International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.04, March 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

A Review of Image Segmentation based Seeded Region Growing Schemes

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ABSTRACT

Region growing is a simple region based image segmentation schemes. It also groups the pixels in whole image into sub regions (i.e. set to sub sets). This paper describes the various schemes of segmentation based visual cryptography and clear state that no proper method / schemes / techniques are used for proper type of images. In this paper, we have analyzed the region growing based image segmentation and the seeded growing area , but the quality of image is totally depend upon the way of selecting the seed i.e. automatically and manual way. As the seeded region growing techniques is gaining more popularity in practical day by day especially in medical images.

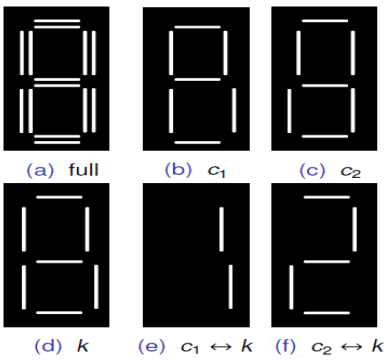
Keywords— Image segmentation, region growing, security, seeded growing region, thresholding, fuzzy clustering.

I.INTRODUCTION

In present time, everybody wants that their information should be confidential from unauthorized accesses. Whatever a user sends to others, other than the intended recipient no one can see it and the original quality should be obtained at receiver's end. Different techniques are used to improve the quality of original image at receiver's end. As in segmentation based visual ctrytrography, an image is encrypted by segments and then sends to recipient. The original image may only be obtained after decryption. The main concept of segmentation based visual cryptography was introduced by B. Borchert in 2007. This type of segment based cryptography is shown as figure 1. In this cryptography he takes the symbol 0 to 9 and all these symbols are made by digits 8, which consist seven parallel bars and all the other digits are subset of the digits 8. Different types of schemes/ techniques used in the segmentation based visual cryptography are as follows:

- Segmentation Based on Edge Detection
- Gray Histogram Technique
- Gradient Based Method

- Region Splitting and Merging
- Thresholding Method
- Segmentation Methods Based on PDE (Partial
- Differential Equation)
- Region Based Segmentation Methods
- Mumford Shah Model
- Segmentation Based on Clustering
- C-V Model
- Segmentation Based on Artificial Neural Network
- Fuzzy Clustering



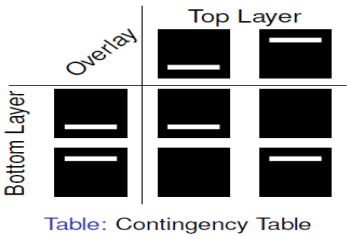


Table: Contingency Table

- Multi objective Image Segmentation etc

Figure : 1 Segment –based visual cryptography (Borchert , 2007)

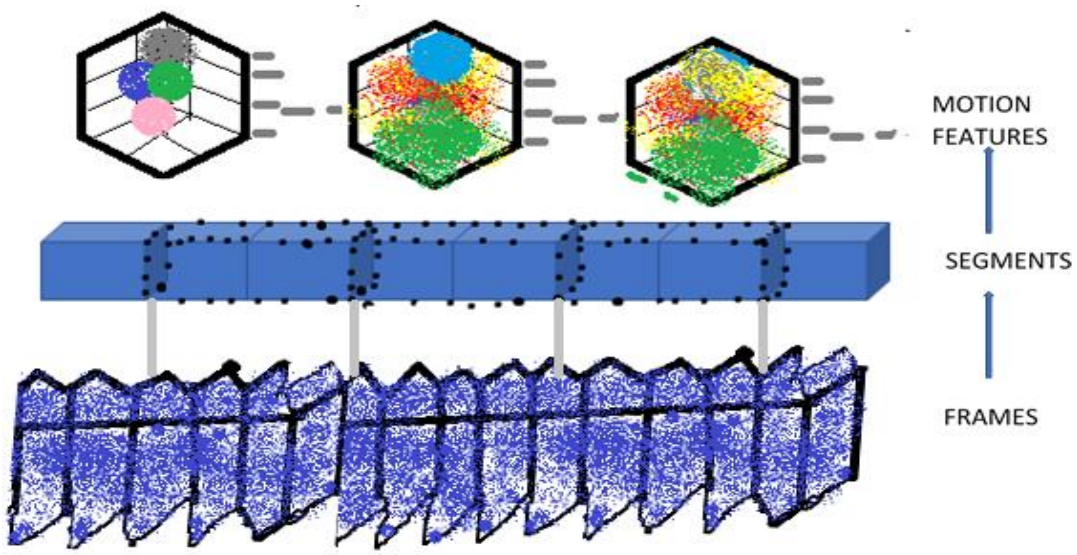


Figure 2 : Illustration of segment-based approach.

As in figure 2, it is shown that a video is divided into the segments by using non –overlapping samples (segmentation). After that, the feature representation is separately calculated for each segment. This figure is best viewed in color, that shows the original video is divided into segments.

II.RELATED TERM

Region growing is a simple region-based image segmentation method. It is also classified as a pixel-based image segmentation method since it involves the selection of initial seed points of images. Region growing can be divide into four steps as follow:

i. By selecting seed pixels group in original image.
ii. Select a set of similarity criterion such as grey level intensity or color and set up a stopping rule (norms).
iii. Grow regions by appending to each seed those neighboring pixels that have predefined properties similar to seed pixels.
iv. Stop region growing when no more pixels met the criterion for inclusion in that region i.e. Size, likeness between a candidate pixel & pixel grown so far, shape of the region being grown.

This approach of segmentation examines neighboring pixels of initial seed points and determines whether the pixel neighbors should be added to the region of image. The process is iterated on. Region-based segmentation is a technique for determining the region directly. The basic formulations are as under:

a) $\cup_{i=1}^{n} \boldsymbol{R_i} = \boldsymbol{R}$, This segmentation is complete if every pixel within the region.

b) R_i is a connected region, i=1,2, ..., n. This means must be connected in some predefined sense and then points be in the region.

c) $\boldsymbol{R_i} \cap \boldsymbol{R_j} = \emptyset$ for all i=1,2, ..., n as the symbol used is empty means that region must be disjoint.

d) $\boldsymbol{P(R_i)}$ = TRUE for i=1,2, ..., n only true means that pixels is in segment regions.

e) $\boldsymbol{P(R_i \cup R_j) = FALSE}$ for any adjacent region R_i and R_j in the sense of predicate P, that region Ri and Rj are different.

$\boldsymbol{P(R_i)}$ is a logical predicate defined over the points in set R_i and $\emptyset$ is the null set.

The benefits of region growing segmentation as:

- Region growing methods can correctly expands the regions that have the same properties as defined.

- It gives us a real / original images, which have clear view.
- A less number of seed points need to represent the property, then grow the region. so it is quite simple.
- As number of criteria has chosen to determine the seed points.
- The region growing performs well with respect to noise.

The region based segmentation is dividing or partitioning an image into similar / homogenous areas. The region based segmentation contain the terms or schemes as:

- Thresholding
- Region Growing
- Classifiers
- Clustering.

As these region based segmentation containing Gaussian probability distribution function (pdf) for the region is given as follows:

$$P_{\alpha_i,\sigma_i}(u) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(u-\alpha_i)^2}{\sigma_i^2}}$$

Where U =mean, V2 = variance.

A simple example to show the region growing segmentation is given in figure 3 is the original image, which is a grayscale lightning image. The grayscale value of this image is from 0 to 255. The reason we apply region growing on this image is that we want to mark the strongest lightning part of the image and we also want the result to be connected without being split / divide apart. Therefore, we choose the points having the highest grayscale value which is 255 as the seed points shown in the Figure 4 After determining the seed points, we have to determine the range of threshold. Always keep in mind that the objective goal is to mark the strongest light in the image. The third figure is the region growing result from choosing the threshold between 225 and the value of seed points (which is 255). Hence we only mark out the points whose grayscale values are above 225. If we make the range of threshold wider, we will get a result having a bigger area of the lightning region shown as the Figure 6 and the Figure 7. We can observe the difference between the last two figures which have different threshold values. Region growing provides the ability for us to separate the part we want connected.

As we can see in Figure 5 to Figure 7, the segmented results in this example are seed-oriented. That means the result grew from the same seed points are the same regions. And the points will not be grown without being connected with the seed points. Therefore, there are still lots of points in the original image having the grayscale values above 155 which are not marked in Figure 7. This characteristic ensures the reliability of the image segmentation and provides the ability to resist noise. For this example, this characteristic prevents us marking out the non-lightning part in the image because the lightning is always connected as one part.

Figure 3 : The original figure

Figure 4:The seed points: 255~255

Figure 5: Threshold : 255~255

Figure 6 : Threshold : 225~255

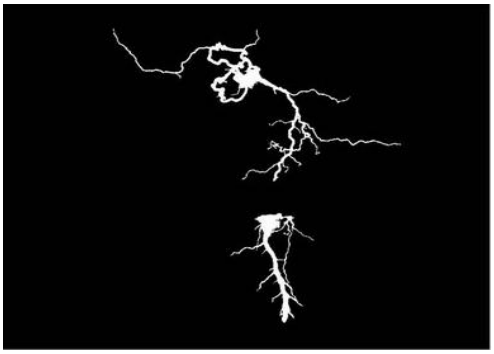


Figure 7: threshold : 155~225

III.REVIEW OF LITERATURE

Due to lost or steal of information is a big threat in present time. A lot of schemes are used to prevent the information from unauthorized access. In visual cryptography different techniques are used to avoid or illicit used of data (images).In some techniques pixels are used for encryption the images and also used of segment for encryption the images. In segment based visual cryptography segment are used to gives more security to images , as in segmentation uses the seven segment and sixteen display to gives the accurate result .In segment based visual cryptography a scheme used Seeded Region Growing .In 2006, D.Boen[4] proposed “Segmenting 2D

ultrasound images using seeded region growing" in which he express that an automatic way/ method of selecting seeds point is demonstrated and proof it effectively. He also eliminates the inherent order limitations but processing pixels with same ∂ values in parallel. He also gives the SRG method in which a seed is selected by automatically or manaually and these methods are tested in matlab. He selected the seedmay both cases manually as well as automatic as see the result. In 2009, H. Rai G.N, T.R.Gopalakrishnan Nair, proposed " Gradient Based Seeded Region Grow method for CT Angiographic Image Segmentation" they givesthe idea that segment based visual cryptography of medical images are generally are fuzzy in nature and this is the most challenging task.They used Gradient based cost function for implementation are as

$$G_n = \sqrt{G_x{}^2 + \frac{G_y{}^2}{KG}}, \text{ such that } 0 < Gn < 1$$

Where Gx is the horizontal gradient component, Gy is the vertical gradient component; k is the constant parameter which controls the region grow and Gmax is the largest gradient magnitude present in the image.They also presented the varios selection criterion of homogeneity as result seen in the quality of segmentation of seeded based region. As they taken the seed as manual based so that user intervention needed here.I n 2011, T. Zuva, Oludayo O. Olugbara, Sunday O. Ojo and Seleman M. Ngwira proposed "Image Segmentation, Available Techniques, Developments and Open Issues" in which they survey of, problems being encountered, achievements and the open issues in the research area of image segmentation and usage of the techniques / schemes in different areas/ ways. In this survey they also suggested what must be done in order for researchers to test their techniques '/ schemes performance and to compare them among other segmentation techniques / schemes.They considerd three main schemes / techniques Threshold-based, Edge-based and Region-based. Ans show the variations among them. In 2012 , R. Dass, Priyanka, S Devi "Image Segmentation Techniques" describes the different type of techniques of image segmentation as Gray Histogram Technique, Gradient Based Method, Thresholding Method etc. They also analyse the different algorithm for segmentation image. They also describes Recalculate position of Centroids in K clusters as

$$\mu_i := \frac{\sum_{i=1}^{m} \mathbf{1}\{c_{(i)} = j\} x^{(i)}}{\sum_{i=1}^{m} \mathbf{1}\{c_{(i)} = j\}}$$

In 2014, M. A. Hamdi Ecole " Modified Algorithm Marker-Controlled Watershed Transform for Image Segmentation Based on Curvelet Threshold" focus on the morphological operator called watershed segmentation.And later they used the low contrast image can be recovered by adaptive Threshold Curvelet.And this is beneficial for image segmentation. They said that segmentation is a process of divide the image into its characteristics e.g objects and color. In 2014, V.Vaithiyanathan and U. Rajappa proposed[25] "A Comparative Analysis among Basic Image Segmentation Methods" describes that segmentation has numerous methods that divide images which are widely apply to other applications i.e edge based, watershed segmentation ,threshold. and clustering. They describes that the main purposes of segmentation is to less / reduce the image for esay analysis without the lost in original image. They also describes that every method or techniques of segmentation has its own importance and used depends upon requirement. In 2015, Mohammad Mirhosseini[1], Omar S Magaña-Loaiza proposed [31] "High-dimensional quantum cryptography with twisted light " in which they describes Quantum key distribution (QKD) systems often rely on polarization of light for encoding, thus

limiting the amount of information that can be sent per photon and placing tight bounds on the error rates that such a system can tolerate. Here we describe a proof-of-principle experiment that indicates the feasibility of high-dimensional QKD based on the transverse structure of the light field allowing for the transfer of more than 1 bit per photon. In 2016, Chris Peikert [32],"A Decade of Lattice Cryptography", describes the Lattice-based cryptography is the use of conjectured hard problems on point lattices in Rn as the foundation for secure cryptographic systems. Attractive features of lattice cryptography include apparent resistance to quantum attacks (in contrast with most number-theoretic cryptography), high asymptotic efficiency and parallelism, security under worst-case intractability assumptions, and solutions to long-standing open problems in cryptography. This work surveys most of the major developments in lattice cryptography over the past ten years. The main focus is on the foundational short integer solution (SIS) and learning with errors (LWE) problems (and their more efficient ring-based variants), their provable hardness assuming the worst-case intractability of standard lattice problems, and their many cryptographic applications. In 2017 LiYibin and KekeGai [35]gives "Intelligent cryptography approach for secure distributed big data storage in cloud computing " in which they Implementing cloud computing empowers numerous paths for Web-based service offerings to meet diverse needs. However, the data security and privacy has become a critical issue that restricts many cloud applications. One of the major concerns in security and privacy is caused by the fact that cloud operators have chances to reach the sensitive data.

IV.MODEL AND METHODOLOGY

In figure 8, which shows the different / various schemes of the image segmentation .In figure 8 also show that what happen with image when the seed is selected manual and automatically and if security is high or low .

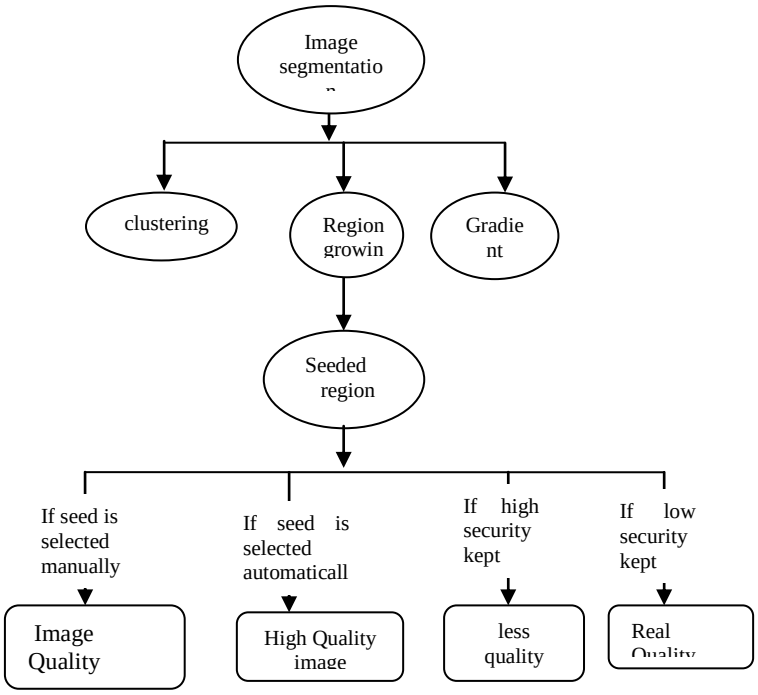


FIGURE 8: REGION GROWING SCHEMES

V.CONCLUSIONS

Region Based Image Segmentation is the one of the best schemes used for segmentation based visual cryptography. After analysing all the schemes of image based segmentation, it is concluded that there is no proper segmentation method / schemes that is best than the other schemes from all the domains. As seeded region growing techniques is an emerging solution because of its reliable, high security, etc. but the images quality depends upon the way to select the seed automatically or manually.

It is clear that different methods used with different images, as no proper method considered good for all types of images and every method has its own pros and cons. But in image segmentation it is clear that for high security the quality of images is somewhat said to be lost and for low security the better quality of images may be recovered.

In future, a lot of work is still pending, regarding which schemes / method is used for which type of images. It is still a challenging issue. As researchers are working to find the factors affected the segmentation and still there is no universally accepted method for segment based visual cryptography.

VI.ACKNOWLEDGMENT

We feel grateful to the referees for their valuable suggestions that have helped immensely in preparing the revised manuscript.

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