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Analysis of Area of a Lake using Image Processing

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Abstract: ***The aim of the project is to obtain the area of lakes having irregular shapes. This paper proposes various algorithms to obtain the area of lake using, Region growing and 8 block chain algorithm. Analyzing the satellite images of lake helped in to determine the declining and rising water level in lake, and obtain the area of lake using various image processing. We have also presented the results of implemented algorithm.***
Keywords: Region Growing, 8 connected Block chain, Segmentation.

I. INTRODUCTION

Region Growing is a technique of image segmentation in which the neighbouring pixels are examined and added to a region if the edges are not detected. This process is performed for every boundary pixel in the region. [1] Region-based segmentation is a connectivity between pixels to choose whether these pixels belong to the same region or not[2]. In method initially a pixel is considered and it continue on adding the pixels based on similarity, to the region. When the growth of a region stops another seed pixels are choosen which does not belong to any other region , and again the process is started. The whole process is repeated until all pixels belong to same region.[6]In Region growing based segmentation method the segmentation of the images is done into various regions based on growing of seeds(initial pixels). The selection of the seed pixels can be done manually or automatically. The growing of seeds is controlled by connecting between the pixels. Chain code provides a storage efficient representation for boundary of an object.[5] Chain coding are used to represent the binary image by a connected sequence of straight –line segments. The representation is based on 4-connectivity and 8-connectivity of segments. As an edge is traced from its beginning point to the end point the direction that must be taken to move from one pixel to another is represented by number in 4-chain code or the 8-chain code. From the two chain codes, the 4-chain is easier as it only requires four different code values. Important features of image are shape, colour and texture. The most important feature of an object is shape. The shape can be described into two methods. The first method uses boundary features and the second method uses region features to describe the shape. Boundary features are extracted from boundary of shape, while regional features are extracted from the region occupied by the shape such as the area.[3] By applying contour detection techniques Boundary features are found. For recognition of shape of any object Contour detection technique is used. To find direction code 4 and 8 chain directional code is used. To find chain code, firstly the object must be scanned from left to right. Once the starting pixel of object is found, the boundary is traverse till the end pixel of the image.[3] The Starting point of an image defines the chain code.

II. METHODOLOGY

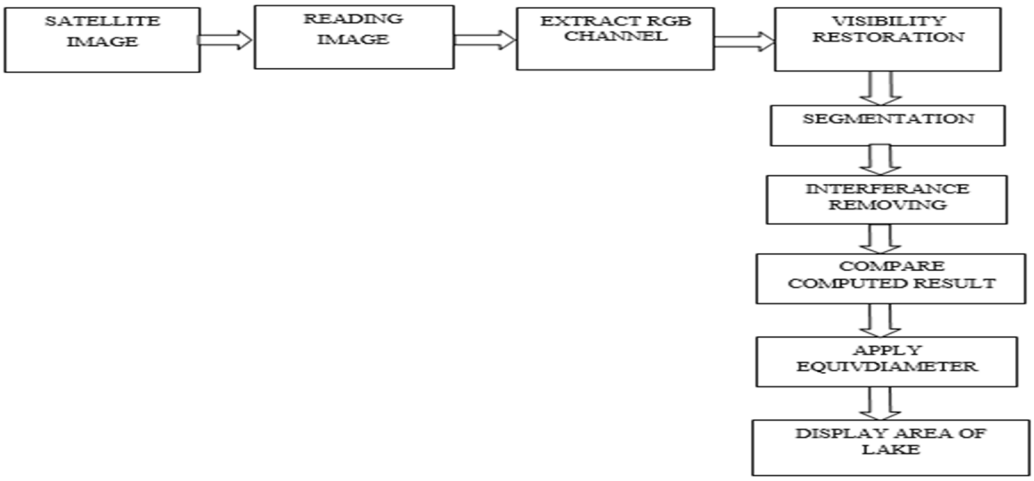

Figure 1: Block Diagram

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III. PROPOSED METHOD

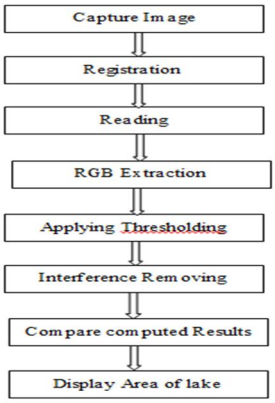

Figure 2: Flow Chart of Implemented Method

IV. ALGORITHM USED

1) Region Growing Method
2) 8 connected Block chain Method

A. 8 connected Block Chain Method

Chain coding is used for the representation of boundary by connecting the line segments sequentially having specific length and direction. This method is based on 4 connectivity or 8 connectivity segments. By using a number scheme the segments are coded based on the direction. It is also called as Freeman chain code. In this method the images which are acquired are processed in grid format with equal spacing in both x and y directions. A chain code is generated by tracing the boundary and assigning direction to segments which connects each pair of pixels. A boundary point is assigned to every pixel. Chain codes are the most size-efficient lossless compression methods for representing rasterized binary objects. Each element in the chain is encoded to show the relative angle difference between two adjacent pixels on the boundary of an object

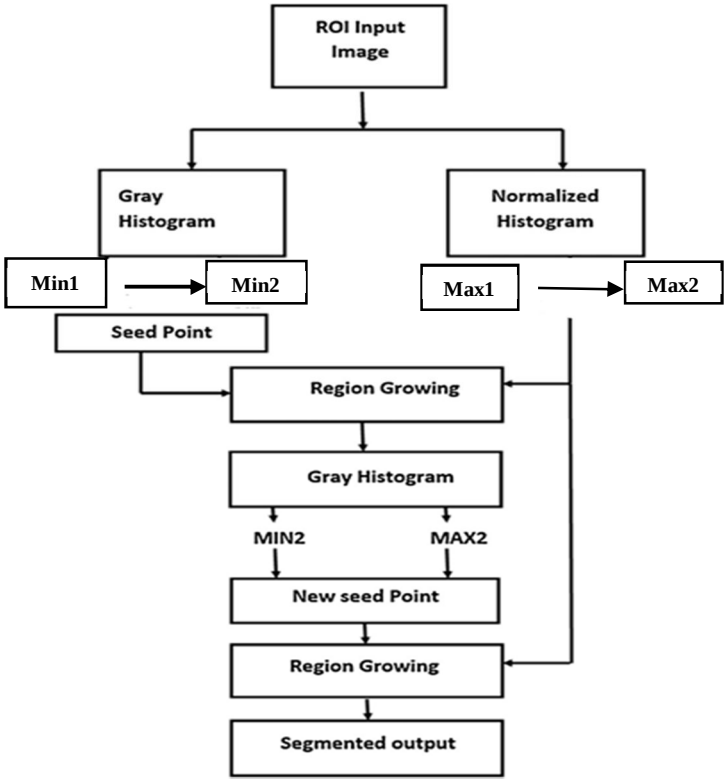

Figure 3: Flow chart for 8 connected block chain method

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B. Region Based Techniques

Region growing is a method of image segmentation. It is opposite to split and merge algorithm. It is the technique to obtain the region directly it is based on connectivity. It provides the original image which has clear edges with better segmentation results also it divide the entire image into sub regions. Each pixel is similar to the properties of image. It is also called as pixel based image segmentation technique.

This method is better than edge based method for noisy images in which the edges are difficult to detect. The process starts with a set of "seed" points and goes on growing the region by appending to each seed points with neighboring pixels having similar properties. The advantage of this method is that it correctly separate the regions that has similar properties, we require less number of seed points to represent the properties we want.

Region based segmentation is a technique for determining the region directly also it is based on connectivity. This technique divide the entire image into sub regions. The region based segmentation is partitioning of an image into similar areas of connected pixels through the application of similarity criteria among set of pixels. Each of the pixels in a region is similar with respect to some characteristics or computed property such as colour, intensity or texture.[1] Region-based techniques rely upon common patterns in intensity values at intervals of neighboring pixels within clusters. The goal of segmentation algorithm is to cluster the regions according to their purposeful roles.

Region growing approach include the following steps

1) Start the process by selecting the seed pixel from selected region and compare it with the neighboring pixels.
2) The region is grown by adding the neighboring pixels having similar characteristics.
3) The size of the region is increased because of the addition of the neighboring pixels, when the growth of one region stops we select the other seed which yet not belong to any region and again repeat the same process.

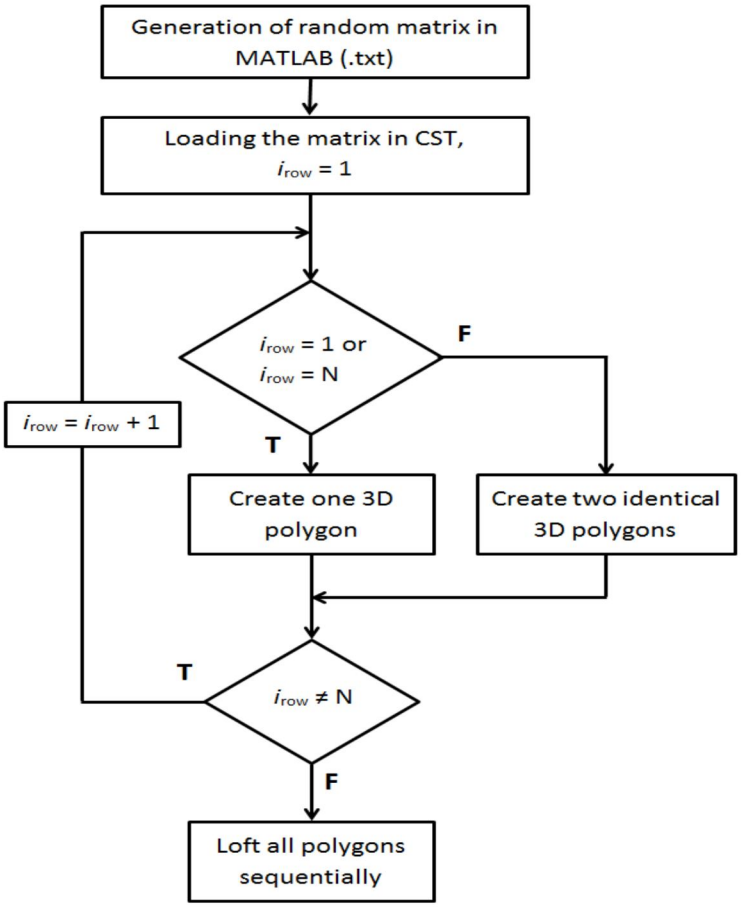

Figure 4 : Flow chart for Region growing method

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V. RESULTS

Figure 5: Rankala lake
Area: 70066 SqM (8 connected block chain)
66864 SqM (Region Growing)

Figure 6: Rankala lake
Area: 36300 SqM (8 connected block chain)
34385 SqM (Region Growing)

Figure 7: Kalamba lake
Area: 27656 SqM (8 connected block block chain)
27633 SqM (Region Growing)

Figure 8: Kalamba lake
Area: 49288 SqM (8 connected block chain)
49192 SqM (Region Growing)

VI. CONCLUSION

In this paper the two algorithms are used one is based on segmentation while another is based on block chain. It takes to the conclusion that the method uses seed pixel, region growing and polygon method to get the area of lake. But we can see that the better results are obtained by using 8 block chain method.

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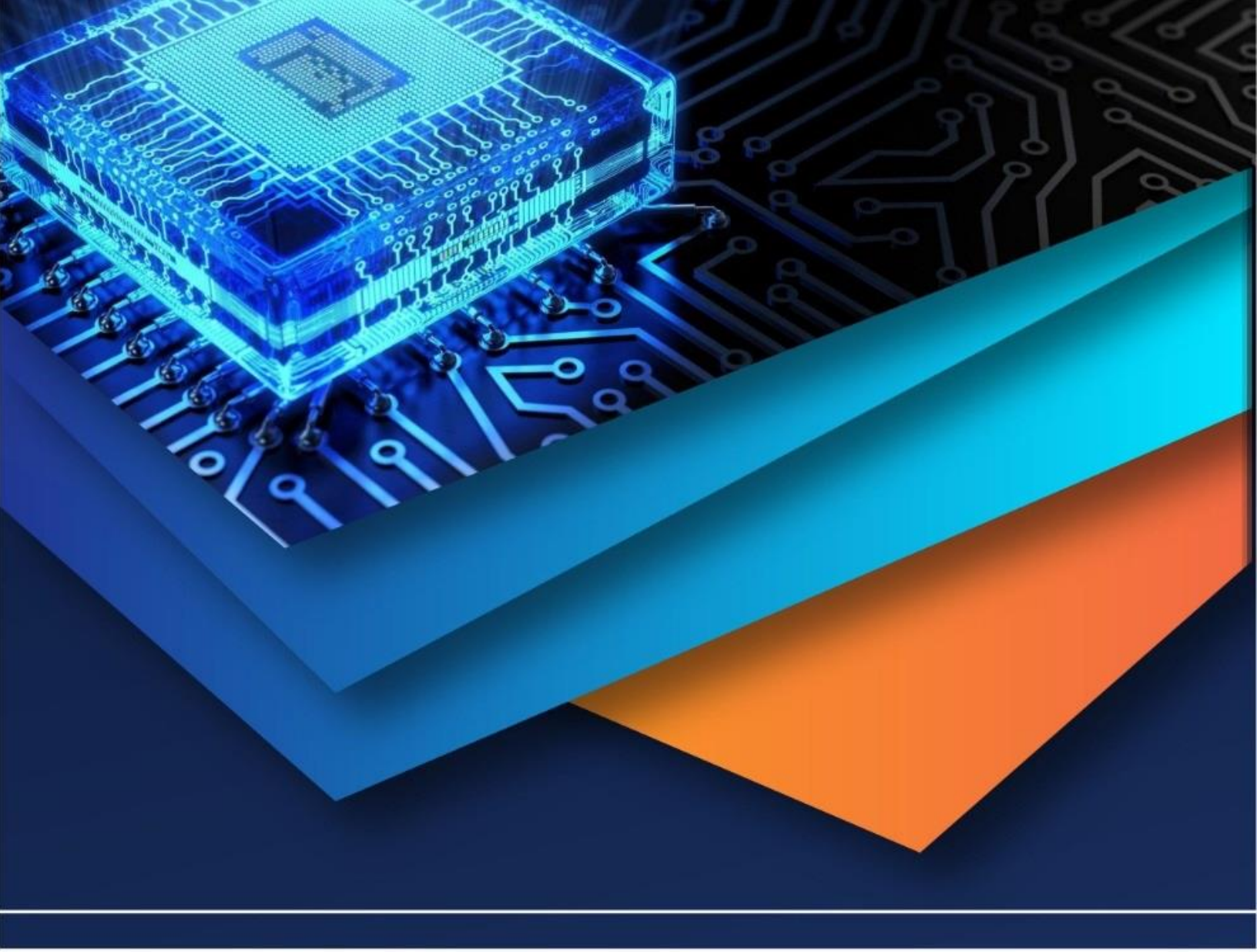

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