Human Motion Based on Foreground segmentation

Khalid Khalis Ibrahim

Introduction

Image segmentation is important in computer vision processing applications : the goal of image segmentation is to find regions that represent objects or meaningful parts of object . while it is impossible to segment static objects in images at the present stage ,
it is more practical to segment moving objects from a 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 they can serve for varieties of purposes , such as content – based image / video retrievel and image / video composition Image segmentation is the action of any algorithm that separates regions of an image in way that resembles how a human would naturally perceive them . Division of the image into regions in relation to objects of interest is necessary before any processing can be done at a level higher than of the pixel .
Identification of real objects , or actually finding any thing of interest within the image , need some form of segmentation . [1]

Al though the objective of this study is not related with segmentation methods , it may be of interest to state here that image segmentation methods will look for objects that either have some measures of homogeneity within Themselves or have some measures of contrast with the objects on their boarder . hence most image segmentation algorithms are modifications , extensions and combinations of these two concepts [2] .

2Segmentation of moving object in image processing:

Segmentation of moving object in image segmentation is very important in many aspects of multimedia . Due to the rapid Progress in image / video coding , images are segmented into objects to achieve efficient compression by coding the contour and texture separately .

The writer of this study has found from review of literature in this concern that classifications of motion segmentation vary significantly and no consistent classification can be found most classifications are either ambiguous or not complete . Meier classifies motion segmentation into four categories :

a-(3D) Segmentation .
b-Segmentation based on motion information .
c-Spatio – temporal segmentation .
d-joint motion estimation and segmentation . Torr also grouped motion segmentation into four categories :
(a) methods for stationary camera .
(b) methods that are based on image properties of projected motion .
(c) Methods that require knowledge of the camera motion .

(d) Methods found on the constrains imposed in the image . [3] .

Teklap classifies motion segmentation into two groups : motion Based versus spatio- temporal : among motion – based Segmentation : (2 D) approach and (3 D) approach , based on the dimensions of motion models employed in the segmentation .

From this elaboration on motion segmentation , it can be concluded that many segmentation techniques have been proposed in the literature but fully general applications are currently not achieved [4] .

3. Related work:

A review of some published related studies are given below with a brief description of each of them .

3.1 – Lim and Boem (1997) : in their paper dealt with some methods of estimating displacement of moving objects from one to the next displacement was estimated by a new algorithm which seeks to minimize the function of the prediction error [5] .

3.2 – Dengsheng et al . (1998) : they dealt in their paper with a Segmentation techniques for segmentation of moving objects in Image sequence . The aim was to create a complete segmentation scheme which combines : temporal and spatial segmentation [6] .

3.3 – Robert , b. , and Bennett, J. (1998) : they tested the virtual views produced by the image – based render on the walking and running sequences . They used the original training data captured from taking orthogonal to the object motion .

4. Design and implementation of the proposed system:

As it was mentioned in chapter one that the objective of this study is to create an algorithm that will separate foreground of human motion from back ground . In the following an attempt is made to achieve this objective through a proposed system . The proposed system is implemented throughout a movie which deals with human motion .

The movie is prepared and played by the writer of this study . The results of applying the proposed system are presented in figures which show three windows : the first window called the current directory which include functions which are programmed for execution of the system . The second window deals with command history which involves the commands used to execute the functions of the program . While the third window illustrates the implementation of the MATLAB function for designing the program.

All computer programming has been done by using MATLAB (version 7) .The test has been done by using IBM - compatible personal computer , With processor Pentium – IV (2.OGHZ) .

4.1 The basic parameters:

The basic parameters used in this study to evaluate performance of the Foreground segmentation results are the following :

a. Number of frames (NF):

This parameter is used to define the total frame samples . This parameter with speed of applying the algorithm are inversely proportional any increment in number of frames requires more computation with regard to applying the algorithm .

b. Frame per second (FPS):

It is a numerical figure , used to compute motion vector of the input file name . Frame per second with the speed of the moving object in the movie are directly proportional .

c. Block Size (BS):

This parameter is used to determine the edges of the foreground from the edges of the background . The block size and speed applying algorithm are directly proportional , any increment in the number of the block size , facilities applying of the algorithm .

d. Noise Mean Square Error (Noise MSE):

It is a function for estimating the (MSE) in an image sequences as follows where MSE is the mean – square error function for two blocks (A) and (B) of size m*n . A (p,q) is the value of the pixel in pth row and qth column of block (A) .B (p,q) is the value of the pixel in pth row and qth column of block (B) .

$$MSE = \frac{1}{mn}\sum_{p=1}^{m}\sum_{q=1}^{n}[A(p,q) - B(p,q)]^2 \quad \ldots\ldots(1)$$

4.2 Design of the proposed system:

Fig. (1) shows block diagram of the proposed system implemented to separate moving foreground from stationary background in video Sequence .

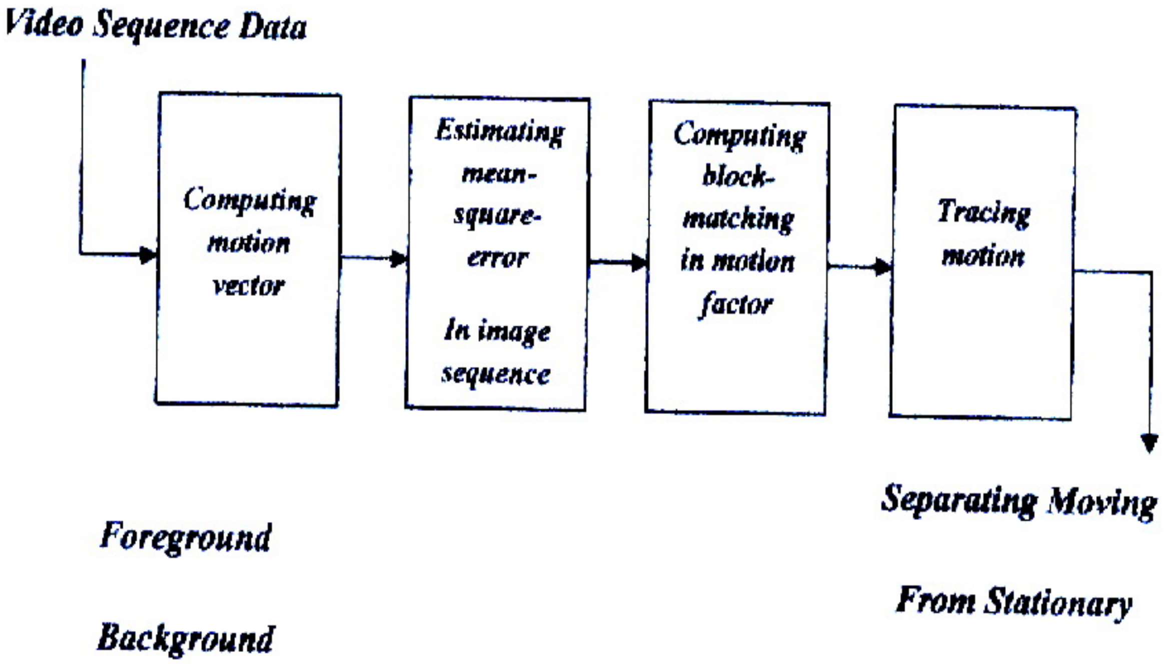


Fig.(1) Block diagram of the proposed system

4.3 Computing Motion Vector:

The following steps illustrate the algorithm implemented to compute Motion vector. The input of this algorithm is a series of frames(avi.movie) The output of this algorithm is a number of values of the motion vectors.

The algorithm is implemented as follows:

Step 1: it is concerned with computing the size of the movie, defining the total frame samples and the blocks size.

Step 2: this step deals with reading the movie frame.

Step 3: it is concerned with converting the frame to index image with color map for the none true color frame and also converting the true color image to intensity image.

Step 4: it is devoted to computing the image size , initializing 3D matrix and that will contain the original movie frame samples as image matrices and to determine the number of block in both directions.

Step 5: it deals with the definition of the image matrix in the original movie , 3d matrix.

Step 6: it defines the rest of original movie image and initialize the motion vector matrix.

Step 7: call the function for estimating the mean square error in an image sequence.

Step 8: call the function for computing block matching of motion vectors.

Step 9: saving and printing all the variables.

4.4 Estimating (The Mean-Square-Error) in an image sequence:

The input of algorithm used for computing block – matching motion vector are: the image block size of the image and motion vector.

On the other hand , its output is the value referred to as mean – square – error . The algorithm is implemented as follows:

Step 1: within this step the image size is found, the block size is determined and the motion vector is initialized.

Step 2: it is devoted to define blocks from the image.

Step 3: it deals with initializing the minimum error to be equal to zero error and the best motion vector to be zero in both directions.

Step 4: it determines the minimum and maximum (y) coordinates for zero block.
Step 5: it determines the minimum and maximum (x) coordinates for zero block.
Step 6: it is concerned with defining the block row by row over the image until it exists from the zero block coordinates.
Step 7: this step is made to define the minimum error to be equal to the current error.
Step 8: it deals with defining the motion vectors for each block in the image.

4.5 Computing Block – Matching Motion Vector:

The input of the algorithm are used to compute Block – Matching vector include the image block size of the image and the motion vector. While its output is a number of values referring to the block – matching motion vector .
The algorithm is used as follows:
Step 1: finding the image size in pixel, determining the block size and initializing the motion vector.
Step 2: defining the block from the image.
Step 3: it is devoted to produce an array with length =8 * 8 =64 and to find the sum of square error resulted from the subtraction of the two block arrays.
Step 4: at this step the minimum error is initialized to be equal to the minimum zero. Also the best motion vector is initialized to be in both directions.
Step 5: it is confined to determine the minimum (y) coordinates, for zero block and the maximum coordinates for zero block.

Step 6: it determines the minimum and maximum (x) coordinates for zero block.

Step 7: defining zero block as previous block by skipping the zero block row by row over the image until it exists from zero block coordinates.

Step 8: defining the minimum error to equal to the current error.

Step 9: defining the motion estimation is three – step search(TSS).

This algorithm was introduced by Koga et al. 1981. It searches for the best motion vectors.

4.6 Tracing Motion:

The process of tracing motion encompasses tracing forward.

Tracing Forwards Motion:

The inputs of the algorithm to implemented to trace motion forwards are: frames, block coordinates in the (x) and (y) directions and seeding block in the frame . The output of the algorithm is to determine a new seeding block.

The algorithm is implemented as follows:

Step 1: load all calculated data from the previous algorithm.

Step 2: call motion vector objects forward.

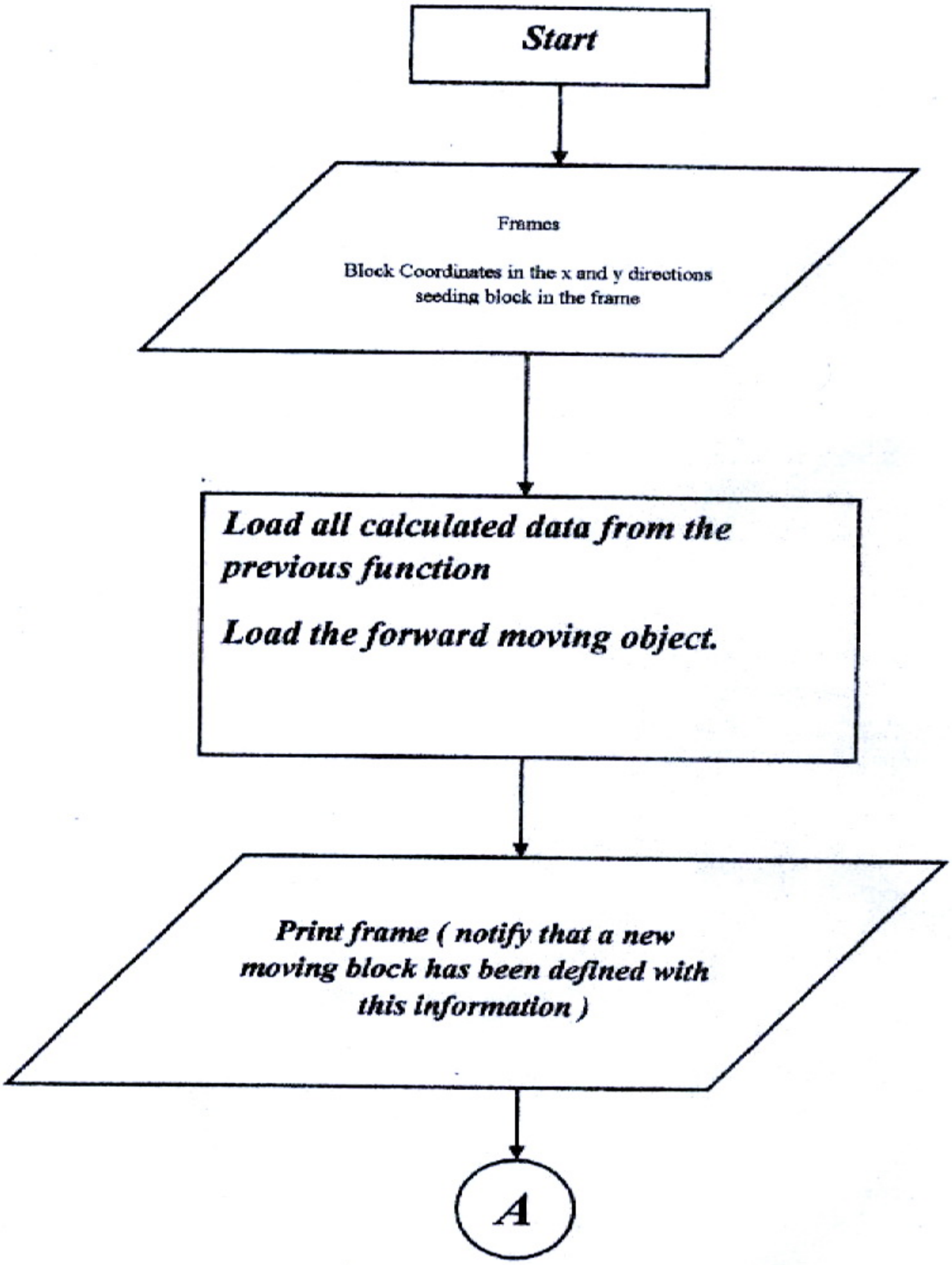
Step 3: check if the motion vector block forward of the frame equals zero, that means there is motion in the block forward.

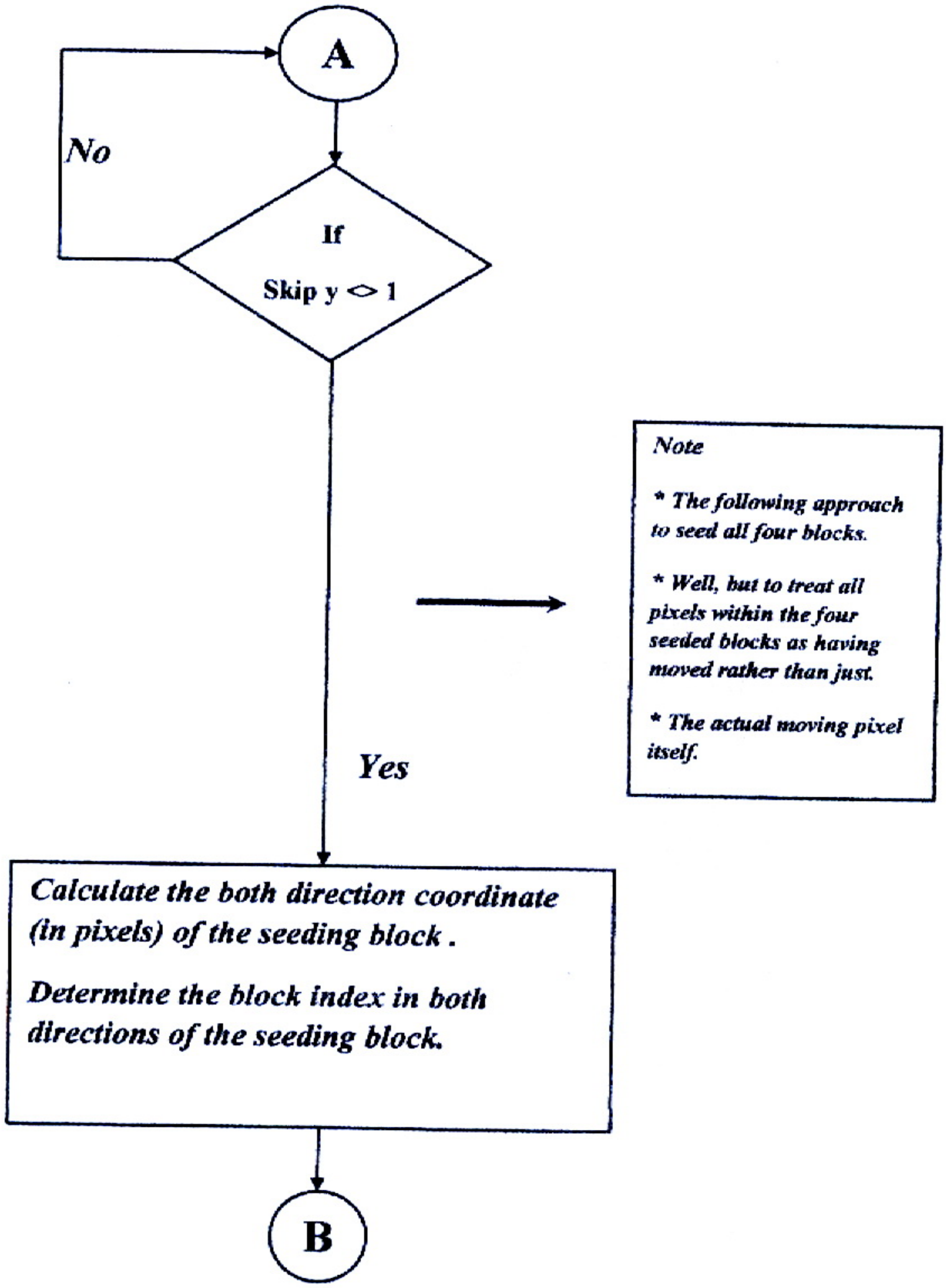
Step 4: check if the motion vector block forward of the frame equals one , that means there is motion in the block (identification of a new seeding block).

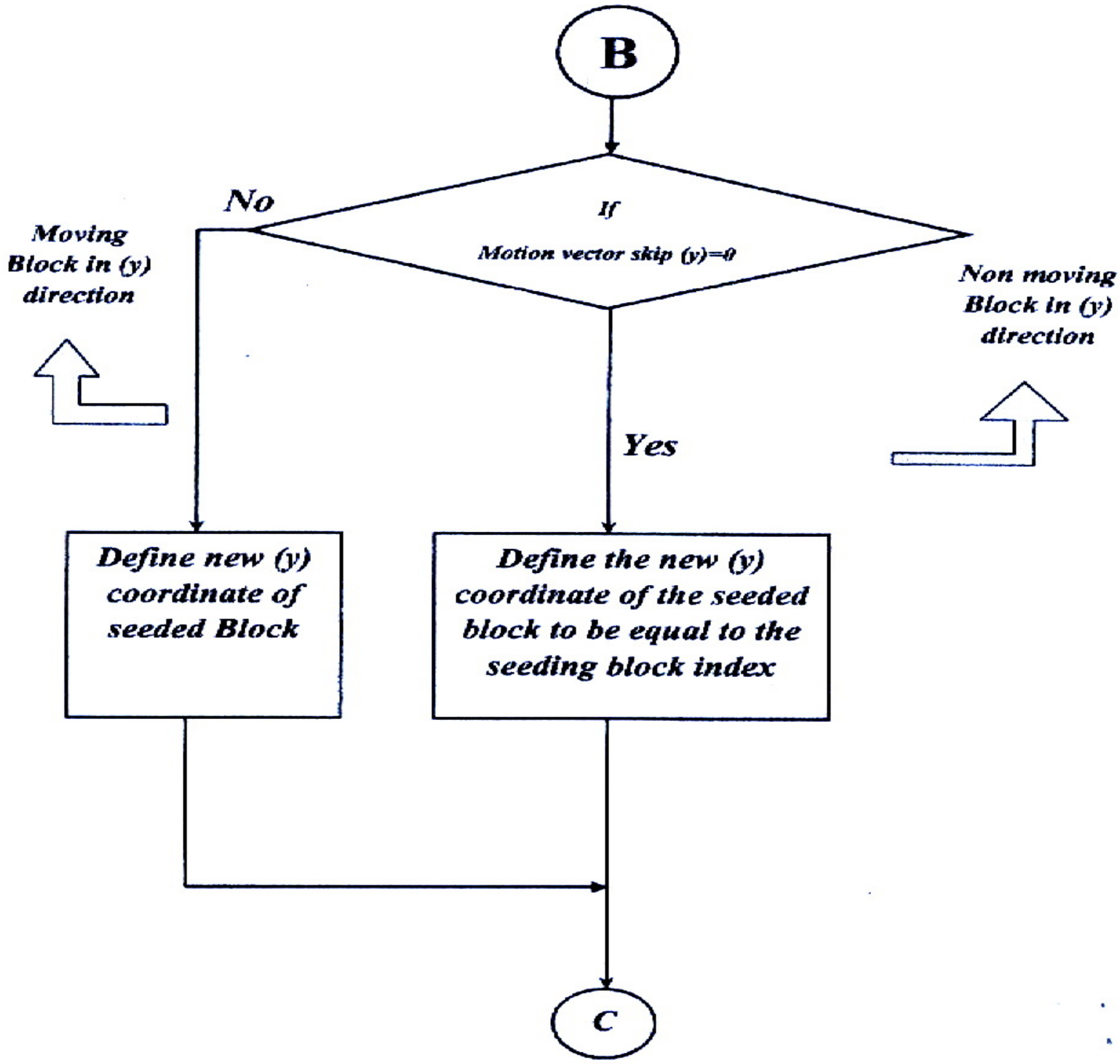
Step 5: calculate both directions of the coordinate for seeding block.

Step 6: determine the block index for both directions of the new Seeding block.

Fig . (2) illustrate flow chart for tracing forward motion .




A
No
If
Skip y <> 1
Yes
Note
* The following approach to seed all four blocks.
* Well, but to treat all pixels within the four seeded blocks as having moved rather than just.
* The actual moving pixel itself.
Calculate the both direction coordinate (in pixels) of the seeding block .
Determine the block index in both directions of the seeding block.
B


B
If
Motion vector skip (y)=0
No
Yes
Moving
Block in (y)
direction
Non moving
Block in (y)
direction
Define new (y) coordinate of seeded Block
Define the new (y) coordinate of the seeded block to be equal to the seeding block index
C

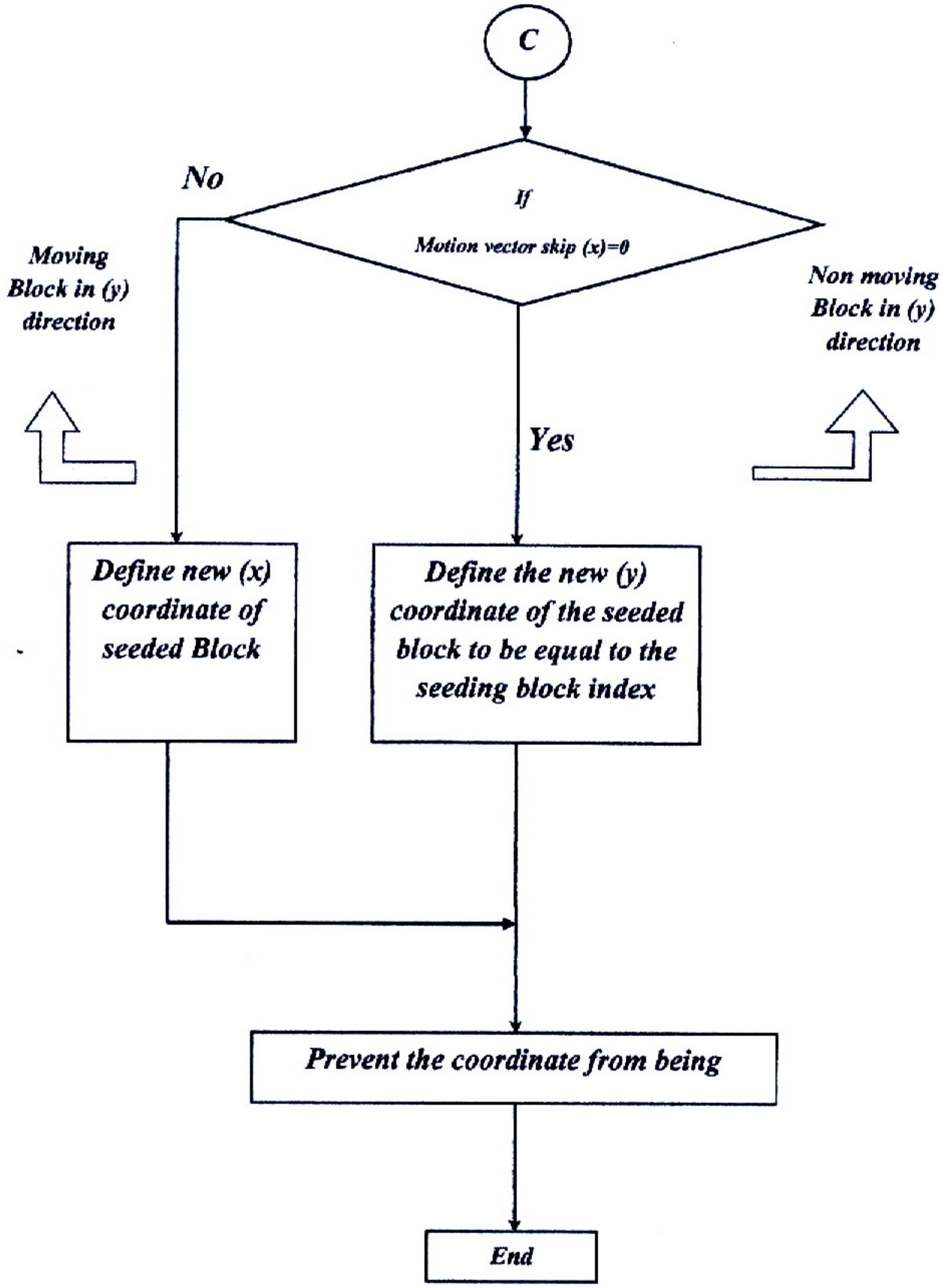


Fig. (2) Flowchart for tracing forward motion

5. Conclusions:

The objective of this study as mentioned in chapter one is to create an algorithm that will separate the moving foreground from stationary background. An attempt is made to design and implement a system to achieve the mentioned objective. The results of the implementation of the system are presented in figures, some remarks related to the implementation are given. The arrived conclusions are summarized in the following:

1- The choice of block size has a great impact on segmented image, small block size tends to produce more false motion vectors despite any noise estimation. Large block size has coarser edges but in less plagued by noise effect.

2- Motion tracing must be done in both the forward and reverse temporal delectations for better and satisfactory segmentation results.

3- During the work, we have noticed that the suggested system can achieve better image segmentation when the camera is fixed and when lighting is not changed suddenly.

4- Although a great advances have been made in image/ video segmentation techniques, there are still challenges to achieve automatic segmentation extraction of semantically meaningful objects.

5- Computer vision system often depends on the ability to distinguish or describe a moving object in an image sequence.

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