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Layered and Feature Based Image Segmentation Using Vector Filtering

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Abstract - A Sensor is a device that reads the attribute and changes it into a signal that can be simply examined by an observer or instrument. Sensors are worked in daily objects like touch-sensitive elevator buttons, road traffic monitoring system and so on. Each sensor would carry distinctive capabilities to utilize. The objects obtained in the sensor are tracked by many techniques which have been presented earlier. The techniques which make use of the information from diverse sensors normally termed as data fusion. The previous work defined the object tracking using Multi-Phase Joint Segmentation-Registration (MP JSR) technique for layered images. The downside of the previous work is that the MP JSR technique cannot be applied to the natural objects and the segmentation of the object is also being an inefficient one.

To overcome the issues, here we are going to present an efficient joint motion segmentation and registration framework with integrated layer-based and feature-based motion estimation for precise data fusion in real image sequences and tracking of interested objects. Interested points are segmented with vector filtering using random samples of motion frames to derive candidate regions. The experimental evaluation is conducted with real image sequences samples to evaluate the effectiveness of data fusion using integrated layer and feature based image segmentation and registration of motion frames in terms of inter frame prediction, image layers, image clarity.

Keywords : *Layered image, Featured image, Image segmentation, Vector filtering.*

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Layered and Feature Based Image Segmentation Using Vector Filtering

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I. Introduction

Layered images defined as the images taken by sensors at diverse perspectives of a general scene. Featured images are images which represent the association of the images such as points, edges, lines and contours. To identify the particular object in both types of image, many techniques have been presented earlier. The techniques which make use of the information from the sensors are termed as data fusion. Data fusion includes a well-established classification of "fusion levels" that sets diverse iterative processes of differing maturity levels. The bottom level, i.e., 0-level of "data alignment", is the registration, preprocessing, and geo-registration of images, which organizes the data for other mixture levels. Image registration, which discovers the association or the transformation between two images, thus adds to this stage in the data fusion hierarchical construction.

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Normally, segmentation and registration are closely tangled. The main job of registration can be enhanced if some features are precisely chosen on the two images. These features might be edges, corners, and contours of the image. Registration is done by the association of feature sets which has been attained. Segmentation and registration may also be joined together in a variant structure using an active contour method. Noise removal is one of the main applications, while noise can begin from various sources and is present in nearly any image processing system. Two essential types of noises are noise created during image formation (i.e., sensor noise) and noise created during transmission (i.e., channel noise). Vector Filtering is a technique which has been used to remove the noise recognition in the digital colored images.

The main contribution of this paper is to address a real and practical problem in layered and featured images in data fusion, specifically, register and segment from different perspectives at mid-range. We propose a vector filtering method to segment and register layered images and featured images together, which, as opposed to traditional layered images, require more than one transformation for registration.

II. Literature Review

Several researches have been presented in the image segmentation process. The image segmentation is done with several techniques that have been presented earlier. Images which are mainly classified as layered image and featured image. The segmentation techniques developed individually, that is, for layered image and the featured image alone. Ping-Feng Chen, Hamid Krim ET. AL 2010 developed a technique for image segmentation for layered image using multi-phase joint segmentation technique. The downside of the project is that this technique cannot be applied to natural images.

L. M. G. Fonseca, D. Fedorov, et. Al., 2006 developed a technique for image segmentation remotely using Automatic registration and mosaicking system which allowed the image segmentation process to be done automatically. S. Jwa, U. Ozguner 2008 presented an Information-theoretic data registration for segmentation process. To implement a multi-phase process for image segmentation, H. Li and X. Tai 2007 developed a technique using level set methods to obtain a clear image quality.

Mohamed Ben Salah et. Al., 2011 used Parametric Kernel Graph Cuts method for image segmentation. Hernâni Gonçalves, José Alberto Gonçalves et. Al., 2011 developed a technique HAIRIS for image registration process using Histogram-Based Image Segmentation. Salah, M. et. Al., 2010 used an active curve objective functional with two terms: an original term and a classic length regularization term for image segmentation.

Sandberg, B, Sung Ha Kang et. Al., 2010 proposed an algorithm that automatically selects a phases to segments the image. Ghosh, P et. Al., 2010 introduced a robust image segmentation method based on a variational formulation using edge flow vectors. Mignotte, M 2010 presented a novel segmentation approach based on a Markov random field (MRF) fusion model to obtain segmentation results with simpler clustering models to achieve a more reliable and accurate segmentation result. But id does apply for artificial images. To overcome the issies, we present a vector filtering techniques to both layered and featured image segmentation and can be applied to natural images also.

III. Image Segmentation Using Vector Filtering

An image segmentation for both layered and featured images are done with vector filtering technique. vector filtering techniques treat the color image as a vector field. For a given input image, filtering format function on the idea that an image can be partitioned into small regions, each of which can be treated as stationary. Small image sections are determined using the supporting window W = {a1 , a2, . . . , aN} with the pixels ai centered around a(N+1)/2. Operating at the pixel level, spatial filtering operators replace a(N+1)/2 with the output pixel a(N+1)/2 = f(a1 , a2, . . . , aN). The architecture diagram of vector filtering technique for both layered and featured imges is shown in fig 3.1.

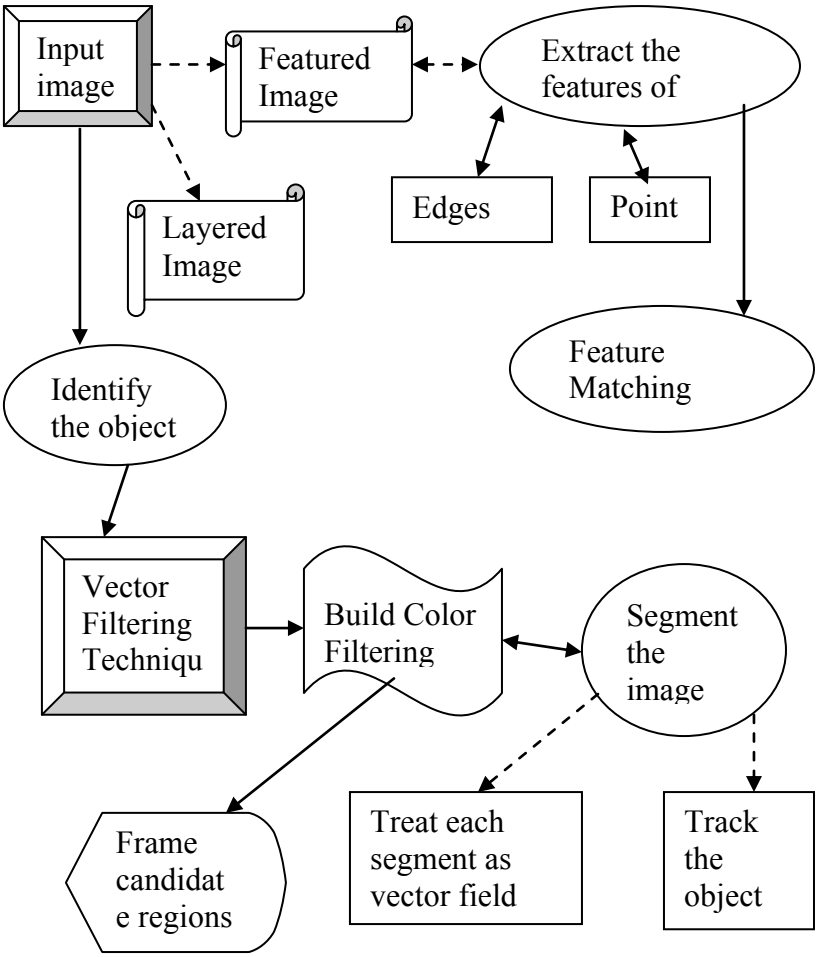

Fig 3.1: Architecture Diagram of Image segmentation using Vector Filtering Technique

For a given type of image, if it a featured image, then extract the features of the images like edges, points, and contours. Identify the interested points on the image and the match the feature with the other image to find the association between the images. If it is layered image, then identify the object which is to be tracked. Use the vector filtering technique for segmenting the image as a vector field. Then track the object till it proves its clarity. Find the motion frames of the image and find the candidate regions. Finally we get the segmented image without noise.

a) Pseudo Code of Vector Filtering Process for Image Segmentation

For a better image segmentation, here we used vector filtering technique which filters the noise efficiently from the image. The objects can also be traced based on stationary or non stationary movements. If the object is non stationary, consider the segmented region as stationary and trace the object. If the object moves out of the view, then move the window according to the position of the non stationary objects based on the features of image.

i. *Extract Features Oflayered/Featured Image*

If the input image is layered image or featured image, then it is necessary to extract the features of the images like edges, points, contours etc. Match the features of the image with other image to define the characteristics of the image and select the object in the image to be viewed.

Layered Image be L and featured image be F

Step 1 Input: Layered Image / Featured Image
Step 2 If L/F image do
Step 2.1 Extract the features like edges, points, etc.,
Step 2.2 Match the features with the image
Step 2.3 Identify the object O to be viewed
Step 3 End If

ii. *Vector Filtering Process*

The output image which we get from 3.1.1, is used here as an input for segmentation. After segmentation, treat each segmented image as a vector field and obtain the object to be traced. The output of this process is the object to be viewed by the user and segmented image with good quality.

STEP 1 Apply Vector Filtering process for the given input image after obtained features
Step 1.1 Segment the image L or F as S1, S2,….,Sn.
Step 2 For Each Si do {where i=1,2,….n}
Step 2.1 Compute the vector field v1, v2…

Step 2.2 Locate the proper size windows on images L or F
Step 2.3 Denote the windows as w
Step 2.4 Within w,
Step 2.4.1 Identify the object surface
Step 2.5 If Object O moves out of w,
Step 2.5.1 Move the window according to the feature
Step 2.6 End If
Step 3 End For
Step 4 End

Outputs: segmented Image, Object traced Segment the given input images and evaluate the vector field for each segmented image with a proper window size. Using window size, the object surface is identified and moves the window according to the movement of the segmented image of the given input image. So that it is simple to detect the traceable object

IV. Experimental evaluation

The Vector Filtering technique for image segmentation is implemented using Java. The experiments were run on an Intel P-IV machine with 2 GB memory and 3 GHz dual processor CPU. The segmentation results on 100 * 100 pixel windows of a 512 * 512 pixel image. The advantage of using a vector filtering technique is that it has an ability to handle both stationary and non stationary objects in the image and the regions inside and outside the images are automatically described.

The image layer transparency defines the different elements of an image in which imaging effects or images are applied and placed. After the image has been segmented using vector filtering technique, the transparency of the image is good when compared to an existing MP JSR technique. After segmentation is done with vector filtering, the inter frame size of the image is good in transparency by removing the noise.

The metrics used in the work involves Mean Square Error (MSE) and Peak Signal to Noise Ration (PSNR) for the image sequence without noise. The MSE is the squared error that lies between the original and segmented image. The PSNR value is the measure of peak error.

$$MSE = \sum\sum [I (a,b) – I' (a,b)] \quad \text{(eqn 4.1)}$$

Where a = 1,2,…m and b = 1,2,….n m = 512 and n = 512. From eqn 4.1 I (a,b) represents the original image whereas I' (a,b) represents the segmented image. The dimensional values are denoted by using m and n.

$$PSNR = 10 \log 10 [R^2 / MSE] \quad \text{(eqn 4.2)}$$

PSNR value is calculated in terms of decibels. The value lies between original and segmented images. PSNR ratio is used as quality of measurement Higher the PSNR rate better will be the quality of segmented image. R value is expressed in terms of 256 or 512 pixels.

V. Results and discussion

From the proposed Vector Filtering technique for both layered and featured image segmentation, it efficiently frames the candidate regions from the segmented image using vector filtering technique. By using eqn 4.1 and 4.2, the PSNR values for the segmented image are computed to evaluate the performance and the quality of the segmented image. Table 5.1 describes the image quality after it get segmented using the proposed Vector Filtering (VF) technique for both layered and featured image segmentation and an existing Multiphase Joint Segmentation-Registration and Object Tracking for Layered Images.

Image Size	PSNR values (db)	
	Proposed VF image segmentation	Existing Multi-phase Joint Image segmentation
512 *512	31.45	45.53

Table 5.1: PSNR comparison table

The comparison for image segmentation by the proposed Vector Filtering technique for both layered and featured image segmentation and an existing Multiphase Joint Segmentation-Registration and Object Tracking for Layered Images is explained in the comparison graphs.

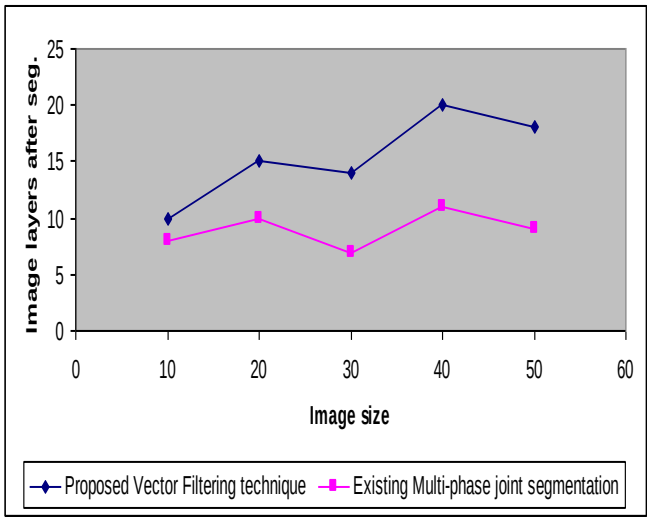

Fig 5.1: Image size vs Image Layers

Fig 5.1 describes the layers of the given image after segmentation process. Even the image size increases in pixels, the layered form of image after segmentation is good in the proposed Vector Filtering technique for both layered and featured image segmentation. Depends on the image size, the layered image has been formed well in the proposed Vector Filtering technique for both layered and featured image segmentation, since the variance would be 20-25% high.

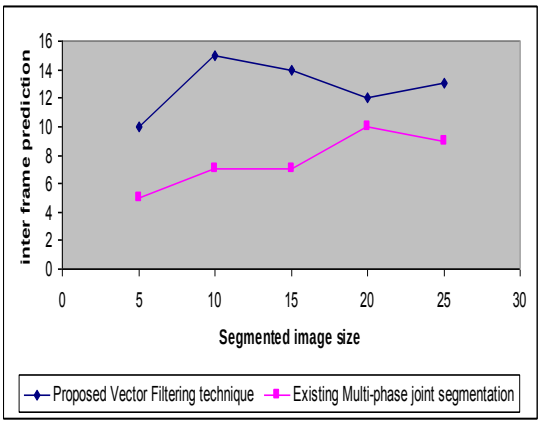

Fig 5.2 : segmented image size vs Inter frame prediction

Fig 5.2 described the inter frame prediction of segmented image. The inter frame prediction is used to predict the segmented image quality to evaluate whether it achieves high compression rate or not. In the proposed Vector Filtering technique for both layered and featured image segmentation, the inter frame prediction is good. So, the segmented image quality is also being good compared to an existing Multiphase Joint Segmentation-Registration and Object Tracking for Layered Images.

Finally, observed that the experimental results and the table 5.1 shows that the image segmentation process for both layered and featured image performed better in terms of image layer, image quality with less noise level to obtain a better image results. The quality of the image is 20-25% high in the proposed Vector Filtering technique for both layered and featured image segmentation.

VI. Conclusion

The Vector Filtering technique for both layered and featured image segmentation proposed in this paper efficiently done the segmentation process in both types of image without any noise. The vector filtering technique used for image segmentation outperforms better in terms of segmented image transparency, image quality. Since the vector filtering technique treated each segmented image as vector field, the proposed Vector Filtering technique for both layered and featured image segmentation successfully had done the image segmentation and registration process. The user can easily get the object in a clear manner by tracking the object in the segmented image. The segmented image quality is 15-20% high compared to an existing Multiphase Joint Segmentation-Registration and Object Tracking for Layered Images. The experimental results have shown that the proposed Vector Filtering technique for both layered and featured image segmentation achieved better results when compared to an existing Multiphase Joint Segmentation-Registration and Object Tracking for Layered Images.

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Global Journal of Computer Science and Technology Volume XII Issue IX Version I April 2012
14

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