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# Effect of using advance interpolation method In video compression

تأثير استخدام طريقة تداخل متقدمة في الضغط الفيديوي

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**Abstract**

In the work developing image video compression of videoconferencing by addition one Bi-directional -frame algorithm between I-frame and P-frame or between two P-frames in H.261 video compression standard without using filter. And using three bi-directional frames between (I and P) or between two P in H.263 video compression standard and using filtering to image before compression. In order to maximize the compression ratio. The proposed methods did not affect the image quality.

**الخلاصة**

في هذا العمل تم تطوير ضغط الصور الخاصة بالمحادثة الفيديوية عن طريق اضافة خوارزمية ال Bi directionalبمقدار صورة واحدة بين كل صورتين من نوع I or P او بين اثنان من نوع P-frameهذا فيما يخص مقياس .H.261 بدون استخدام filter للصور.واستخدام خوارزمية ال Bi directionalبمقدار ثلاثة صور بدلا من واحدة بين كل صورتين من نوع I او P او بين اثنان من نوع P-frame هذا فيما يخص مقياس.H.263 مع استخدام filter للصور قبل الضغط . مما أدى إلى زيادة نسبة الضغط مع المحافظة على مواصفات الصورة.

## 1-Introduction to video compression

Internet Since the past two years, digital image processing has increased dramatically in view of the wide use of the. We can watch video images on websites where we have a DVD for HDTV storage used to arrange video for viewing. So we know what video format we need to exaggerate the video characteristics and we must know which video is used and which is a series of successive images that are displayed. Each of these images is called a frame. It is not possible to observe simple differences in images such as slight changes in color, ie, the pressure steps do not press the simple differences, ie, do not press all the capacitors with the serial images. So it is possible to get a high compression ratio. It is usual A 30-image display is displayed on the display per second so some information will be duplicated between the sequential images of the video clip. For example, a video clip containing a tree was displayed for a second and at a rate of 30 frames the congenital remains can be fixed on the previous footage. Where the I-frame is compressed where it is the approved frame, the compression process of this information is not repeated. Each color is represented by the three basic colors of red, green and blue. The images can be represented using the YUV chromatography, but the

color field is not suitable for the compression process. It must be converted to the Y chromatography which gives the gray color. Y is used in the compression process only, It is also used for television systems NTSC, PAL, SECAM. The original file size will be split before you click on the size of the compressed file. Where the ratio is increased by taking advantage of the repetition of images of the expected data where only the differences are compressed. The dct, zigzag and entropy coding.

**2.H.261**

Inhibitory H.261 video compression was developed. To send video equivalent to 64 KBPS jitter. There are some H.261 applications, including videoconference and videoconferencing, a JPEG-like measure of static image compression. H.261 is used for motion detection, which compensates for the movement in the H.261 image. The FRAMES structure consists of four FRAMES and these FRAMES represent The images are divided into a group of blocks and the block is divided into a micro block and each block is divided into 8 * 8. These multiple images are sent in sequence and each image has a HEADER. The image format of H.261 is called the CIF[1].

**3. H.263**

Where the H.263 is designed to compress at a very low rate. H.263 uses DCT to compress the motion. H.263 has the highest pressure ratio of H.261. The pressure characteristics of the H.263 are called the TMN test if used to develop the pressure of H.263. Test Models. The H.263 is primarily based on H.261 but is largely developed for compression to low video compression ratio by dividing each video image into a micro-block. Each microblock is divided into 16 * 16 or 8 * 8 blocks of type Y and blocks of type Cb, Cr where the redundancy is obtained from the application of dct and the frequency of time is taken advantage of by compensating the variation of any movement. The h.263 is different from h.261, compensates the motion with half-point accuracy and two-way pressure. 8 * 8 is overlapping in front and rear directions. Arithmetic compression is used. These features are not present by pressing MPEG1, MPEG2. This is useful for applications to low bit rates. The decompression process depends on the h.261 with the development to increase the efficiency of the pressure. There are four choices to improve the compression process. This is the model of the unrestricted movement model, the use of arithmetic pressure instead of the pressure of the huffman and the use of 8 * 8 blocks instead of 16 * 16, P-frame and B-frame together. The micro-block 16 * 16 defines motion using B and P, where they are compressed with one image of the PB-frame code

**4-Previous work**

Previous frame in H.261 is use frame in a sequence are coder use two difference algorithms as illustrate in figure (1).

Previous frame in H.263 is use frame in a sequence are coder use three difference algorithms once B between I and P frame or between two P-frames as illustrate in figure (2).

**5-New work**

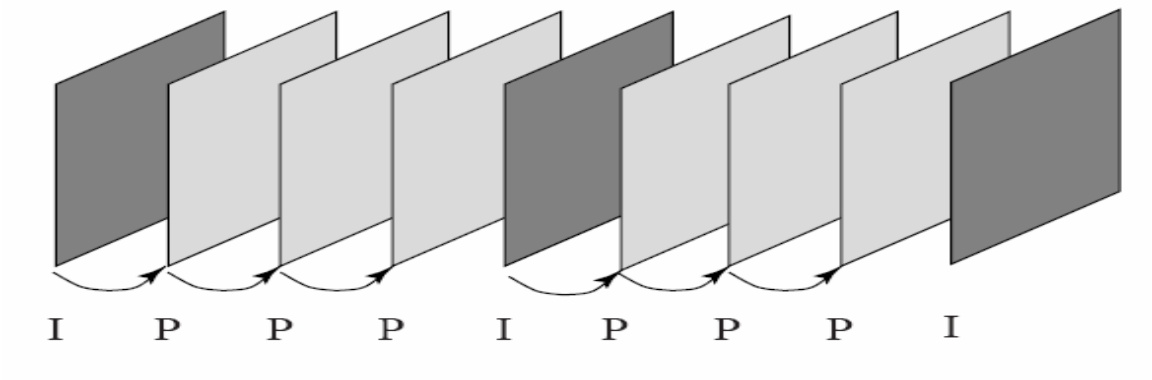
In H.261 use B picture frame between I and P or between two P-frame pictures without use filter of frames.

In H.263 use three B picture between I and P or between two P- picture frames with use filter to frame sequences before compression used. The video coders standard, frame in a sequence are coded using three different algorithms, as illustrated in figure (2).

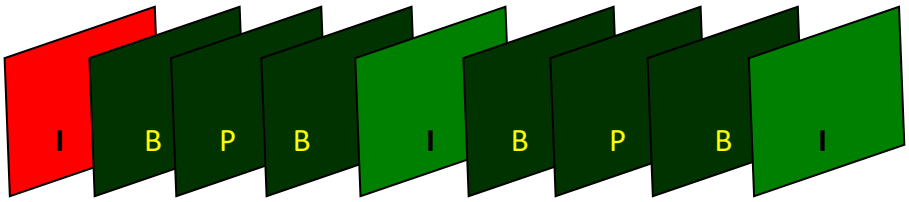
I picture Format: The I-frame image is similar to the JEPG image. The image is compressed first using DCT and then QUANTIZATION, and then the result is converted to entropy. The dct is applied after dividing the image into 8 * 8 blocks and then the result is quantified using this computation scale, increasing the compression ratio by 30%[2].. The coefficients resulting from the zigzag process are then rearranged and then run-length and variable-length compression and entropy pressure are applied. Data flow such as JEPG.

P Picture format: P Image format: P (format) Image format introduces the concept of motion compression. Each macro is encoded with a vector predicted from previous I or P frames. The decryption process copies the contents of the data of the total size in the address indicated by the vector to the macros from the currently decrypted P frame. Finally, the difference between the prediction and the macroblock that will be compressed in such fashion may be encoded into the I coding frames discussed above [2].

B picture format: The direction of the movement is in the two directions by two types of tires, the previous frame I and the next frame, p where the difference in the previous and subsequent vector is calculated, and the result of the difference in blocks determines frame B and is compressed before frame P and then decoding As with the p frame, the difference between the prediction and the compressed frame is compressed and placed with the flowing bit sequence. The error factor is reduced and the motion prediction is added to frame B[3].

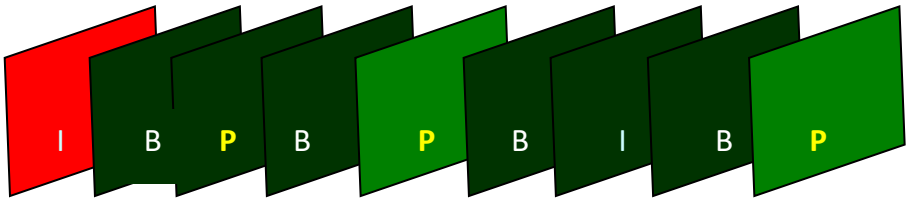



**B: old work in H.261 frame sequence**

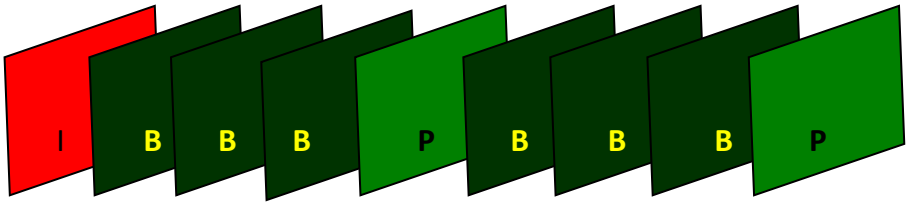



**B: New work in H.261 frame sequence**

**Figure(1) pervious and new work in H.261 frame sequence**




**A:Pervious work H.263 frame sequence**




**B: H.263 frame sequence**

**Figure(2): pervious and new work in H.263 framesequence**

## 6-Video compression with motion compensation

### Video compression of motion

Similar images are repeated in a video clip where there is a repetition. It is useful for the repetition as not every image requires video to compress independently as a new image, but the difference between the current image and the previous image is compressed in the video resulting in small values with good compression ratio

Steps to compress video images sequentially based on motion compensation

**1. Traffic calculation (search for direction of movement)**

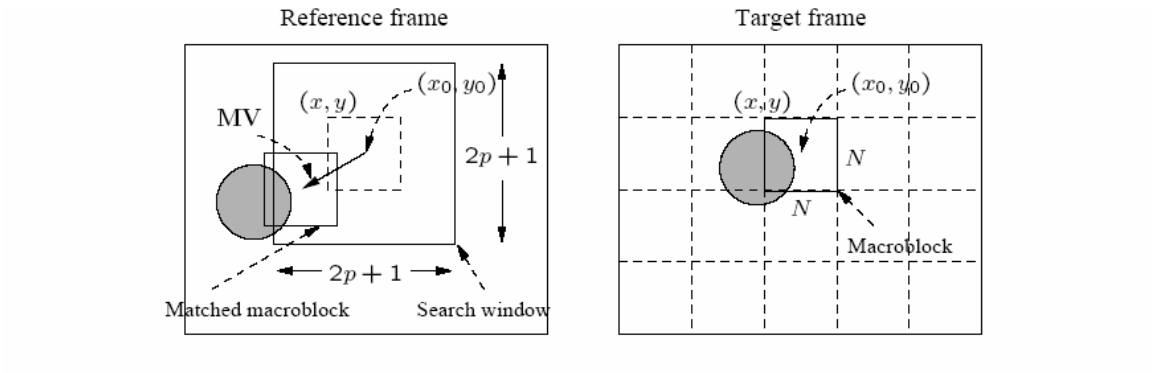
**2 - applying the mc, which depends on the prediction**

**3 - Discover the error of any variant difference**

**.1 Motion compensation**

Each image is split into a microblock with a certain size such as 16 * 16 for the Y-type and 8 × 8 for the Cb,Cr image. Sub-samples such as 0: 2: 4 are used only where the motion is exposed between the micro-block. The current image is called the target image and is compared with the previous or next image referred to as the reference images. This is called the Motion Finder and Figure 3 is the state of the foreground images from which the frame of reference is taken as a previous image.

The search is usually confined to the area of the small integer values in the horizontal and vertical directions of the space [p, p]. This makes the search window area of 2p + 1 (X) (2p + 1).




**figure(3) : macroblocks and motion vector in video compression**

### 6.2 Search for motion vectors

Find differences between the blocks ie the difference between the two blocks by using the absolute difference equation for the MAD rate

$$MAD(i,j)=\frac{1}{N^2}\sum_{k=0}^{N-1}\sum_{i=0}^{N-1}\left|C(x+k,y+l)-R(x+i+k,y+j+l)\right| \quad .....(1)$$

N Indicates the size of the block or mackerlock

K and l indicate the point in the macroclock and i and j refer to the horizontal and vertical coordinates

K + x and y + l refer to the macromolecule point in the target image R (x + i + k, y + j + l) refers to the point in macroblock in the reference image. The aim of the research is to find a vector (i, j) which represents the difference ie the vector of motion mv = (u, v), so that the minimum (i, j)

$$(u,v)=[(i,j)|MAD(i,j)\ \ is\ \ \min imum, i\in[-p,p], j\in[-p,p] \quad .....(2)$$

### Sequential search

Serial Search: Sequentially look for the window (2p + 1) x (2p + 1) fully in the reference image (also expressed in full search).

Where the macroblock comparison is located in each of the locations within the window to macrobloc in the target frame pixels by the points come second phase then derived from mad using mv (1).

- The location (i, j) which indicates less than the value mv (u, v) is assigned to the total mass in the target image.

The search method is highly cost-effective, assuming that each comparison point requires three operations (subtraction, absolute value, etc.). The caterpillar getting the transmission for the macroblock is one (2p + 1). (2p + 1) .N2 0.3 = O (p2 N2) [4,5].

**Procedure motion vector_ sequential_ search**

```
Begin
Min-MAN=LABGE-NUMBER;   /*Initization*/
For i=-p to p
 For j=-p to p
   {
     Cur-MAD=MAN(I,j);
      If cur-MAD< min-MAD;
       {
          Min_MAD=cur_MAD;
u=i;     /*Get  the coordinates for mv.*/
v=j;
}
}
```

end

**7- H.261 and H.263 Frame Sequences**

There are two types of I-frame and a frame of type (p, B-frame) where the I-frame is treated as a separate image and the dct is applied in a similar way to the JEPG. This applies to each type I frame as shown in Figure 4.

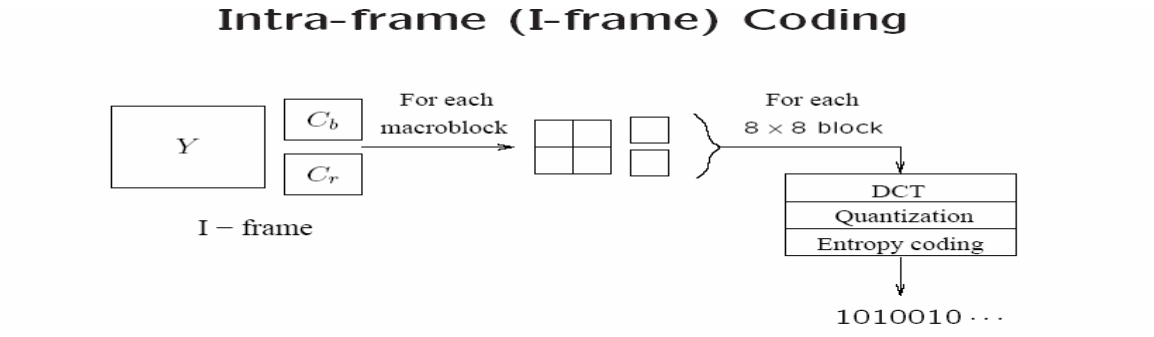
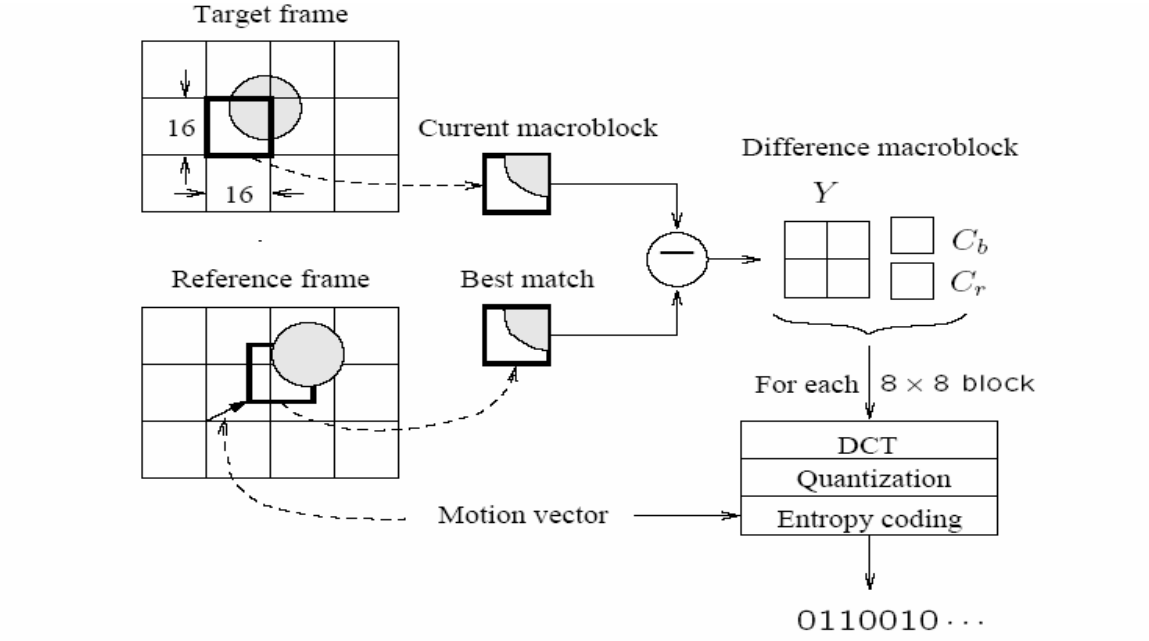



**Figure (4) I- frame coding**

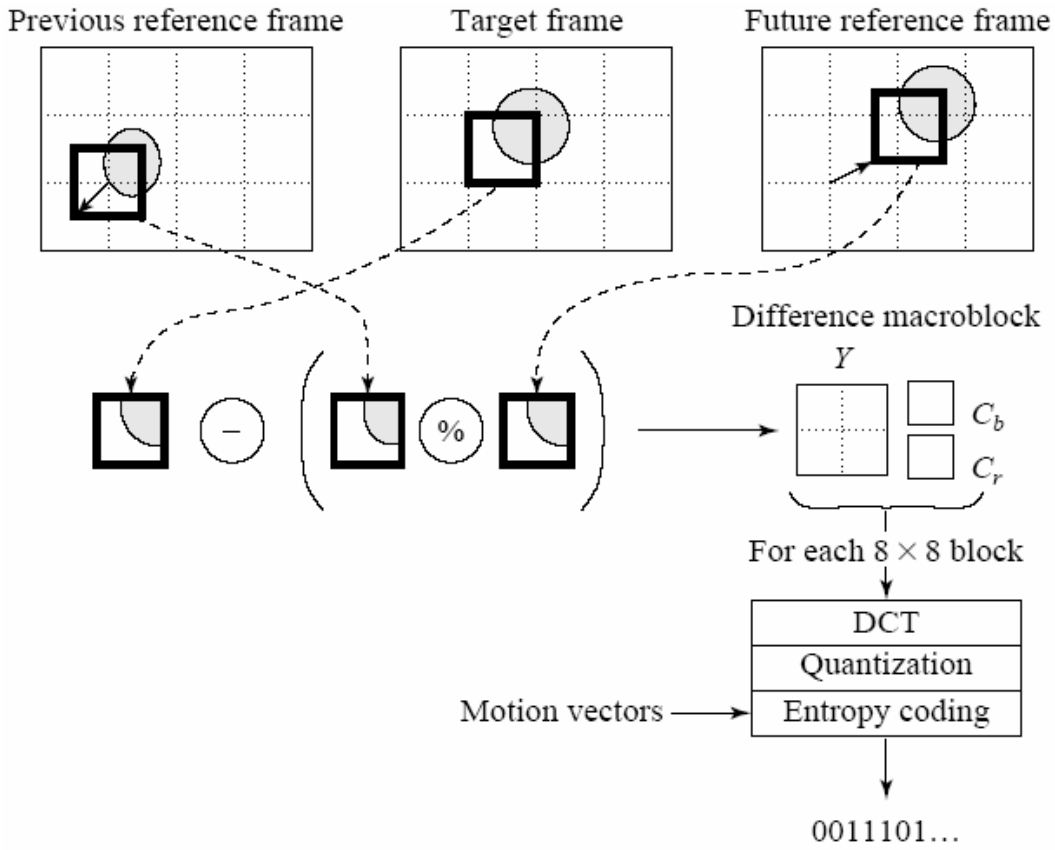
I hope the p-frame image series depends on the compression of any variance with the previous frame of type p or type I and not only with I, where the repetition is deleted with p, and the pressure of type I is to delete the spatial recurrence. As shown in Figure 5



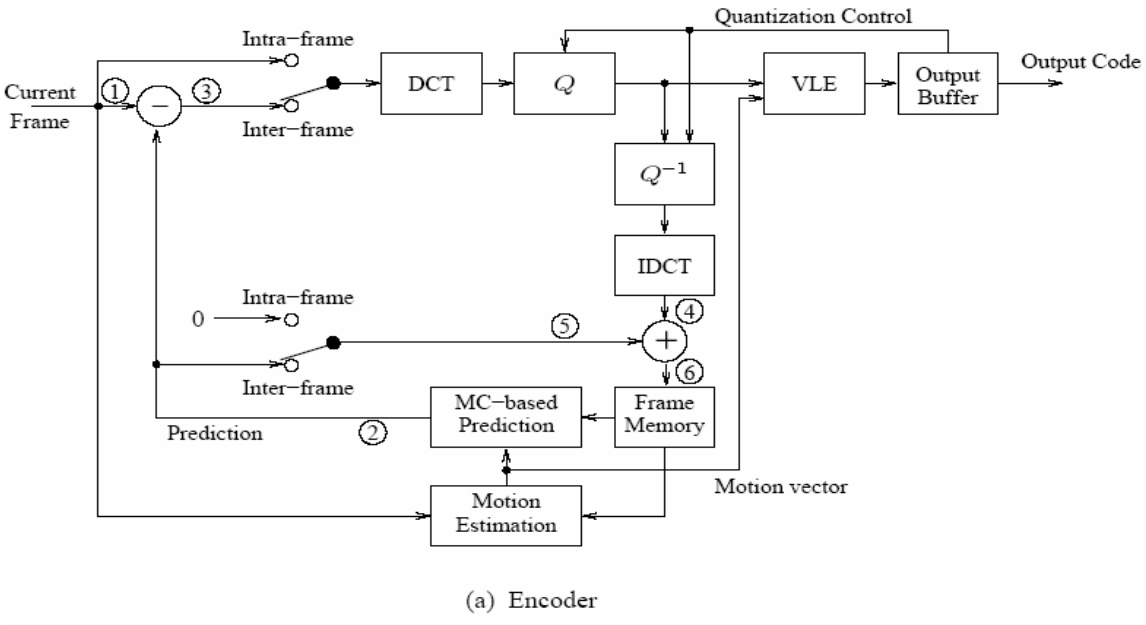

**Figure(5): H.261 and H.263 P-frame Coding Based on Motion Compensation**

The frame of the B-frame is bi-directional, which is the result of the difference between the previous image of type I or p and p-frame in the PB-frame unit and the pressure is solved as shown in Figure (6)[6,7].

The H.263 and H.261 pressure motion vectors always depend on the full point of a specified range between 15 and 15, where p is 15 Block size 16 * 16 points for picture frame of type Y, block size 8 * 8 for picture frame of Cb, Cr Each block of size 8 * 8 applies DCT conversion and then moves the DCT coefficients to the quantization phase and the zigzag arrangement and then the entropy encoding phase Figure 5 illustrates the H.26 H.263 P-sequence diagram based on compensation to compensate for the difference. For each macoblock in the target image, the motion vector is determined using a conventional search method after the expected movement is detected Figure 5 shows the H-26 H.263 diagram of the P sequence on the basis of compensation by assigning variation. For each macrblock in the target image, the vector is determined using the traditional search method after the expected motion detection.




**Figure(6):B-frame Coding Based on Bidirectional Motion Comensation.**



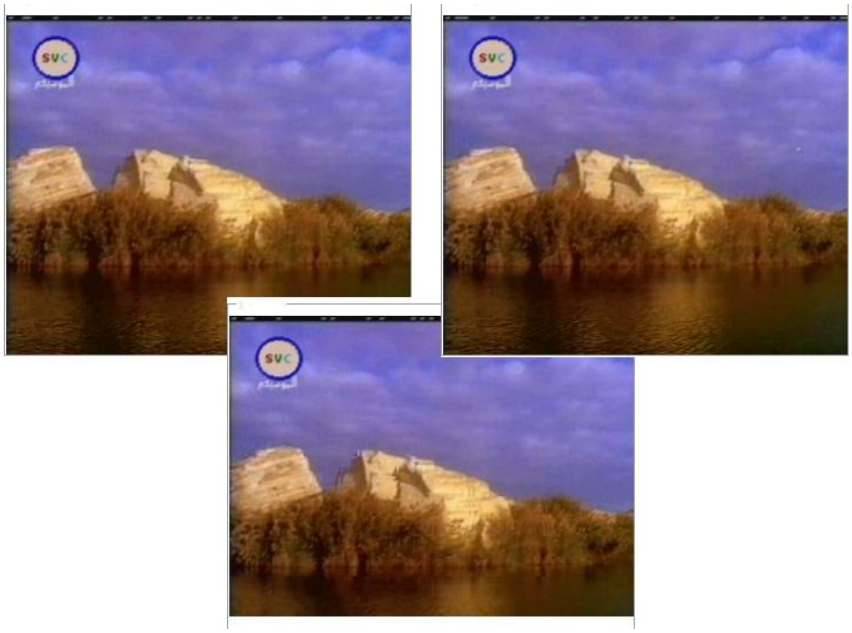

**Figure(7) :H.261 and H.263 encoded and decoder.**


**Figure(8): some reconstructed frames for the video-1 sequence using the H.261 video compression after addition bi-direction-frame .**


**Figure(9): some reconstructed frames for the video-1 sequence using the H.263 video compression. after increase bi-direction-frame.**


**Figure(10): some reconstructed frames for the video-2 sequence using the H.261 video compression after addition bi-direction-frame .**


**Figure(11): some reconstructed frames for the video-2 sequence using the H.263 video compression after increase bi-direction-frame.**



**Figure(12): some reconstructed frames for the video-3 sequence using the H.261 video compression after addition bi-direction-frame .**


Figure(13): some reconstructed frames for the video-3 sequence using the H.263 video compression. after increase bi-direction-frame.

Table-1 results of old work for H.261 video compression

| Video image | Compression Ratio | NO of blocks | PSNR | PSNR-I | PSNR-P | PSNR-B |
|---|---|---|---|---|---|---|
| Video 1 | 18,43 | 11610 | 37.52 | 49.88 | 30.46 | - |
| Video-2 | 14.34 | 10746 | 38.69 | 48.43 | 33.13 | |
| Video-3 | 39.48 | 8274 | 37.02 | 50.83 | 31.84 | |

Table-2 results of new- work for H.263 video compression.

| Video image | Compression Ratio | NO of blocks | PSNR | PSNR-I | PSNR-P | PSNR-B |
|---|---|---|---|---|---|---|
| Video 1 | 20.52 | 10116 | 34.60 | 50.18 | 32.37 | 30.16 |
| Video-2 | 18.70 | 8016 | 35.98 | 48.50 | 33.22 | 35.18 |
| Video-3 | 47.37 | 6870 | 35.18 | 50.76 | 31.59 | 31.82 |

Table-3 results of old- work for H.261 video compression.

| Video image | Compression Ratio | NO of blocks | PSNR | PSNR-I | PSNR-P | PSNR-B |
|---|---|---|---|---|---|---|
| Video-1 | 27.59 | 11406 | 34.60 | 50.15 | 32.63 | 35.82 |
| Video-2 | 28.28 | 8022 | 35.98 | 48.50 | 33.21 | 36.00 |
| Video-3 | 71.09 | 6384 | 29.96 | 38.74 | 26.80 | 26.96 |

Table-4 results of new work for H.263 video compression.

| Video image | Compression Ratio | NO of blocks | PSNR | PSNR-I | PSNR-P | PSNR-B |
|---|---|---|---|---|---|---|
| Video 1 | 41.99 | 7632 | 28.27 | 39.51 | 26.94 | 27.23 |
| Video-2 | 47.37 | 5546 | 26.65 | 36.30 | 25.64 | 26.65 |
| Video-3 | 86.2 | 5118 | 28.05 | 38.70 | 27.01 | 26.97 |

**Conclusions**

1- In the case of using I-frame algorithm and P-frame algorithm in H.261 the compression ratio less than by using three algorithms (B-frame) between me and P or P and P. where compression ratio increases, also the quality criterion (PSNR) shows better results.

2- In the case of using I-frame algorithm and P-frame algorithm and one B-frame between me and P and using filter before compression where compression ratio increases, also the quality criterion (PSNR) shows better results.

3- In the case of using three B-frame algorithms between I and P or P and P the compression ratio better results, also PSNR good results.

4-the number of blocks compression in the new method is smaller than the number of blocks in the old method.

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