental results have shown that the proposed algorithm achieves a reduction of 56% computational complexity on average, while introducing only 0.059 dB loss in PSNR and 0.2% increment on the total bit rate compared with JM reference algorithm.

Ling-Jiao Pan et al [33] developed fast mode decision algorithm for intra prediction, this proposed algorithm reduces the number of candidate modes. The intra prediction algorithm is based on directional information and dominating direction of a smaller block is similar to that of bigger block and also selecting candidate modes using simple directional masks from horizontal and vertical edges. This algorithm compared with JM reference software JM10.1 of H.264/AVC. Experimental results of this algorithm save encoding time with little loss of PSNR and increment of bit rate for IPPP sequence. Limitation is increased in bit rate and loss in picture quality i.e. PSNR.

Hanli Wang et al [34] presented Gaussian model based approach to reduce DCT computation in H.264, by Gaussian model reducing redundant computations and obtain Rate distortion performance is almost similar to reference algorithm of AVC.
Huang Hui et al [35] addressed the enhanced intra prediction algorithm for H.264 advanced video coding standard is based on using pixel calculated already as reference pixel to predict the rest of the pixel in current block and then dynamically update the prediction mode order to achieve most probable modes. Taking prediction direction and correlation among the adjacent pixel in the same block into consideration a new intra prediction are obtained. The results are obtained for QCIF and CIF sequences and achieved reduction of bit rate is up to 3.42% and slightly increase 0.01 to 0.07dB in PSNR for different values of quantization parameters.

Jen-Shiun Chiang et al [36] developed fast intra prediction mode decision algorithm for 4x4 intra block which is based on the partially sampling prediction and symmetry of the adjacent angle modes. This method can reduce the encoding time of the intra prediction by 60% with maintaining similar video quality and bit rate of H.264 reference software.

Jiju n Shi et al [37] developed fast prediction mode algorithm for AVC, this algorithm is based on the edge direction detection of macro block can select prediction modes. This algorithm is compared with JM 10.0 reference software. The experimental results show that this algorithm can save 62% of encode time and increment of bit rate of 0.836% with loss of 0.003dB PSNR.

Jiwe Yuan et al [38] presented intra prediction mode decision algorithm in H.264 based on Sum of Absolute Difference (SAD) selects modes. The simulation results show that the proposed algorithm reduces computational complexity with negligible loss of PSNR and little increase of bit rate.

Guifen Tian et al [39] presented block type decision algorithm for H.264/AVC intra prediction algorithm, this algorithm is based on the entropy feature of macro block can select prediction modes. Experimental results show that this algorithm can save 22% of encode time and increment of bit rate of 0.37% with gain of 0.003dB PSNR.

Tianruo Zhang et al [40] developed frequency based block type decision algorithm for intra prediction in H.264/AVC high profile, this algorithm is based on the relation of smoothness of macro block and the block type of intra prediction. Experimental results show that this algorithm can save 28.46% of encode time and increment of bit rate of 2.3% with loss of 0.17dB PSNR.
Shuwei Sun et al. [41] developed fast intra mode algorithm for AVC based on transform domain bit rate estimation method. Results show reduces encoding time with loss of PSNR 0.097dB and bit rate increment of 1.538% for Intra frame sequence.

Tsai et al. [42] proposed efficient intra prediction in advanced video coding standard based on intensity gradient technique for intra frame coding. Methodology is based on eight orientation features are extracted from macro block by intensity gradient filters. These orientation features are utilized to select a subset of prediction modes. Compared to reference software of AVC, the proposed method saves 76% of encoding time with slight PSNR degradation and bit rate increase.

Ji Lei et al. [43] developed fast intra mode decision algorithm for AVC based on directional pixel value differences of target block. This algorithm is compared with JM 11.0 reference algorithm of AVC. The experimental results of this algorithm can reduced the complexity with increments of bit rate in all the modes with loss of PSNR.

K.Bharanitharan et al. [44] presented efficient intra prediction algorithm which is based on directional difference prediction, this algorithm is compared with JM 10.0 reference software. The experimental results show that the algorithm can increment in bit rate of 1.30 % with loss of 0.04 dB PSNR.

Sourabh Rungta et al. [45] proposed a fast mode selection algorithm for intra frame for H.264 encoder, to reduce the number of mode in intra prediction. The experimental results of this proposed algorithm show that reduction in encoding time and with little loss of bit rate and visual quality.

Yeong-Joen et al. [46] presented fast intra mode decision algorithm using directional gradients, based on directional gradients it can select prediction modes. The experimental results of this algorithm shows that bit rate increment is about 4.831% and loss of PSNR is about 0.148.

Yunhui Shi et al. [47] presented fast and efficient intra mode decision algorithm, the proposed algorithm is based on the variance of macro block can select the intra prediction modes. This
algorithm is compared with JM 10.1 reference software of AVC. The experimental result shows that average increment in bit rate about 2.13% with degradation of PSNR.

Zhang Jiang-Xin et al [48] developed fast intra prediction algorithm which select appropriate intra prediction type based on complexity of the macro block, use the difference between neighbour block’s gradient vector and neighbours block’s most optimization direction to select current block prediction mode. The proposed algorithm was implemented into JM8.6. The experimental result shows that average increment in bit rate about 1.3% with degradation of PSNR and reduction of encoding time about 31.3% Limitation of the proposed algorithm were degradation PSNR and increment in bit rate.

Zhikao Ren et al [49] presented fast intra prediction algorithm for H.264. The algorithm is based features of macro block such as Mean Absolute Deviation (MAD) and frequency domain features. This algorithm is compared with JM 8.6 reference software. The experimental result shows that 3.84% increment in bit rate with loss of 0.152dB PSNR.

A.Ganguly and A.Mahanta et al [50] presented a fast intra-prediction mode selection algorithm; the algorithm is based on the quantization parameter and the local edge information obtained by calculating the edge histogram parameters. The algorithm reduces the computational complexity and time considerably while maintaining similar PSNR and bit rate.

Pengya Liu et al [51] developed fast intra frame prediction algorithm based on feature of macro block. It calculate the histogram of the macro block if histogram of macro block is more than predefined threshold the it select 16 x16 modes or if histogram of macro block is less than predefined threshold it select 4x4 modes. The experimental results are compared with JM 12.2 reference software. This algorithm can reduce 32.8% of encoding time and increment of 3.2% bit rate with 0.04 dB loss of PSNR.

Zhou Qiya et al [52] developed efficient block type decision algorithm for H.264/AVC intra prediction, the methodology is based on edge feature of macro block for selection of intra prediction modes. The proposed method is compared with JM 8.6 reference software of H.264/AVC standard. The experimental results of algorithm can achieve averagely 2.22 % bit
rate saving for QCIF and 2.01% for CIF sequences with loss of 0.25 dB PSNR for QCIF and 0.05dB for CIF sequences.

Huanqiang Zeng et al [53] proposed a fast intra mode decision algorithm, which is based on hierarchical intra mode decision (HIMD), to reduce the number of modes. Experimental results of this algorithm achieves a reduction computational complexity while 0.164 dB loss in peak signal-to-noise ratio and 2.336% increment on the total bit rate compared with Joint Model (JM) reference.

Amrita Ganguly et al [54] developed fast mode decision algorithm of AVC which is methodology is based on edge characteristics of residue images. The proposed method is compared with JM 12.4 reference software of H.264/AVC standard. The experimental results of algorithm can achieve averagely 1.50 % bit rate increment for CIF and 0.57 % for CIF sequences with loss of 0.02 dB PSNR for QCIF and 0.01dB increment for CIF sequences.

Yi-Hsin Huang et al [55] proposed a variance-based algorithm for block size decision using contextual information. The algorithms show the improvement of coding efficiency over previous methods.

A. Elyousfi et al [56] developed fast intra prediction algorithm for H.264/AVC based on quadratic and gradient model. The proposed method is compared with JM 10.1 reference software of H.264/AVC standard. The experimental results of algorithm can achieve averagely 3.5 % bit rate saving for QCIF with loss of 0.02 dB.

Fang Ren et al [57] developed fast and efficient intra mode decision algorithm which is based on Gray scale of macro block. This algorithm is compared with JM reference algorithm. The experimental result shows the algorithm increment in bit rate of 1.66% with loss of 0.04dB PSNR.

Yung-Chiang Wei et al [58] presented intra mode decision for Advanced Video Coding, this algorithm is based on transformed domain block size. The experimental results of proposed algorithm shows that average of bit rate increment of 0.68%, encoding time reduces of 20.34% with loss of 0.06dB.
Do Quan et al [59] developed an efficient intra prediction mode decision algorithm for intra frame. Proposed method is not checking all the modes for each macro block it directly choose a DC mode as best mode. The experimental results of proposed work achieved 81.90% time saving and slightly increase in PSNR and decrease in bit rate.

Lili Zhao et al [60] presented an intra frame coding based on different texture region approach; This algorithm is compared with JM 15.1 reference algorithm of AVC, The experimental results shows that compared with H.264 Intra coding algorithm, the proposed algorithm can produce a bit rate saving 30% with gain of 0.5dB PSNR.

Yinyuan Wang et al [61] developed an improved image edge detection algorithm based on intra prediction. The proposed algorithm describes basic concept of intra prediction and edge detection technology, it detect improve edge of the of image using laplacian Gaussian operator after intra prediction. If prediction deviation of current block is small it not exist edge. If prediction deviation of current block is larger, it exist edge.

Jin Wang et al [62] presented an intra prediction algorithm for H.264. The algorithm is based on low rank matrix completion. The proposed method is compared with JM 11.0 reference software of H.264/AVC standard. The experimental results of algorithm can achieve averagely 5.39% bit rate saving for CIF and 4.21% for QCIF sequences.

Guoyun Zhong et al [63] developed fast mode decision algorithm based on all-zero blocks detection, analysis of theory of integer and quantization, and probabilities of inter and intra modes. Proposed algorithm achieves better encoding time saving, small amount of PSNR degradation and increase in bit rate.

Li-Li Wang et al [64] developed intra prediction algorithm based on samples in a macro block or block hierarchical predicted instead using a block based prediction. The experimental result gives better compression performance with small coding complexity.

Tian Song et al [65] developed novel intra modes with temporal spatial prediction for H.264/AVC. The algorithm is based on temporal-spatial prediction, candidate block selection, similar block selection and reference and predictor pixels generation. This algorithm is
compared with JM 14.2 reference software. The experimental result shows that 16.43% reduction in bit rate and increment in 1dB PSNR.

Taecho Kim et al [66] presented efficient block mode decision and prediction mode selection for intra prediction algorithm in AVC for high profile. The methodology of this algorithm is based on calculating the variance of macro block can select the prediction modes. The experimental of this algorithm is compared with JM 13.2 reference software. The result of algorithm shows average increment of bit rate is about 0.826% with loss of PSNR is about 0.191 dB.

Zhuoying Zeng et al [67] presented fast intra frame algorithm which is based on content similarity of macro block, the algorithm is compared with JM 16.2 reference algorithms. This algorithm can increases bit rate is about of 3.27% with degradation of PSNR is about 0.18dB.

Song Yun et al [68] presented efficient fast mode decision algorithm for intra prediction in AVC. The algorithm is based on gradients of macro block, gradients between the reference pixels and current block pixels are calculated in all prediction directions and the prediction modes with larger gradient are skipped and prediction modes with smaller gradient are retained in prediction process. This algorithm is compared with JM 18.0 reference software. The experimental result shows that 2.610% increment in bit rate with degradation of 0.167dB PSNR.

Samira Bouchama et al [69] developed intra prediction modes for real time applications, based on data hiding. This algorithm, measures the performance of intra frame. The result of this algorithm saves considerable complexity and bit rate increment 2.18% with loss of 0.06dB PSNR.

Nejmeddine et al [70] developed a fast intra mode decision algorithm based on the best inter prediction mode for H264/AVC High Definition (HD) baseline profile encoder. Proposed algorithm can save up to 60% computation time, 16% of skipping intra16x16 and up to 83% for intra4x4 without PSNR degradation and bit-rate increase.
Qiăng Li et al [71] presented fast intra prediction method for H.264/AVC; this algorithm is based on variance based classification of texture complexity. The experimental result shows that can save 23% of encode time and bit rate reduction of 0.707%.

Kyungmin Lim et al [72] developed fast block size and mode decision algorithm for intra prediction. This algorithm is based on inner variance of macro block can select the prediction modes, this algorithm is compared with JM 11.0 reference software. The experimental results show that the algorithm can increment in bit rate of 2.199% with loss of 0.170 dB PSNR.

K.Bharanitharan et al [73] presented efficient block size decision algorithm for intra mode decision in AVC encoder, this algorithm is based on block size decision which calculates variance of macro block. Variance of macro block selects the prediction modes. The results of this algorithm are compared with JM10.0 software. The experimental results shows that 68% saves encoding time, increase in bit rate of average 3.3% for QCIF and 3.27 for CIF sequences with loss of 0.27dB PSNR.

Yingzhe Liu et al [74] presented fast intra mode decision algorithm based on histogram of macro block it select prediction modes. This algorithm is compared with JM 10.1 reference software. The experimental results of the algorithm can reduce 77% of encoding time and a bit rate increment of 4.3% with loss of 0.08 dB PSNR.

Xingang Liu et al [75] developed low complexity intra prediction algorithm which is based on based on the smoothness and directional similarity of Macro Block (MB). The simulation results show that this algorithm achieves 18% reduction in the computational complexity and increment in bit rate of 4.14% compared with the various conventional methods.

Bharathi.S.H et al [76] presented diagonal-down-left intra prediction algorithm for H.264 video encoder. Diagonal-down-left intra prediction algorithm implemented using Matlab. The results of this algorithm show that the reconstructed picture (PSNR) obtained after applying diagonal-down-left intra prediction is about 32 dB.

Haitao Li et al [77] presented low complexity algorithm for H.264/AVC intra prediction. It calculates texture feature of the macro for selection of intra prediction modes. The
experimental results are compared with JM 18.0 reference software. This algorithm can reduce 32.8% of encoding time and increment of 2.8% bit rate with 0.078 dB loss of PSNR.

Xin Lu et al [78] developed fast intra prediction algorithm for H.264/AVC, the experimental results of this algorithm is about 0.86% bit rate increment with loss of 0.02dB PSNR under different quantization parameters.

Yinbo Liu et al [79] developed fast intra prediction algorithm for H.264/AVC, this algorithm is based on spatial domain energy i.e. calculating variance and mean absolute difference. The algorithm is compared with JM 18.4. The experimental result shows that increment of bit rate about of 2.89% with loss of PSNR is about 0.18dB.

Changnian Chen et al [80] developed fast mode decision algorithm, this algorithm is based on edge detection. This performance of this algorithm compared with JM 11.0 reference algorithm, this algorithm can reduce 2.29% of encoding time and increment of 0.173% bit rate with 0.006 dB loss of PSNR.

Sara hamdy et al [81] developed new efficient H.264 intra prediction algorithm based on best prediction matrix mode. The new prediction scheme is best prediction matrix mode (BPMM) which is formed by combination of vertical horizontal and DC. This new scheme act as a new efficient prediction mode. The experimental results shows compression ratio is about 28.8%, bit rate is about 2.25% and PSNR is about 2%.

Ying-Hong Wang et al [82] presented fast intra skip decision algorithm for H.264/AVC, this algorithm based on skip decision rule can select best prediction mode. This algorithm is compared with JM 13.2 reference software. The experimental results show that this algorithm can increment in bit rate of 0.023% with loss of 0.002dB PSNR.

June Kim, Youngseop et al [83] developed efficient compression algorithm for H.264/AVC intra prediction which is based on activity map for the pixel unit of respective prediction block in conjunction with specific thresholds. This algorithm is compared with JM 18.2 reference software. This algorithm shows a 0.35% coding efficiency over JM reference algorithm.
Chou-Chen Wang et al [84] presented fast mode decision algorithm for AVC which is based on inter block correlation, the simulation results of the proposed algorithm was compared with JM 18.1 reference algorithm. The experimental result shows that increment of bit rate about of 3.9% with loss of PSNR is about 0.03dB.

Yun Song et al [85] presented intra prediction mode decision algorithm based on discretisation total variation and total variation and orientation gradient. This algorithm is compared with JM reference algorithm under different quantization parameters. The experimental results of the algorithm shows that 39.64% of reduce encode time, 0.009% of reduction of bit rate and loss of PSNR.

The above previous algorithms used several methods/techniques to reduce the computational complexity or encoding time of Intra frame in AVC and also results in loss of picture quality with increment in bit rate. The merit of previous algorithms is reduction of computational complexity or save encoding time, limitation of previous algorithms are degradation of picture quality and increment in bit rate for different quantization parameters using intra prediction modes.

Some of previous proposed methods presented for reduction of encoding time or computational complexity reduction. All the above previous methods are based on the computation of all intra prediction modes and functional blocks of AVC process are required to process one macro block. These methods increases bit rate with degradation of picture quality i.e. PSNR.

The previous work on Intra frame coding using fast mode decision intra prediction algorithm was achieved reduction of computational complexity at cost of increased in bit rate and degradation of PSNR. But in previous algorithms consistent picture quality (PSNR), reduction of bit rate and compression is not achieved. So that present research work is to develop an appropriate method or better approach for Intra frame coding in H.264 to achieve consistent PSNR, reduced in bit rate, reducing in encoding time and good compression.

The previous work on intra frame coding in Advanced Video Coding Standard/H.264 using Intra prediction algorithms was achieved increased in bit rate, degradation/loss of PSNR and
only reduction of computational complexity or save encoding time at different quantization parameters.

Previous intra prediction algorithms is based on different method/approach such as partial computation of cost function, local edge information of macro block, enhanced of cost function, feature of macro block, variance of macro block, approximating the cost function, early block type selection etc. Using these approach results increased in bit rate, degradation of PSNR. But only reduction of computational complexity or encoding time achieved.

So far, for intra frame coding, reduction in bit rate, consistent of PSNR and good compression was not achieved and Gaussian approach s not used.

So that the present work was developed a new approach which is based on Gaussian pulse for Intra fame coding in order avoid degradation of picture quality and increment in bit rate and to achieve consistent PSNR, reduce in bit rate, reduce in encoding time and good compression.

In next chapter presents details about problem statement, objectives of research and methodology of proposed research are provided.