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A Review On Different Segmentation Methods

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***Abstract*: In current years, the use of remote sensed satellite images applications has increased promptly. Image Segmentation is one in every of the rising trends within the field of image process. The target of segmentation is always to simplify and/or change the representation of a graphic into something that is more meaningful and simpler to analyse. Image segmentation helps in segmenting the images into sub regions which are of our interest which can be analysed individually. Satellite imagery is one of the wide areas in segmentation. This paper gives the review on different segmentation techniques are used for segmenting satellite images. Finally, at end of the paper it gives an outline of and conclude with the different segmentation methods.**

***Keywords*: Remote sensed satellite images, Image Processing, Image segmentation.**

1. Introduction

The use of Remote Sensed Satellite images to analyse the land cover is a process that is been carried out for a long time now. In order to extract useful information from the satellite images which covers a huge area measured in several kilometres and objects that range from buildings to water-bodies to noise, clouds etc. A multi-spectral image is a collection of several monochrome images of the same scene, each one taken with a different sensor. Each image is referred to as a band. In image processing multispectral images are most commonly used for remote sensing application. A Multi-spectral image is one of that captures image information at explicit frequency across the spectrum. Image segmentation includes the process of portioning a digital image into multiple segments. The aim of segmentation is to simplify and change in representation of an image into something more meaningful and easier to analyse. Image segmentation is ordinarily used to locate objects and boundaries in images. More precisely, image segmentation is the procedure of assigning a label to every pixel in an image such that pixel with the same label share certain characteristics. The image segmentation result is a set of segments that overall cover the entire image, or set of contours extracted from the image. Each of the pixels in a region are similar with respect to certain characteristics or computed property, such as colour, texture, intensity.

2. Literature Survey

In this [3] three phase segmentation algorithm for high resolution satellite images has proposed. In this proposed scheme, three phases are used to segment remote sensing image. Here remote sensor image is given as input image. In this three phases are as Image pre-processing and watershed segmentation, Statistical threshold method, reduced segmented region. In a first phase, gray scale image which is converted from colour remote sensor image is applied to pre-processing.

In pre-processing, gray-scale image is divided into spatial blocks, after that calculate the double gradient and Eigen values for each spatial block of image. After pre-processing, watershed segmentation method is applied to get initial segmented marked regions. Due to watershed algorithm these segmented marked regions are over segmented. These over segmented regions passed to second phase as a input to removed redundant and noisy regions. In a second phase, over segmented image is given as input to statistical threshold approach. In statistical threshold, control limit, lower control limit and upper control limit by these three factors each block of window size w is processed. Pixel importance in the over segmented region is identify by using these three factors. In the over segmented region each pixel was checked against the three limits and corresponding decision was taken. At last noise, pixels are removed from segmented region. In a third phase, input as Noisy removal image is taken from statistical threshold. Then find out all over segmented regions with pixel set. Calculate the area of two adjacent regions for each pair of adjacent regions and then find the merging condition. This provides a high accurate segmentation approach on remote sensing images. In order to reduce segments, a confidence based watershed algorithm is proposed, but it fails to initialize the constant threshold during the segmentation process.

In this [4] they proposed an algorithm that first works on the high-resolution panchromatic data, performing an over segmentation aimed at preserving fine details and then takes into account the spectral information contained in the low-resolution multispectral data to further process this basic information. The initial over-segmentation produces a large number of elementary regions, most of them very small, which are then clustered and progressively merged, based on both spectral and spatial properties, in order to reduce the map to a small number of meaningful classes. The merging process goes on as far as possible, delivering a sequence of nested segmentation maps at different levels of detail, that provide a very rich hierarchical description of the image in terms of its component regions.

The first step is the Pixel-level segmentation of the panchromatic image, carried out by means of the hierarchical

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algorithm, based on a tree-structured MRF model of the image. The algorithm parameters are selected so as to guarantee an over-segmentation of the image which in turn minimizes the risk of keeping together regions of different nature that have close gray levels. The output of the first step is a collection of disjoint regions, characterized only by gray-level and spatial properties. The Fusion step enriches this characterization by adding a spectral feature, obtained as the weighted average of the spectral vectors of all pixel that, in the low-resolution multispectral image, correspond a minimum of partly to the region of interest. The following two steps aim at forming elementary clusters of regions that share the same characteristics: these are the new basic segments of the image and, to avoid losses, it is important to have a large number of them. First there is a Spectral Clustering, based on the multispectral features. Then new features are computed, based on the spatial neighbourhood of each region which account for the local textural properties of the image and are used in the spatial Clustering. At this point, the image has been segmented in a large number of clusters of regions, each of which is characterized by certain spectral, spatial, and textural properties.

In the final Merging step, such clusters are progressively merged on the basis of a suitably defined gain measure associated with each segment, which favours the merging of neighbouring clusters covering the same spatial area. The major innovations, and qualifying points, of this algorithm are the priority given to the panchromatic image, which helps providing a reliable high resolution map, the hierarchical nature of the segmentation, which allows one to recover multiple maps and select the one most useful for the current application, and the sequential region merging itself. A further advantage of the proposed algorithm is that all processing is at the region level, but for the first segmentation step, and hence the computational load is much reduced all the additional thus since multispectral knowledge are not used at the constituent level. As an obvious drawback, it can happen that neighbouring regions, with distinct spectral features, are not distinguishable in the panchromatic domain and hence kept together from the beginning, leading in the end to classification errors.

In this [5] two Multi-resolution algorithm present to active contour models which can speed up process. Firstly, they proposed a multi-resolution algorithm of an improved balloon model. Convergence is accomplishing on an image pyramid and parameter are automatically modified so that, at each scale, the maximal length of curve is proportional to the image size. This algorithm leads to an important saving in computational time without decreasing the accuracy of the result at full scale. The main advantage of this algorithm is to reduce computing costs. The computation time needed for convergence has been 55% shorter with the multi-resolution balloon model than with standard balloon model. Then here they present a multi-resolution parametrically deformable model using Fourier descriptors in which the curve is first described by a single harmonic; then harmonics of higher frequencies are used so that precision increases with the resolution. Here boundary finding using this multi-resolution algorithm leads to more stability. The goal of this multi-resolution algorithm is to obtain a better stability by increasing progressively the number of harmonics.

The main aim of this paper [6] is to improve the convergence speed. The image is decomposed by wavelet transform into different resolution. The final results show, improvement in speed and accuracy. Sometimes active contour is not suitable for real-time application due to slow propagation which is result of curve propagation in which active contour's level set formulation uses partial differential equation. In this paper, proposed multi-resolution approach based on wavelet transform by utilizing coarse resolution for curve initialization, convergence speed can increase rapidly. For image processing, wavelet is tool and in the rough scale it can suppress noise in an image. Also at the coarse level, contour is attracted at strong edge and weak edges avoided. The convergence will be quick, if initialization of curve starts with coarse version of an image, because only key features and edges remains, other details omitted. The algorithm is proposed to rise speed of level set segmentation that can used with any level set segmentation. Suppose take an image with number of resolution is given by user. The image is decomposed into number odd level of resolution using wavelet transform. Wavelet decomposed results are approximation coefficients, horizontal details, vertical details, and diagonal details. Starting from coarse image resolution, the level set algorithm of choice is run. As recent resolution is not of the original image, the convergence curve of the current resolution is ensample to the finer resolution up sampled is performed by factor of 2. The algorithm is carry on until the curve is converged in the original resolution. The advantages of this algorithm is, reduced the time of curve propagation in level set segmentation as well as make it applicable for real time application by solving the problems of slow convergence and accuracy of segmentation in noisy image are greatly improved.

3. Conclusion

In this paper, a survey on various multi-resolution segmentation algorithm has been done. The major aim of segmentation methods is to provide the accuracy in segmented images. Here the first [3] watershed segmentation algorithm gives better performance compared to the traditional segmentation techniques in terms of time, noise, and over segmentation. Secondly [4] A Hierarchical segmentation algorithm is fast and all processing is at region level. In further [5], proposed two multi-resolution algorithms, first on balloon model its aim to speed up process while allowing a constant accuracy of the result and second on parametric model which can increase the model stability. Last algorithm [6] which is level set image segmentation using wavelet shows a great improvement in terms of speed and accuracy.

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