An Adaptive Model to extract the object from Video Sequence

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Abstract: The object detection in video is one of the critical task. In this paper, a hybrid model is presented to perform the segmentation over the video. The work includes the detection of video frame that is followed by series of image processing operations to detect the object. In this work, a watershed improved morphological approach is defined to perform the segmentation. This segmentation process includes the detection and extraction of some moving object from video. In this paper, a model of segmentation process is explained.

Keywords: Feature Detection, Color Model, Segmentation, Morphological Operators

I. Introduction

Image segmentation is one rich image processing application as well as the methodology to work as the baseline in the area of images. Image segmentation basically includes the detection of the object or the extraction of the features from the image. To detect the object or the image features, the image is divided to the several sub areas and by performing the statistical or the pixel based analysis under the different criterias, the detection of the object will be performed. There are number of approaches that are directly or indirectly associated with image segmentation. One of such approach is the Clustering [1][2].

Clustering is basically to divide the image in smaller regions under some pixel based classification. The clustering is the structural process that divides the pixel in different homogeneous groups so that similar data or the pixel area will be maintained in one group. Based on this feature based analysis the classes over the image will be defined along with the cluster boundaries. These all classes basically form the partitions over the image. These partitions divide the images in certain groups and define the data distribution over the image.

Image segmentation is the foremost step of image analysis and the pattern recognition. It is one of the critical image processing tasks to define the image separation respective to the application. In most general view the image segmentation separates the foreground from the background. There are number of image segmentation approaches and some of them are listed as under[3][6][9].

A. Histogram Thresholding

According to this approach the image is represented by the image histogram and by performing a peak and average weight analysis some pixel range is kept in the image and some is discarding. This range specification actually defines the threshold value

B. Edge-Based Approach

The kind of image segmentation is the edge detection. There are number of such edge detection operators such as Sobel, Laplacian for example. Resulting regions may not be connected; hence edges need to be joined.

C. Region-Based Approach

This kind of analysis includes the similarity based check over the image regions to identify the relative areas or the similar areas over the image. Such kind of approach further include some methodology like region growing approach, threshold based analysis etc. The watershed algorithm also defined under the same approach.

II. Literature Review

Chin-Ya Huang, Mon-Ju Wu proposed the image segmentation with the help of gray and color images. He introduces a basic idea about color information and edge extraction to achieve the image segmentation. The color information helps obtain the texture information of the target image while the edge extraction detects the boundary of the target image. By combining these, the target image can be correctly segmented and represent [1]. Ullrich Kothe proposed general algorithmic framework based on priority queues that allow for the integration of a variety of different segmentation algorithms. A seeded region growing approach, along with a number of improved seed selection methods of critical areas, is chosen to realize this framework. Experimental
evaluation shows very good performance of these algorithms on a relatively large number of outdoor photographs without the need to adjust parameters [2]. Nassir Salman proposed combination of K-means, watershed segmentation method, and Difference In Strength (DIS) map was used to perform image segmentation and edge detection tasks. We obtained an initial segmentation based on K-means clustering technique. Starting from this, we used two techniques; the first is watershed technique with new merging procedures based on mean intensity value to segment the image regions and to detect their boundaries. The second is edge strength technique to obtain accurate edge maps of our images without using watershed method. In this paper: We solved the problem of undesirable over segmentation results produced by the watershed algorithm, when used directly with raw data images [3]. An improved Ostu method based on the GGM function is proposed in this paper. It makes use of not only the gray level information of the image, but also the gradient information, so it can segment the image efficiently. The simulation shows that the binary image after segmentation by the GGM algorithm has less noise and clearer edge than other algorithms [4].

Another work based on the normalized probabilistic rand index was performed by the author to perform image segmentation on large scale images. Author showed the probabilistic interpretation under the likelihood estimation. The model was the improved form of Gibbs model that presented the effective results on normalized images. Author verified the results on truth ground images with large datasets [5]. Another work on image segmentation based on shift based approach and the graph based segmentation. This paper presents an evaluation of two popular segmentation algorithms, the mean shift-based segmentation algorithm and a graph-based segmentation scheme. Author also performed the quantitative evaluation of these methods under different measures. Author also verified the results with comparative analysis on different segmentation approaches [6].

This paper had a comparison of the following two-dimensional Ostu thresholding method. One-dimensional Ostu method considered only grayscale information of the pixel, 2D Ostu algorithm considered both the gray value of a pixel and the average gray value of its neighborhood, thus is more robust to noise [7]. Lamia presents a new method for image segmentation using mathematical morphology. The approach used is based on the watershed transformation. In order to avoid an over segmentation, it propose to adapt the topological gradient method [8]. In Year 2008, Tetsuya Kakuta at el presented a work on the detection of features from the moving objects under the spherical vision camera for outdoor reality. Author defined the object detection and the feature extraction with mixed reality system. Author defined a new probabilistic segmentation approach to superimpose the vital objects. To achieve the effective segmentation the stencil buffer is defined by defining the limit on the area rendering. Author also defined the work on synthesized images [9].

In Year 2001, Byong Mok Oh at el defined a photo editing based work on model images. Author has taken the single image as input and performs the single point input. Author defined the layered collection of depth images. As the pixel encodes both color and depth information to employ the user assisted techniques. Author defined the painting metaphor to assign the work in different layers. The work presented by the author is based on different viewpoints to extract the feature from group of images [10]. In Year 2012, Cesar Isaza at el performed a work, “Synthetic Ground Truth Dataset to Detect Features Cast by Static Objects in Outdoors”. In this paper, Author propose a precise synthetic ground truth dataset to study the problem of detection of the features cast by static objects in outdoor environments during extended periods of time (days). For Presented dataset, Author have created a virtual scenario using a rendering software. To increase the realism of the simulated environment, Author have defined the scenario in a precise geographical location [11]. In Year 2010, Girisha R at el performed a work, “Self Feature Elimination Algorithm for Surveillance Videos using ANOVA F test”. Author proposes an algorithm based on inferential statistical one way ANalysis Of VAriance (ANOVA) F test. This statistical model can deal scenes with complex and time varying illuminations without restrictions on the number of light sources and surface orientations [12]. In Year 2009, M.H. Khan at el performed a work, “A Robust Background Subtraction Algorithm for Motion based Video Scene Segmentation in Embedded Platforms”. The paper presents robust background subtraction algorithm to segment motion based video scene in embedded platforms. Presented algorithms used bandpass video scene filtering with wavelets for extracting illumination invariant scene features and then combine them efficiently into the background reference frame. Performance of algorithms was evaluated on the basis of number of frames in which the moving target was detected for each video sequence[13]. In Year 2009, Syed Sohaib Ali performed a work, “Moving Human Detection and Recognition in Videos using Adaptive Method and Support Vector Machine”. This paper presents a robust adaptive moving human detection and recognition method in videos. The adaptive threshold method is used to simultaneously update the system to environment changes. The modified human model consists of five parts with robust features to facilitate human recognition process. For recognition purpose Support Vector Machine has been used as classifier[14].

### III. Research Methodology

We are purposing an approach to perform the feature area segmentation over the raster images by using a combined approach of water shed algorithm and the morphological operators. Watershed algorithm is basically defined to perform the boundary detection of feature area. Proposed watershed algorithm is improved by using...
the median filter at the processing stage. The median filter will improve the smoothness over the image so that the sharp edges will be identified. In the second phase, the morphological operators will be used as the region growing approach to detect the ROI over the image. Finally, the adaptive thresholding will be applied so that the well defined object segmentation will be performed. The design of the proposed work is given as under

- The first step is a preprocessing to obtain the normalize image over the image
- In the second step, the watershed algorithm will be defined along with median filtration so that the smooth edges over the image will be identified.
- In third stage, the morphological operator will be used to perform the ROI detection by using the region growing approach.
- Adaptive thresholding will be used as the final stage to obtain the exact object mapping to cover up the object in the boundaries.
- Analysis of the work under different parameters

A. Median Filering
The median filter since it preserves edges and rejects uncorrelated noise effectively. Median filtering is done in two steps: first, sorting pixel values covered by the mask and then putting this computed median value into the center pixel of the mask.

B. Watershed Model
Morphological enhancement of the gradient image is accomplished by simulation of a natural watershed process after rainfall. To extract area having large magnitudes such as water reservoir, we use an inverted gradient magnitude image), Watershed after rainfall induces water that is collected in concave regions in lower altitude around the current pixel at which raindrop is to be added. By iterative rainfall, the concave regions can be merged into a lower concave region. Water filled valleys at equilibrium correspond to potential areas having large magnitudes. To track down the final water filled regions, a labeling process is necessary for each local concave region or local minimum. The depth of a water filled region is the average over the region under water. It is calculated using weighting factors that decrease as the distance from the mask center increases.

C. Morphological Operators
Mathematical Morphology is the a mathematical approach inspired from the set theory. It also includes the structural processing with topology change and random function implementation. This theory is applied on raster images and employed on graphs, solids, mesh and the spatial structures. The topological and geometric concepts like shape, size, connectivity and distance analysis are the key feature of this model. To achieve the effective results from mathematical morphology, a series of morphological operations are implemented to perform the effective derivation and extraction of information.

D. Adaptive Thresholding
Thresholding is applied to the water filled regions in which edge detection is based on the amount and depth of water. Since the total amount of rainfall or water used in the Watershed process can change the regional characteristics, thresholding results vary depending on the amount of water poured on the inverted gradient magnitude image.

E. Model
As we can see in figure1, the proposed model is shown. The model will accept the video as the input sequence. The video will be taken in AVI format. Once the video is obtained, the next work is to generate the image sequence from the video. This image sequence is the actual input object that will be processed by the model. The next step is to convert the image to normalize image. It includes the denosing if required, adjusting the brightness and contrast of image. To separate the background and foreground, this normalize sequence will be converted for the color model. From this color model extract foreground object will be done. Now to perform the edge detection the watershed algorithm will be performed. This stage will be followed by the thresholding approach to perform the actual detection of object. Later on the morphological operators will be used to perform the hole filling. Finally the exact object will be obtained from the sequence images. The proposed model in the work is shown as under
Figure 1 : Proposed Model

IV. Conclusion

In this paper, a hybrid model is presented to extract the object from a video sequence. The video sequence is processed in the form of object sequence in which at first the video frame extract and then the object extraction is performed. The approach includes the watershed algorithm followed by thresholding and morphological operators to derive the effective results.

V. References

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