Center Detection of Motion Object

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Abstract

Motion detection and center computation of moving objects in time-varying images is becoming increasingly important in diverse applications. A method for motion detection and center of object computation in time sequence of images has been used in this work.

Researchers have used segment and match techniques to acquire center information. This technique is sensitive to segmentation errors and the success of the algorithm is based on accurate segmentation of static frames, which is rarely satisfied in real scenes.

Keywords: *motion detection, center of object, stander deviation segmentation*

1. Introduction

Most researchers of time-varying images use only two or three frames of a sequence. The analysis based on a few frames misses complete information about the motion of objects [1].

Observed image motion can be describe a complex motion, because scene objects and the other observer may be moving. The Complexity of the motion depends on the size of analysis region. In a large analysis region, the region may contain several moving objects. On the other hand, the motion in a small analysis region can usually be modeled by simple translation. However, the motion in such small region cannot usually be computed accurately and unambiguously because of image noise and the aperture problem [1, 2].

There are two main principles using in motion analysis technique: First, the size and shape of analysis region is adjusted by using algorithm, which include only those image regions which move coherently[2].

Different analysis region are selected to recover different motions. Usually, the selected region size is sufficiently large to overcome accuracy and aperture problem. Yet sufficiently small so that only one motion dominates the region [3]. The second basis of the technique is an observed property of a gradient –based coarse- to line motion recovery technique; namely, the motion algorithm tracks a single component even through the analysis region contains several motion components [4].

One result of this surprising observation is that the size and shape of the analysis regions for each motion need not accurately define coherently moving regions in order to recover an accurate estimate of coherent motion [3, 4].

2. Analytical Formulation

Moving bodies in a sequence of images can be modeled as a big moving object. In order to simplify the description of image, processing of a specific object, a binary mask 0 (x, y, t) is introduces so that the image signals are identified as time-varying function. The relationship between the mask and the image data is given by [5]:-

g (x, y, t) = k (x, y, t) f (x, y, t) + [1- k(x, y, t)] b(x, y, t) …. (1)

Where:

g (x, y ,t) is the recorded time sequence of image.

f (x, y ,t) is the moving object in the time sequence.

b (x, y ,t) is the time-varying background.

k (x, y, t) = 1 for all pixels corresponding to the moving object.

k (x, y, t) = 0 for otherwise.

The case of zero background is considered. Using the projections of the moving objects in the x and y directions, the two-dimensional sequence is transformed to two one-dimensional sequences [5].

3. Suggested Algorithm Standard Deviation &Summation Method)

To illustrate the proposed algorithm, there are many steps that processed as follows:

Step 1: -

Read the image then convert it into a matrix.

Step 2: -

Divided the image (original image) into non-overlapping blocks, such as (4 x 4, or 8 x 8).

Step 3: -

Compute the stander deviation (STD) for each block.

Step 4: -

Compare the Stander Deviation (STD) of each block with a certain threshold value (cv) (that represents the stander deviation of body of airport).

Step 5: -

If STD $\leq$ cv then

Full the block elements by 1's.

Else

Full the block element by 0's.

End if.

Step 6: -

If the condition satisfy (std $\leq$ cv) then

X-position = X-position + i

Y-position = Y-position + j

Else

Next block

End if

Step 7: -

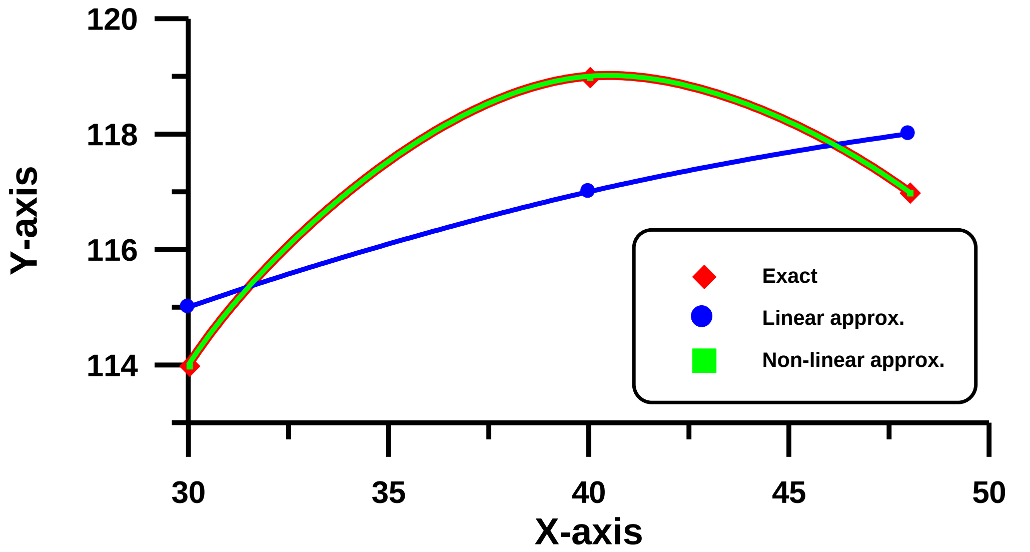
Determine the center of mass by using the following example;

$$X = \text{CINT}\left(\frac{\text{X- Position}}{\text{Total no. of elements that have 1's value}}\right) \quad \ldots(2)$$

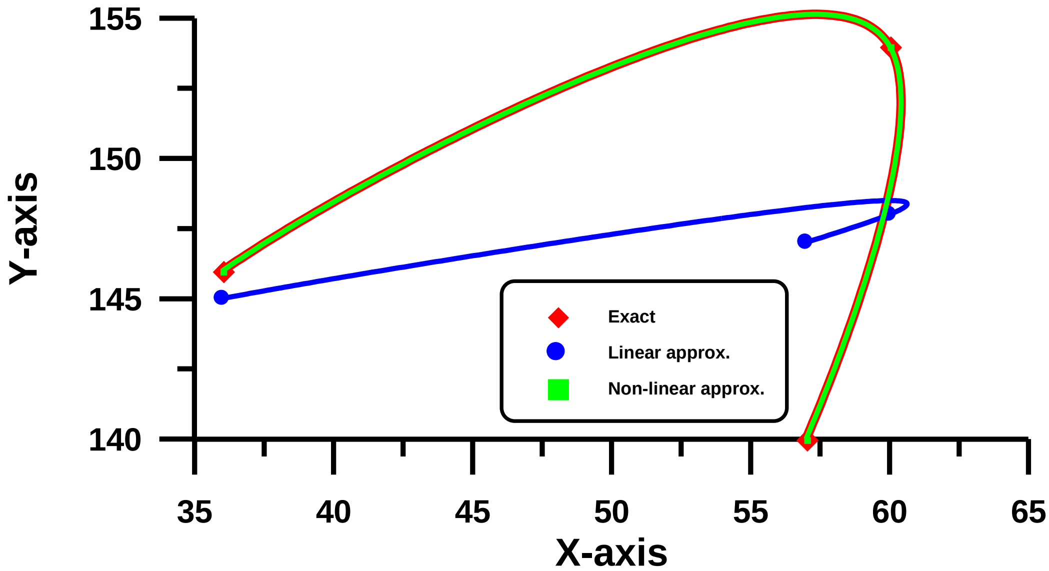
$$Y = \text{CINT}\left(\frac{\text{Y-Position}}{\text{Total no. of elements that have 1's value}}\right) \quad \ldots(3)$$

4. Results of Standard Deviation Segmentation & Summation Method

This technique is performed on the airplane images (three frames). The results from this technique shown in figure (1), by using block sizes (bs) (4x4, and 8x8).



(a) bs= 4x4



(b) bs= 8x8

Figure (1) stander deviation segmentation & summation technique

The actual values of (x, and y) values of center of object and the values of linear and non-linear curve fitting are shown in the table (1), and the equations of these curve fitting are shown below;

y_{linear} (x) = 109.574 + 0.18x
bs= 4x4

$y_{non\text{-}linear}$ (x) = 49 + 3.417x - 4.17E-02x^2
bs= 4x4

y_{linear} (x) = 141.298 + 0.105x
bs= 8x8

$y_{non\text{-}linear}$ (x) = 579.71 – 19.476x + 0.206x^2
bs= 8x8

X_{Exact}	Y_{Exact}	Y_{Linear} Approx.	$Y_{Non\text{-}Linear}$ Approx.
30	114	115	114
40	119	117	119
48	117	118	117

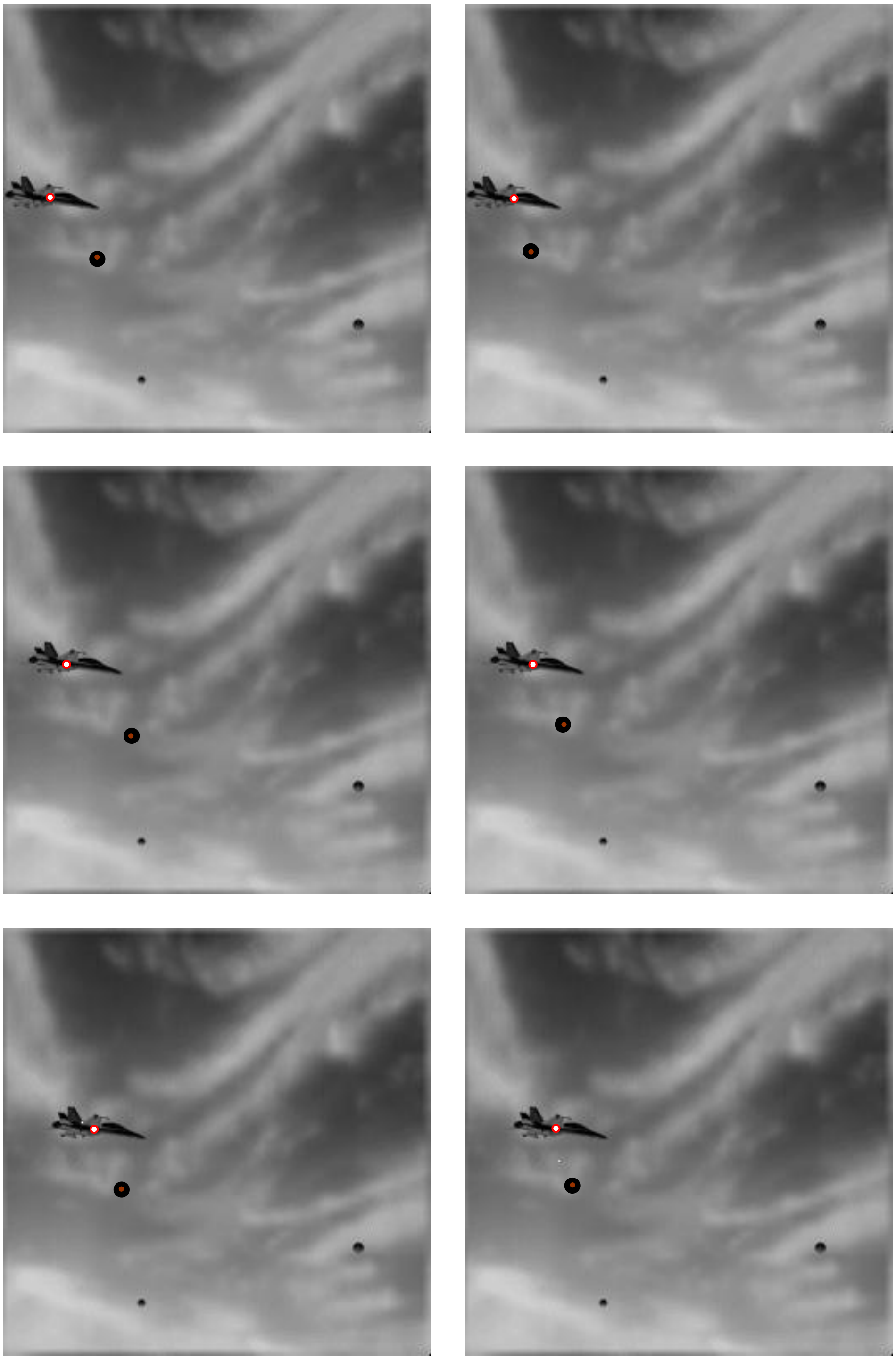
(a) bs= 4x4

X_{Exact}	Y_{Exact}	Y_{Linear} Approx.	$Y_{Non\text{-}Linear}$ Approx.
36	146	145	146
60	154	148	154
57	140	147	140

(b) bs= 8x8

Table (1) Results of Stander Deviation Segmentation & Summation Technique

Figure (2) show that the optimal position of center of object can be achieved with expectable visible value position when the block size (bs) is (4x4) because contain the original airplane images on black region, that have the same stander deviation of body of airplane.



(a) bs= 4x4 (b) bs= 8x8

Figure (2) Three Output Frames of Airport Images at Difference Block Size (bs)

- Linear approx. value.
- Exact value (center of the object).

5. Conclusions

By using this technique ,we found that the value of exact and none-linear approximate are the same at different block size, that indicates this methods gives the optimal results and can be used in military applications such that directed the missile to the aircraft .

6. References

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