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Reduction of Block Overlap in Motion Estimation

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Abstract

This work is based on the motion estimation to handle the ill-posed nature. The algorithm used in this study that performs the motion estimation for overlapped block is used to calculate with using pixel of neighborhood block with higher correlation and present block by considering the correlation level of neighborhood block. The proposed method shows in a significant improvement in the quality of the mothion field when comparing the conventional methods.

Keywords: *Block reduction, Motion estimation, Motion compensation, Block matching algorith*.

1. Introduction

The motion estimation (ME) is used in the video processing application. The motion blur occurs in video clip of Liquid Crystal Display (LCD) device which is currently being used very much [1-3]. Such method has been adopted in video coding standard like MPEG and H.26x [4-5]. The method of compensation of motion estimation can be done by using the mean frame of two consecutive frames and various such methods have been using till now. The motion blur maximally can be minimized in the case of a frame interpolation using the motion estimation-motion compensation [5]. Basically ME by Block Matching Algorithm (BMA) with two successive video frames can be classified into global and local. The first occurred by camera motions such as translation, scale, and rotation, whereas another one is due to motions of individual objects contained in the video. This method is to perform the block based motion estimation for all positions within the search area of previous frame [7]. In this work, new motion estimation and compensation technique is proposed in which how to effectively reduce block artifact which has occurred when using wrong motion vector are expressed.

2. Proposed Algorithm

In the proposed algorithm, blockwise ME/MC, pixelwise classification, area-based ME/MC, and MC confidence map are categorized. The first step represents the blockwise ME/MC. Blockwise ME means the conventional BMA, in which a single translational object motion is assumed in a block. The image

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compensated by the blockwise MV is passed through the second step (pixelwise classification step). The large difference occurs near boundary pixels of a moving object. The area with large positive (negative) intensity difference values corresponds to the covered (uncovered) part of a moving object or vice versa. Thus, the proposed algorithm partitions a block into three types of non-overlapping areas (area with small frame differences, area with large positive frame differences, and area with large negative frame differences) based on the aspect of the frame difference. The accuracy of the motion estimation (ME) process is reduced if a block consists of more than two types of areas, for example, the uncovered area often has no information in the forward ME. Figure 1 belongs to the step three. With up to three non-overlapping areas in a block, the third step uses different processes for area sequences A1, A2 , and A3 For area sequences A1, and A2 the area-wise ME/MC, which represents the conventional BMA, is performed. Since area sequences A1, and A2 almost correspond to the object-boundary areas, another ME process separating the different motion areas finds more accurate MVs close to the true motion. For area sequence, A3 the overlapped MC is performed to reduce the blocking artifact.

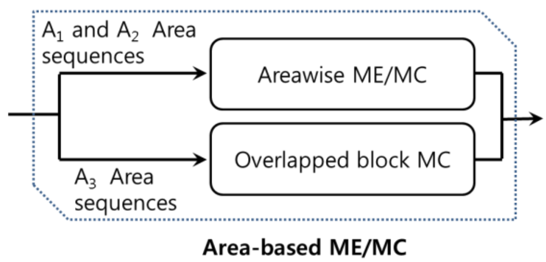


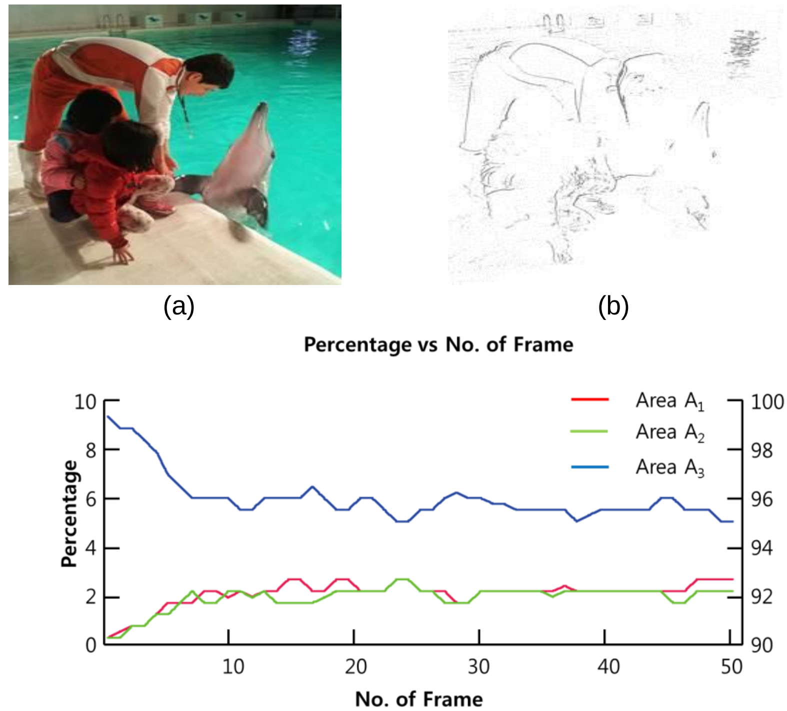
Figure 1. Area based motion estimation and motion compensation

3. Experimental Result

In the proposed method, depth maps of the test images created which are illustrated in Figure 2. The gray of depth map indicates depth of 5-level. If the gray of depth map is close to white, then the depth is shallow. If the gray of depth map is close to black, then the depth is deep. For efficient performance evaluation, it is estimated that the sense of depth is applied properly in each object through absolute pixel difference of left and right image created by stereoscopic image conversion method (1).

$$S_{APD}(i,j) = ABS(\ S_L(i,j) - S_R(i,j)\ ) \tag{1}$$

In (1), SAPD is the absolute pixel difference, SL and SR are left and right stereoscopic images, respectively, and ABS is the absolute value. Figure 2 (b) shows the pixels classified by (2) with a =10, in which selected areas , A1, A2 , A and A3 are represented by gray levels 0, 128, and 255, respectively. Most of the black blocks in Figure 2 are classified as A1 and A2 with up to three non-overlapping areas, in which each area has more accurate MVs. Figure 2(c) shows percentages of each area A1, A2 , A and A3 as a function of the frame number of the original image with a =10. Percentage values of A1, and A2 are indicated along the left vertical axis, whereas the percentage value of A3 is indicated along the right vertical axis. We observe that most of the areas (94-99%) are included in area, A3 and the areas (1-6%) sensitive to motions are included in areas A1, and A2.



(c)

Figure 2. Area classification : (a) Original image, (b) Area image (5th frame), and (c) Area ratio (50 frames)

4. Conclusions

We presented two BMA-based ME algorithms based on pixelwise classification of the MC error. The blocking artifacts especially near the boundaries of objects were reduced. The proposed algorithms classify each block into up to three non-overlapping areas by the MC error of the reconstruction image. The pixels with large absolute MC error as significant elements were categorized to enhance the ME/MC performance. The more accurate MVs in the categorized area were found, the improved results were found. The proposed algorithms can effectively segment objects and background using the three non-overlapping areas. In the video based application, they can be effectively applied to accurate ME.

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