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AN EFFICIENT DATA HIDING IN A VIDEO FILE USING FLEXIBLE MACRO BLOCK ORDERING

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Abstract— Information concealing systems can be utilized to install a mystery message into a compacted feature bit stream for copyright assurance, access control, content annotation and exchange following. Feature information covering up is still an essential examination point because of the configuration complexities included. Our propose another feature information concealing system that makes utilization of deletion remedy ability of Repeat Accumulate codes and prevalence of Data Hiding. Particular implanting is used in the proposed technique to focus host sign specimens suitable for information concealing used to discover a relationship between macroblock-level peculiarity variables and the estimations of a shrouded message bit. Adaptable Macroblock Ordering (FMO) peculiarity of H.264/AVC feature for message concealing and extraction. When all is said in done, a coded picture is isolated into one or more cuts. Cuts are independent and can be decoded and showed autonomously of different cuts. Every cut gathering contains one or more cuts and macroblocks can be alloted in any request to these cuts. The task of macroblocks to distinctive gatherings is motioned by a linguistic structure called the "cut gathering id". Adaptable Macroblock Ordering method for message stowing away does not abuse its unique reason.

Key words—Compressed video, compression, data embed- ding, H.264, information hiding.

I. INTRODUCTION

MOTION PICTURE, broadly known as feature, has turned into a standout amongst the most compelling media in the stimulation business. Before, feature was essentially a succession of edges. As semiconductor innovation propels, clients get to be greedier and raise the bar of innovative needs. We wish more peculiarities in feature, including moment casing access, high resolu- tion, high edge rate, quick forward, and so on. Consequently, the Motion Picture Expert Group (MPEG) standard was built in 1993, and it empowered feature reduced plate (VCD) technol- ogy , took after by MPEG-2 in 1995, which empowers the computerized feature circle (DVD) and satellite TV. In the quest for higher proficiency in feature coding, and it has turned into a standout amongst the most normally honed feature pressure designs subsequent to 2003. The configuration of H.264 gives an upgraded pressure execution on feature representa- tion for different purposes, including feature telephony, stockpiling, show, and gushing applications. H.264 accomplishes a sig- nificant change in rate twisting exchange off by offering high feature quality for generally low bitrate when contrasted with the past eras of feature pressure standard. Subsequently, different advanced feature advances lay on the H.264 pressure structure, for example, Blu-beam feature circle, feature gushing (e.g., YouTube, Dailymotion), reconnaissance cam, convenient feature recorder, and so on. A comparable pattern is normal for the as of late finished H.265 feature pressure standard .

Fig. 1. General framework of information hiding.

As of this written work, a few reviews highlight the individual field of data concealing and its comparing application extending from 1998 to 2012. These studies incorporate water- checking, steganography, and related issues in advanced information encryption. Su et al. concealing systems against essential, heartiness, mosaic, and interpretational assaults. Cheddad et al. supported a few central necessities in the utilization of steganography, for example, keeping up an adjusted appropriation of the install ding bits (i.e., "0 and 1"), evading smooth homogeneous territories, minimizing visual ancient rarities, and underscoring the ne- cessity to check heartiness against steganalysis. Furthermore, Kayarkar et al. overviewed on late data stowing away strategies in still picture, sound sign, system parcels, and feature groupings, alongside relative investigation of these procedures.

There are some review papers on computerized information encryption strategies, in which piece of them are nearly identified with in- development covering up. For instance, Lin et al. distributed a study concentrating on encryption and watermarking techniques, alongside the difficulties and headings of computerized right administration (DRM) in feature area. As of late, Stutz et al. distributed a discriminating diagram of encryption routines in the H.264/SVC (versatile feature coding) compacted feature space. They compress the uses of feature encryption as far as bundling, spilling, transcoding, and watermarking.

II. Overview of H.264 Video Compression Standard

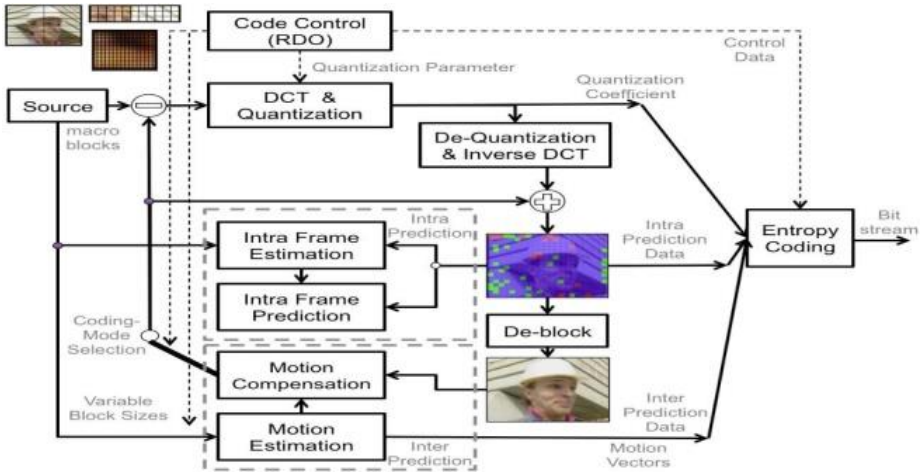
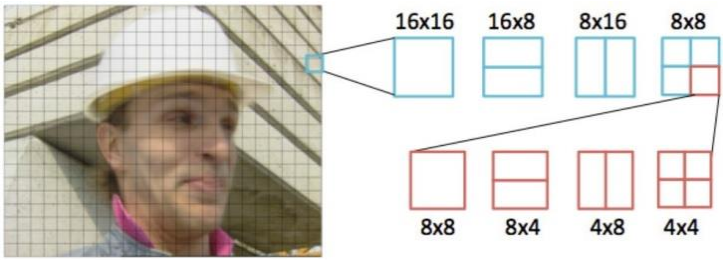


Fig. 3. H.264 hybrid video encoder.

In examination to the past gauges, H.264 joins different new peculiarities to further enhance feature pressure productivity. Eminently, these peculiarities incorporate intra- forecast in intra-outline, numerous casings reference capacity, quarter-pixel introduction, deblocking separating post- handling, and adaptable macroblock requesting (FMO). All in all, H.264 partitions the arrangement of edges (i.e., pictures) into a few gathering of pictures (GOPs). These casings are named as I (intra), P (anticipated), and B (bidirectionally anticipated) edges, contingent upon the request in which they show up.

The half and half encoding methodology of the H.264 feature compres- sion standard is indicated in Fig. 3.



III. DATA REPRESENTATION SCHEMES

Theoretically, a data concealing technique can be illus- trated by the relationship among state, element, and the significance of every state. Here, importance alludes to part (e.g., the sixteenth 4-bit fragment) of the data and it is spoken to (i.e., encoded) by a specific condition of the element in which case a substance can be a pixel, coefficient, coding mode, and so on. The data decides the state in which the element ought to be in amid the inserting methodology, and the change plan changes the substance starting with one state then onto the next to encode the sought data. For the sample indicated in Fig. 5, the message "canine hits feline" can be spoken to by three coefficient values, to be specific, E1 = 12, E2 = 28,

State (condition)	Meaning
A (E_i < 10)	cat
B (10 ≤ E_i < 15)	dog
C (15 ≤ E_i < 20)	chase
D (20 ≤ E_i)	hit

Example:
Meaning : Dog hits cat
State : B, D, A
Entity : E_1 = 12, E_2 =28, E_3 =3

A. Bit Plane Replacement

The general thought of bit plane substitution is to implant data in a specific bit plane (i.e., area) settled upon by both the sender and beneficiary. In this methodology, one bit can be embedded into an advanced host without bringing on huge perceptual effect on the host content.

B. Spread Spectrum

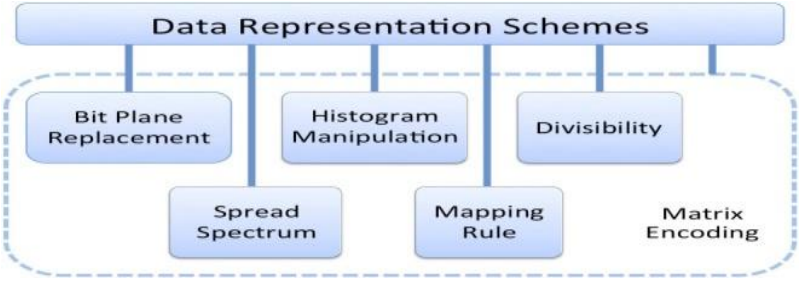
In a still picture, spread range based data concealing strategy is broadly used for watermarking purposes. In H.264 compacted video.this class of information representation plan, concealed informationis implanted inside a scope of satisfactory changes and it is not distinguishable to the human visual framework. Cox et al. presented three watermarking strategies in view of spread range. These methods can be defined as

V'i = vi + awi (1)

V'i = vi(1 + awi) (2)

V'i = vi(eawi) (3)

i are theinput and yield values, individually, andwill be a scalingparameter that decides the degree to which w adjusts vi. Comparison (1) proposes that the yield is created by adding data to the host, which is invertible. Yields of (2)and (3) are produced in view of duplication and exponential operations, and they are invertible just if vi = 0.



C. Histogram Manipulation

Fig. 7 demonstrates the histogram of pixels in a packed still picture (identical to one casing in feature). The pixels qualities are normally connected with an alternate worth to install data.

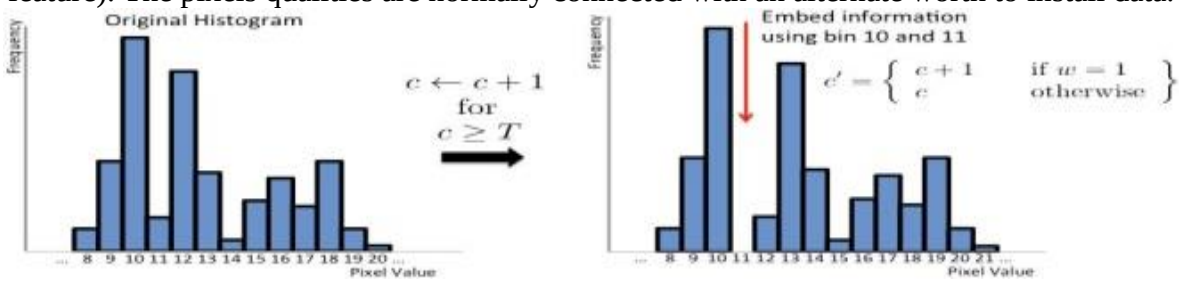


Fig. 7. Hiding information using histogram.

Specifically, Ni et al, used the zero and top purposes of the histogram and somewhat change the (grayscale) pixel qualities to insert data. The first histogram is preprocessed to zero out the T th canister (i.e., the container by the crest point) for information inserting purposes by expanding the worth c to c+1 for all c ≥ T. Ni et al. accomplished reversible information inserting with high payload while keeping up high perceptual quality (i.e.,>48 dB).

E. Detachability

The detachability of a worth by a particular divisor can be abused as a fundamental property for reversible data concealing. For instance, in Wong et al. scaled the greatness of every coefficient in the macroblock prime number using 1 is to be implanted, or abandon them as they seem to be (i.e., no change) to implant "0". In place for this technique to be feasible, distinguishableness of all coefficients by the picked prime number needs to be checked to keep away from mistake amid extraction. A more complex technique considers a couple. These qualities are then changed to comply with a basic mathematical statement as

$yi + nxi+1 \equiv 0 \bmod (n + 1)$. (4)

Information (ω_i)	Modification (μ_i)						
	μ_1	μ_2	μ_3	μ_4	μ_5	μ_6	μ_7
ω_1	✓		✓		✓		✓
ω_2		✓	✓			✓	✓
ω_3				✓	✓	✓	✓

Fig. 9. Example of a (1, 3, 7) matrix encoding [52].

F. Framework Encoding (ME)

ME is a general guideline that can be connected on top of the previously stated information representation plans to enhance their implanting efficiencies, i.e., the quantity of changes every inserted bit. Fig. 9 demonstrates an illustration of the (1, k, 2k −1) = (1, 3, 7) grid encoding plan and the conditions of the data μi on the substances ωi. Here, at most one alteration is obliged to implant k = 3 bits utilizing 2k − 1 = 23 − 1 = 7. The plan then chooses which μi to change when fundamental. For instance, if p1

= ω1, p2

= ω2 however p3 = ω3, then μ3 will be adjusted in light of the reliance stipulated in Fig. 9. ME is proposed by Crandall et al. [53] and further enhanced by Fridri.

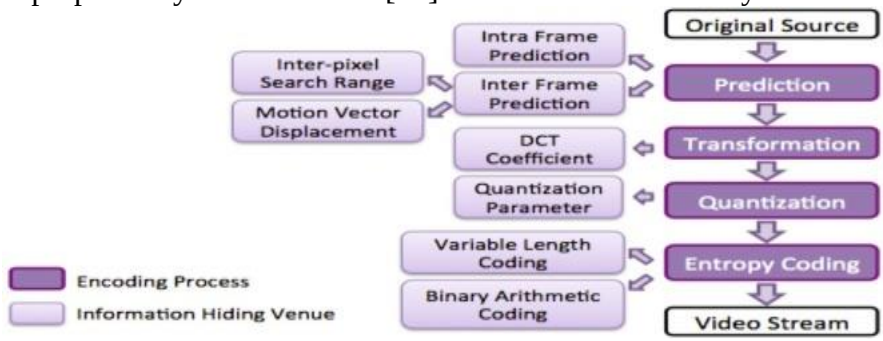


Fig. 10. Venues for information hiding in H.264.

IV. OPEN DOORS FOR INFORMATION HIDING IN H.264

H.264 is a half and half feature encoding standard that comprises of a few vital procedures, including expectation, change (i.e., DCT), quantization, and entropy coding, as indicated in Fig. 10. Through the years, different data concealing systems are proposed and acknowledged utilizing different segments, alluded to as venues, inside every procedure. Basically, data stowing away can happen preceding the encoding methodology, i.e., ordinary strategies (vigorous against pressure) can be connected straightforwardly to every casing.

A. Forecast Process

A few specialists have controlled the square forecast transform in vector quantization-based picture pressure to install data. Diverse coding techniques are connected on devoted squares, for example, truncate coding, and side-match vector quantization. In the compacted feature area, comparative methodologies are taken by misusing mode, square size, substances, and so forth., that are identified with the forecast process.

1) Intra-Frame Prediction:
On the off chance that a macroblock is encoded in intra-mode, the forecast is completed by using one of the 14 expectation modes (i.e., nine for 4×4 hinders, four for 16×16 squares, and the skip mode) while alluding to the already encoded and reproduced pieces, where they themselves could be macroblocks anticipated utilizing the intraprediction mode.

Size (State)	Bits represented (Meaning)
16×16	00
16×8 or 8×16	01
8×8 or 4×4	10
8×4 or 4×8	11

	CAR	Information
Example :	434152	ASCII (Hex)
	0100 0011 0100 0001 0101 0010	ASCII (Binary)

Separated in 2 bits per group

01	00	00	11	01	00	...

Select block type according to the mapping rule

8×16	16×16	16×16	8×4	8×16	16×16	...

Fig. 11. Mapping rules for prediction block type to embed information.

B. Change Process
Like data stowing away in still picture, luminance DCT coefficients are regularly used as thevenue to shroud data by utilizing bit plane replacement(i.e., odd–even) installing procedure. Mama et al. proposed to insert data into the quantized DCT coefficients (luminance) in I-outline. In light of the examination of the relationship between the DCT coefficients and the mutilation acquired in pixel values, a few coefficients are combined for information implanting and mutilation change purpose.

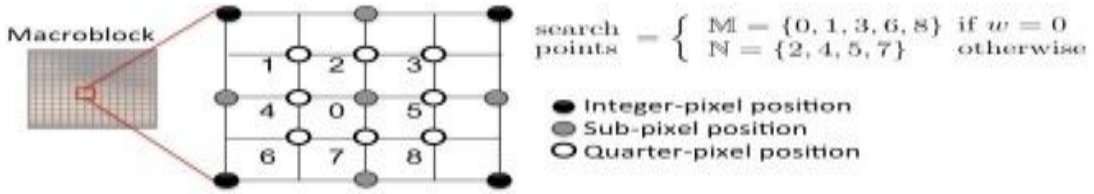


Fig. 12. Quarter pixel search point position for information hiding.

C. Quantization Process
In Wong et al's. procedure, quantization size of every macroblock (on the off chance that it is coded) is used for data covering up. This technique has the capacity protect the feature bitstream size with low inserting many-sided quality. In an alternate paper, Wong et al. kept up nature of the changed feature precisely to that of the first host even after information installing. In the event that "0" is to be inserted, the macroblock is left as it seems to be. Something else, the macroblock is controlled by isolating the quantization scale by a prime number and increasing every nonzero DCT coefficient by the same prime number.

D. Entropy Coding
Two entropy coding techniques, to be specific CAVLC and CABAC are accessible in the H.264 pressure standard, and they are likewise used for information inserting purposes. In CAVLC, run-level coding is used to minimalistically speak to series of zeros by alluding to the T1s (trailing ones) table to check the last three ±1 coefficients. Liao et al. used the T1s codeword (0–3) to convey data in light of the accompanying mapping principle.

$$\widetilde{T1s} = \begin{cases} 2, & \text{if } w = 0 \text{ and } T1s \geq 3, \\ 1, & \text{if } w = 1 \text{ and } T1s = 2 \text{ or} \\ & \text{if } w = 1 \text{ and } T1s = 0, \\ 0, & \text{if } w = 0 \text{ and } T1s = 1, \\ \text{unchanged}, & \text{otherwise.} \end{cases} \quad (7)$$

IV. GENERAL TRENDS

Data stowing away in feature is an expansion of data covering up in still picture because of the likeness in their coding structures and handling systems. Fig. 13 demonstrates the course of events for institutionalization of picture and feature pressure positions. The year at which a segment (i.e., element in an arrangement) is initially misused for data concealing designs is caught to the best of our insight. Note that the rundown of parts is nonexhaustive and it is limited to the segments in packed feature, and those in compacted picture that are promptly appropriate to packed feature.

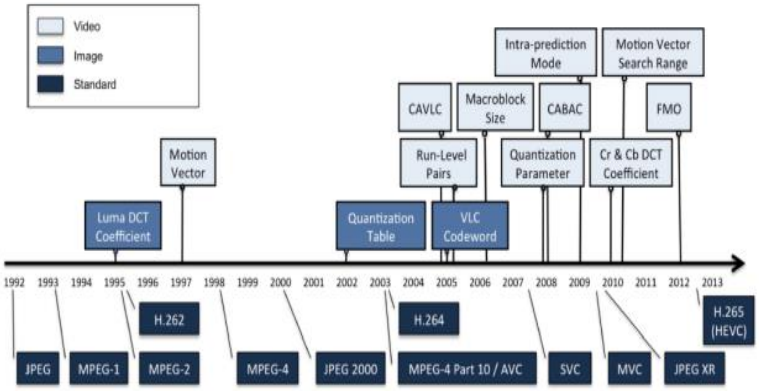


Fig. 13. Timeline of compression standards and first use of their components to realize information hiding.

We see from the outline that the pattern of data covering up is identified with the arrival of new picture/feature pressure standard. In the 1990s. Analysts presumably require a couple of years to comprehend, analysis, plan, and execute new data concealing procedures after another standard is discharged.

VI. DISCOURSES AND ANALYSIS

Naturally, among all the data concealing procedures, piece size, and intra-expectation sort choices offer straightforward approaches to encode data by partner the lists (i.e.,states) with gatherings of bits (i.e., significance). These strategies keep up coding proficiency with immaterial change in bitrate, yet cause feature choice gatherings (to four or eight gatherings) to encode more data. On the other hand, systems including movement vector build the intricacy of the feature encoding procedure. This class of methods requires exact reckoning to stay away from wrong movement remuneration amid the casing reproduction processin which case the blunders may spread until the following GOP is experienced. Then again, change coefficients can give apparently the most elevated payload to data concealing purposes. Then again, this methodology may prompt a discernible corruption in feature quality and a critical bitstream size addition when installing at high rate.

VII. Suggestion and Further

Research Direction We suggest the accompanying decisions of venue for data concealing

purposes in view of the feature criteria recorded in Table II. Specifically, for feature with lower movement reductions between casings (e.g., articles are just somewhat removed in two continuous edges), the encoder has a tendency to choose interprediction mode (over intra-mode) amid the encoding procedure. it can likewise be considered to choose a suitable data concealing method. For size (GOP) > 10 casings, piece size choice, movement vector and control on movement assessed leftover worth are suggested. These plans give high payload on the grounds that the quantity of between casing (P/B) is high in every GOP.Packed feature space, concentrating on the H.264 feature pressure standard. Normally considered information representation plans and the concealing venues were compressed. The general pattern of data covering up in the packed feature space were introduced. At that point, we sorted the current data concealing strategies in view of the venues at which they work and highlighted their qualities and shortcomings. Feature criteria, for example, movement assuagement, GOP size and bitrate were prescribed as rules to choose proper procedure for data concealing, and future examination headings were proposed.

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