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Computation of Optimum ATC Using Generator Participation Factor in Deregulated System

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Abstract: This paper presents an high speed VLSI architecture for Video compression algorithm with high competence data access system to support multiple video encoding standards such as H.264 MP/HP, SVC, and MVC to enhance coding efficiency which results in the best performance with less memory access due to complex data access requirement. Image compression plays a vital role for spatial and temporal video compression. There are few algorithms are existing for Video compression with efficient and low power architectures design. Prediction units plays key role in compression by reducing redundant blocks transmission. For gradient images most predictions executions are redundant, since the intra-coding mode occupies 40% of the overall coding in prediction unit. Intra prediction to reduce block prediction time best exploited in data-path circuit designing for intra prediction in H.264.

Keywords: Advanced Video Coding (AVC), H.264, High Efficiency Video Coding (HEVC), standards, video.

I. Introduction

Transcoding is an necessary plan for real-time video performance and VoD (Video on Demand) actions over heterogeneous network which may require different QoS (Quality of Service). One of the main issues in VoD service is that when video is pre-coded and recorded the features of the channel through which it will be transmitted cannot be added. This fact results in a poor performance of flexibility in communication of these pre-coded video streams. High Efficiency Video Coding (HEVC), also known as H.265 and MPEG-H Part 2, is a video compression standard, one of several potential successors to the widely used AVC (H.264 or MPEG-4 Part 10)[8]. In comparison to AVC, HEVC offers about double the data compression ratio at the same level of video quality, or substantially improved video quality at the same bit rate. It supports resolutions up to 8192×4320, including 8K UHD.

In most ways, HEVC is an extension of the concepts in H.264/MPEG-4 AVC. Both work by comparing different parts of a frame of video to find areas that are redundant, both within a single frame as well as subsequent frames. These redundant areas are then replaced with a short description instead of the original pixels [12]. The primary changes for HEVC include the expansion of the pattern comparison and difference-coding areas from 16×16 pixel to sizes up to 64×64, improved variable-block-size image segmentation, improved "intra" prediction within the same picture, improved motion vector prediction and motion merging, improved motion estimation and compensation filtering, and an additional filtering step called sample-adaptive offset filtering. Video streams through heterogeneous network. This problem is obvious when the client channels have diverse QoS [11]. In case of real-time video communications, the picture quality can be seriously degraded due to the change of channel capacities of transmission channels.

In this paper, a fast algorithm is proposed for CU size decision in HEVC encoder. Instead of using the variance complexity, the global and local edge complexities in horizontal, vertical, 45° diagonal, and 135° diagonal directions are proposed.

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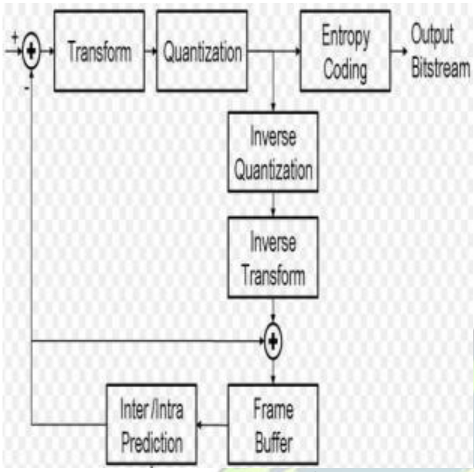

Fig 1. Block diagram of HEVC

II. High Efficiency Video Coding

A. Partition

HEVC supports highly flexible partitioning of a video sequence. Each frame of the sequence is split up into rectangular or square regions (Units or Blocks), each of which is predicted from previously coded data. After prediction, any residual information is transformed and entropy encoded. Each coded video frame, or picture, is partitioned into Tiles and/or Slices, which are further partitioned into Coding Tree Units (CTUs). The CTU is the basic unit of coding, analogous to the Macro block in earlier standards, and can be up to 64x64 pixels in size.

B. Prediction

The HEVC standard is designed to achieve multiple goals, including coding efficiency, ease of transport system integration and data loss resilience, as well as implementability using parallel processing architectures. The following subsections briefly describe the key elements of the design by which these goals are achieved, and the typical encoder operation.

C. Video Coding Layer

An encoding algorithm producing an HEVC compliant bit stream would typically proceed as follows. Each picture is split into block-shaped regions, with the exact block partitioning being conveyed to the decoder. The first picture of a video sequence (and the first picture at each clean random access point into a video sequence) is coded using only intra picture prediction (that uses some prediction of data spatially from region-to-region within the same picture, but has no dependence on other pictures). For all remaining pictures of a sequence or between random access points, inter picture temporally predictive coding modes are typically used for most blocks. The encoding process for inter picture prediction consists of choosing motion data comprising the selected reference picture and motion vector (MV) to be applied for predicting the samples of each block. The encoder and decoder generate identical inter picture prediction signals by applying motion compensation (MC) using the MV and mode decision data, which are transmitted as side information.

D. Coding tree units and coding tree block (CTB) structure

The macro block, containing a 16×16 block of luma samples and, in the usual case of 4:2:0 color sampling, two corresponding 8×8 blocks of chroma samples; whereas the analogous structure in HEVC is the coding tree unit (CTU), which has a size selected by the encoder and can be larger than a traditional macro block [3]. The CTU consists of a luma CTB and the corresponding chroma CTBs and syntax elements. The size L×L of a luma CTB can be chosen as L = 16, 32, or 64 samples, with the larger sizes typically enabling better compression. HEVC then supports a partitioning of the CTBs into smaller blocks using a tree structure and quad tree-like signalling.

E. Prediction units and prediction blocks (PBs)

The decision whether to code a picture area using inter picture or intra picture prediction is made at the CU level. A PU partitioning structure has its root at the CU level. Depending on the basic prediction-type decision, the luma and chroma CBs can then be further split in size and predicted from luma and chroma prediction blocks (PBs). HEVC supports variable PB sizes from 64×64 down to 4×4 samples.

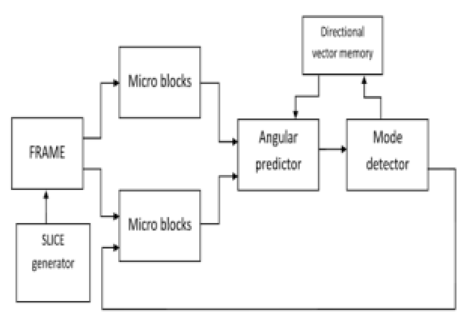

Fig 2. Process in Prediction

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III. Model Implementation

The prediction residual is coded using block transforms. A TU tree structure has its root at the CU level. The luma CB residual may be identical to the luma transform block (TB) or may be further split into smaller luma TBs. The same applies to the chroma TBs. Integer basis functions similar to those of a discrete cosine transform (DCT) are defined for the square TB sizes 4×4, 8×8, 16×16, and 32×32. For the 4×4 transform of luma intra picture prediction residuals, an integer transform derived from a form of discrete sine transform (DST) is alternatively specified.

Quarter-sample precision is used for the MVs, and 7-tap or 8-tap filters are used for interpolation of fractional-sample positions (compared to six-tap filtering of half-sample positions followed by linear interpolation for quarter-sample positions in H.264/MPEG-4 AVC). Similar to H.264/MPEG-4 AVC, multiple reference pictures are used. For each PB, either one or two motion vectors can be transmitted, resulting either in uni-predictive or bi-predictive coding, respectively As in H.264/MPEG-4 AVC, a scaling and offset operation may be applied to the prediction signal(s) in a manner known as weighted prediction.

A. Intra picture prediction

The decoded boundary samples of adjacent blocks are used as reference data for spatial prediction in regions where inter picture prediction is not performed. Intra picture prediction supports 33 directional modes (compared to eight such modes in H.264/MPEG-4 AVC), plus planar (surface fitting) and DC (flat) prediction modes.

B. Quad tree-Based Block Partitioning

HEVC retains the basic hybrid coding architecture of prior video coding standards, such as H.264/AVC [6]. A significant difference lies in the use of a more adaptive quad tree structure based on a Coding Tree Unit (CTU) instead of a macro block. In principle, the quad tree coding structure is described by means of blocks and units. A block defines an array of samples and sizes thereof, whereas a unit encapsulates one luma and corresponding chroma blocks together with syntax needed to code these. Consequently, a CTU includes Coding Tree Blocks (CTB) and syntax specifying coding data and further subdivision. This subdivision results in Coding Unit (CU) leaves with Coding Blocks (CB). Each CU incorporates more entities for the purpose of prediction, so-called Prediction Units (PU), and of transform, so-called Transform Units (TU). Similarly, each CB is split into prediction blocks (PB) and transform blocks (TB). This variable-size, adaptive approach is particularly suited to larger resolutions, such as 4k×2k, which is a target resolution for some HEVC applications [2].

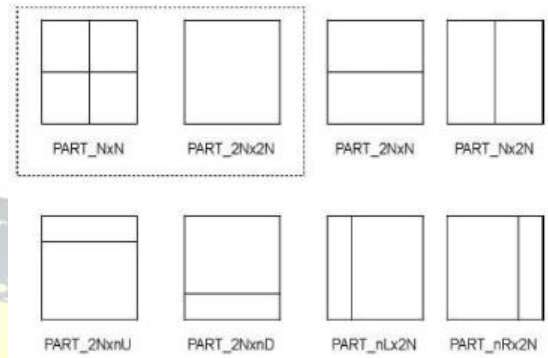

Fig 3. Prediction Modes

HEVC may also require more cache memory due to the larger block sizes that it supports. In H.264/AVC, macro blocks of size 16×16 define the buffer size required for storing predictions and residuals. In HEVC, intra picture prediction and transforms may be of size 32×32, and the size of the associated buffers thus quadruples. It should also be noted that HEVC lacks coding tools specific to field coding.

IV. Results And Discussion

A. Conversion of Frame to Gray Scale Image

Among the 30 frames, any one frame is given as the input to the DCT Transform which produces three output. They are gray scale image, DCT inverse transform, DCT reverse transform.

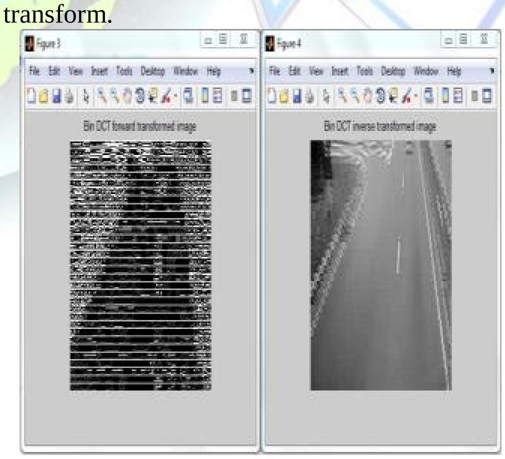

Fig 4.1 Forward and Reverse DCT

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The above figure shows that the input image is converted to the gray scale image

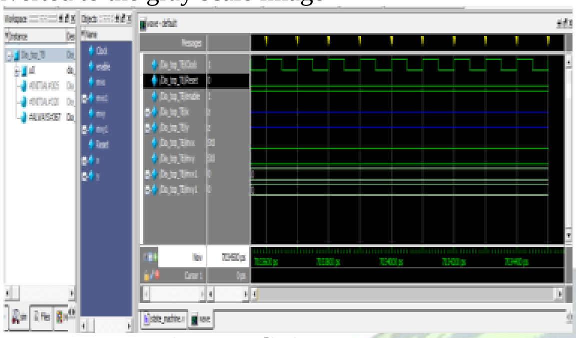

Fig 4.2 Prediction process output

V. CONCLUSION

An high speed VLSI architecture for Video compression algorithm with high competence data access system to support multiple video encoding standards such as H.264 MP/HP, SVC, and MVC to enhance coding efficiency which results in the best performance with less memory access due to complex data access requirement. Image compression plays a vital role for spatial and temporal video compression. There are few algorithms are existing for Video compression with efficient and low power architectures design. Prediction units plays key role in compression by reducing redundant blocks transmission.

This approach can be used in multiple video encoding Standards, data center, building management activities etc.

VI. FUTURE ENHANCEMENT

The work presented are aimed for the process of prediction in order to reduce redundancy during compression. Further work is required to evaluate the performance of the fastest compression using different algorithms in real-life video scenarios.

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