BLOCK MATCHIG ALGORITHAM FOR MOVING IMAGE SEGMENTATION

Prof. K. M. Pimple*, Tushar R. Tale, Ankush V. Konde*****

(Department of Electronics & Telecommunication, Assistant professor, IBSS COE Amravati)

ABSTRACT

Many fast algorithms for block matching have been proposed in the past, but most of them do not guarantee that the match found is the globally optimal match in a search range. This paper presents a new fast algorithm based on the winner-update strategy which utilizes an ascending lower bound list of the matching error to determine the temporary winner. Two lower bound lists derived by using partial distance and by using Murkowski's inequality are described in this paper. The basic idea of the winner-update strategy is to avoid, at each search position, the costly computation of matching error when there exists lower bound larger than the global minimum matching error. The proposed algorithm can significantly speed up the computation of the block matching

Keywords **- motion estimation, winner-update strategy, Block matching, fast algorithm.**

I. INTRODUCTION

The need of data transmission from one point to other point is increasing rapidly with the demand of transmission of both image as well as speech signals. Application of image processing comes to play when images has to be operated for different applications. One such application is separating the desired images sequence from given input sequence. The isolation of desire image from an image sequence is termed as segmentation. Segmentation plays a vital role under image processing where the image alteration is specific for a limited area. Segmentation of moving images is found to be quite complicated compare to a still image segmentation. The complexity increases due to large number of repetitive frames in an image sequence. This affects the operational speed of the overall system resulting in a non-efficient system. This effect can be overcome if an appropriate number of frame sizes and frame skips are considered.

The ideal goal of segmentation is to identify the semantically meaningful components of an image and grouping the pixels belonging to such components. While it is impossible to segment static objects in image at the present stage, it is more practical to segment moving objects from dynamic scene with the aid of motion information contained in it. Segmentation of moving objects in image sequence plays an important role in image sequence processing and analysis. Once the moving objects are detected or extracted out, they can serve for varieties of purposes.

The aim of image segmentation is to segment the video frame into background, foreground, objects, and sub objects with different characteristics so that the mesh can represent the motion of objects perfectly. During segmentation, luminance, color and motion are used. In fact, decomposing a video sequence into Visual Object (VO) is very difficult. An intrinsic problem of VO generation is that objects of interest are not homogeneous with respect to low-level features such as color, intensity, or motion.

II. BLOCK MATCHING ALGORITHM

The motion estimation and compensation technique has been widely used in video compression due to its capability of reducing the temporal redundancies between frames. Most of the algorithms developed for motion estimation so far are block-based techniques, called block-matching algorithm (BMA). In this technique, the current frame is divided into fixed size of blocks, and then each block is compared with candidate blocks in reference frame within the search area. The widely used approach for the BMA is the full search BMA (FSBMA), which examines all candidate blocks within the search area in the reference frame to obtain a motion vector (MV). The MV is a displacement between the block in the current frame and the best matched block in reference frame in horizontal and vertical directions The basic idea of block matching is depicted in the figure where the displacement for a pixel (n_1,n_2) in frame k (the present frame) is determined by considering an N_1 x N_2 block centered about (n_1, n_2) and searching frame k+1 (the search frame) for the location of the best-matching block of the same size. The search is usually limited to an N_1+2M_1 x

N_2+2M_2 region called the search window for computational reasons.

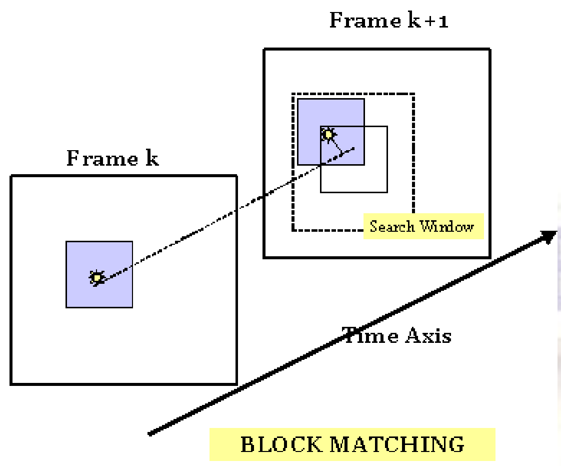

Figure 1: Block Matching

III. Matching Criteria

The matching of the blocks can be quantified according to various criteria including the maximum cross-correlation, the minimum mean square error (MSE), the minimum mean absolute difference (MAD) and maximum matching pel count (MPC)

$$MSE(d_1,d_2)=\frac{1}{(N_1,N_2)\sum[s(n_1,n_2,k)-s(n_1+d_1,n_2+d_2,k+1)]^2}$$

The estimate of motion vector is taken to be the value of (d_1, d_2) which minimizes MSE.

$$[d_1,d_2]T=\arg\min MSE(d_1,d_2)$$

Normally not used, as it is difficult to realize the square operation in hardware

$$MAD(d_1,d_2)=\frac{1}{(N_1,N_2)\sum[|s(n_1,n_2,k)-s(n_1+d_1,n_2+d_2,k+1)|]}$$

$$[d_1,d_2]T=\arg\min MAD(d_1,d_2)$$

Performance of MAD deteriorates as the search area becomes larger due to the presence of several local minima.

$$MPC:T(n_1,n_2;d_1,d_2)=1,$$

If

$$|[s(n_1,n_2,k)-s(n_1+d_1,n_2+d_2,k+1)]|\le t;$$

Otherwise

$$MPC(d_1,d_2)=\sum T(n_1,n_2;d_1,d_2)$$

$$[d_1,d_2]T=\arg\max MPC(d_1,d_2)$$

The selection of an appropriate block is essential for any block-based motion estimation algorithm. There are conflicting requirements on the size of the search blocks. If the blocks are too small, a match may be established between blocks containing similar gray level patterns, which are unrelated in the sense of motion. On the other hand, if the blocks are too large, then actual motion vectors may vary within a block, violating the assumption of a single motion vector per block.

IV. Winner Update Strategy

For the application in video compression, the major drawback of not guaranteeing the global minimum is that the compression ratio is generally lower due to the higher matching error (which can be thought of as the prediction residual to be coded). In this paper, I propose an efficient and simple block matching algorithm, named the winner-update algorithm. This algorithm can accelerate the block matching process while still ensuring that the global minimum of the matching error can be obtained. This algorithm utilizes an ascending lower bound list of the matching error to save the computation

V. Winner Update Algorithm

The process of choosing the winner having the minimum penalty score in the previously mentioned game resembles the process of finding the corresponding block having the minimum matching error in block matching.

Thus, PSAD represents the temporarily accumulated penalty score. Obviously, the following inequality relationship holds true:

$$PSAD^1(u,v)\le PSAD^2(u,v)\le ....PSAD^{B2}(u,v)=SAD(u,v)$$

As a result, the list of the partial accumulation, $PSAD^1(u,v)=\{1,........B^2\}$, can be used as the lower bound list needed by the winner-update strategy. That is,

$$LB^1(u,v)=PSAD^1(u,v)=1,.........K$$

where $K = B^2$. This lower bound will be referred to as the partial-sum lower bound. Notice that the last element in this list, $LB^K(u, v)$, equals the complete matching error, SAD(u, v). These K lower bounds are in ascending order:

$$LB^1(u,v) \le LB^2(u,v) \le .... \le LB^K(u.v)$$

Furthermore, the number of pixels used for summing up these lower bounds is ascending from 1 to B^2.

VI. RESULTS

1. Input Frames at Frame Skip =5 Frame Number = 5

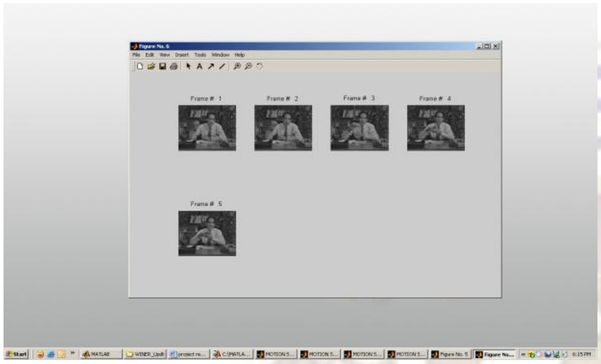

Figure 2: Input frames at frame skip =5 frame number = 5

2. Output Frames At Frame Skip= 5 Frame No=5

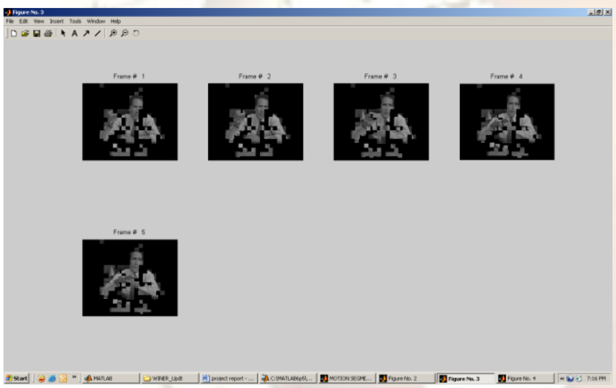

Figure 3: Output Frames At Frame Skip= 5 Frame No=5

A. Time Comparison

Claire

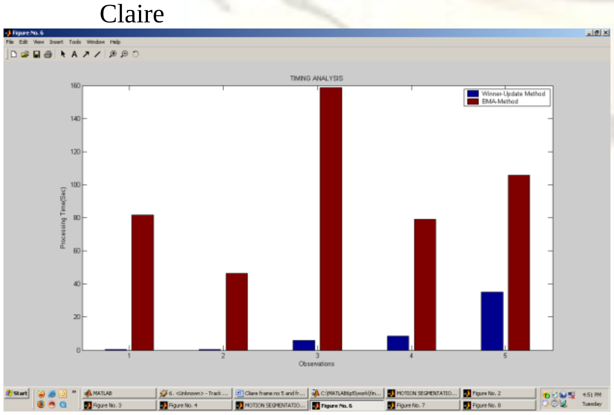

Figure 4: Claire

B. The Segmentation by BMA

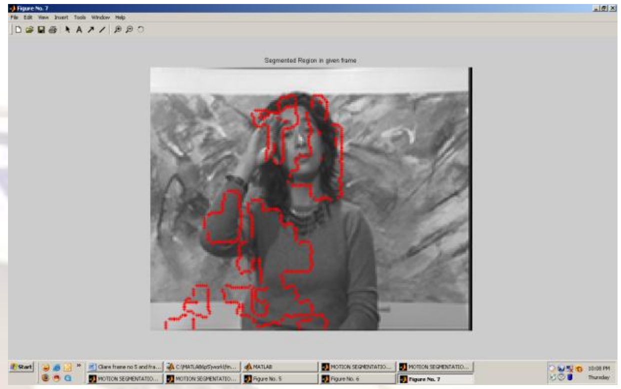

Figure 5: Segmentation of Silent video using BMA

C. Segmentation by Winner

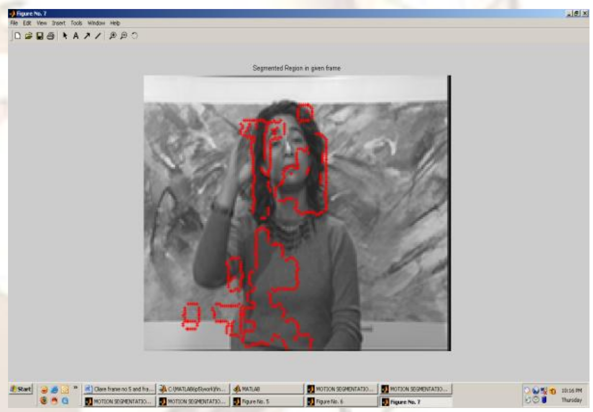

Figure 6: Segmentation of Silent video using Winner Update Method

VII. Conclusion

As per the problem of segmentation where moving image segmentation was always a difficult task a system has been proposed here which can efficiently segment a moving foreground object from a given image sequence with still background .the sub module of the system are developed using matlab and been verified for its functionality. from the result obtained it can be observed that with the increase in frame number and keeping constant frame skip the clarity of the segmentation is increased and increasing of frame skip ,keeping frame number constant results in higher resolution of segmentation because of the difference between two neighboring frame is quit less. This observation shows the effect of varying frame number and frame skip on segmentation.

From all the above observations it can be concluded that with a higher value of frame number and lower value of frame skips results in clear image segmentation .the optimal value obtained for input frame i.e. salesman.qcif- file is 5 frame and 5 skips considering the operation speed and clarity.

VIII. FUTURE SCOPE

In this particular implementation I have performed operation on gray indexed images, the images in which color of image is in different shades of gray. In future the algorithm can be effectively utilized for colored images als

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