Segmentation and Enhancement of Satellite Images using Flood Fill Algorithm for Analysis for Disaster Management

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Abstract - *The geographical location is also one of the factors that causes flood to occur. The impact flood has results in severe damage and cause for lives. Due to huge amount of rainfall the rivers, lakes, and dams overflow which results in massive damage to people's lives and their assets. The bigger rivers cause a lot of chaos. Rivers that flood destroys the livelihoods. During this situation it is necessary to identify the affected areas for rescuing the lives and take immediate action. After the disaster it is required to discover the geographical area which is affected and help administration to plan so that they can bring back the people safely. This paper is an attempt for observing the affected area using satellite images for rescue operation and analyze the disaster.*

Keywords-Flood, flood-fill algorithm, Image processing, MATLAB.

1. INTRODUCTION

Flood is a hazard that results from extreme geophysical events creating unforeseen threat to human life and assets. It impacts negatively on the people and their welfare. Heavy rainfall which happened during the month of July-August 2018, created severe floods in many parts of India. Kerala, Uttarakhand and Kodagu were some of the states affected by these floods. According to various resources immediate mitigation and rectification expenditure may cost more than 1000 Crores. Flood management planning is very important, it helps in rescuing people from the affected areas, to alleviate the problem of flood and to take necessary preventive measures. The study shows the scientific and efficient approach with suitable illustrations of map and real time flood inundations. The areas, which are highly affected by flood are delineated. Hence the people affected from flood can be rescued and moved to a safer place. Analysis of geographical image can also provide support to rescue team to plan for rehabilitation.

2. Literature Review

C forms of jobs pose certain restrictions on a neural-based approach. The unresolved problems are combined those related to the pattern of techniques based on identification using image processing and application specific to neural networks [3].

Ajay Kumar Boyat1 and Brijendra Kumar Joshi states that digital images are prone to noise always while image acquisition, transmission and coding. It is tedious job to remove noise from the digital images having no much knowledge respect to noise model. Review of noise models are essential in the study of image denoising techniques. In this paper, we express a brief overview of various noise models. By analysing their origin these noise models can be selected. We present a complete and quantitative analysis of noise models available in digital images [4].

Maciej Kalisiak and Michiel van de Panne offer a new variation of the RRT planner was offered by Maciej Kalisiak and Michiel van de Panne which demonstrates good performance on both highly constrained as well as loosely constrained environments. An implicit flood-fill-like mechanism is the key to the planner, a technique that is well suited to escaping local minima in highly constrained problems. The sample results have been shown for a variety of environments and problem, and discuss future improvements [5].

Codruta O. Ancuti, Cosmin Ancuti, Christophe De Vleeschouwer, and Philippe Bekaert introduced an effective approach was introduced by Ancuti, Cosmin Ancuti, Christophe De Vleeschouwer, and Philippe Bekaert to enhance the underwater images captured and degraded because of the medium scattering and also absorption. This technique is approach with single image which need not require any specialization in hardware or the ideas about the underwater conditions or scenic structure. The two images are blended together and derived from a compensated colour and a version of white balanced image that has been originally degraded. These images are fused with their weight maps and well defined to promote the colour contrast and transfer of edges resulting in a output image. Artefacts are created in order to avoid the weight of map transitions of the image that has been reconstructed in the components of low frequency. A multiscale fusion strategy has been adapted. The qualitative evaluation and quantitative evaluation show the images that are enhanced and the videos are categorized with better expose of dark regions, global constraint and the sharpness of edges. The algorithm is validated and hence proved that it is practically independent of the settings of the camera and it improves the accuracy of various image processing applications, like image segmentation and key point match [6].

Eva-Marie Nosal uses Flood-Fill algorithm in the "bucket" tool to fill the connected parts with colour of a bitmap of *paint programs. This results in node getting connected in a multi-dimensional array. Recursive flood-fill algorithm implementation is focused. if there is a path existing between two elements then it is said to be connected along where the value exceeds of all elements by some threshold for a given node and threshold. On every interested node of all elements, flood-fill is made to run recursively. Passive acoustic monitoring is explored for two applications: One is Two dimensional (frequency and time) flood-fill signal detection is applied to spectrograms; Four dimensional (x, y, z, and time) for source detection, flood-fill applied to source position possibility volumes found using an algorithm that gives the chance of a source occupy a point in time and space [7].*

Lei Zhang, WeishengDong, DavidZhang, GuangmingShi presents an effective image denoising pattern by utilizing LPG with PCA. For a better preservation of image local structures, a pixel and its nearest neighbours are sculpted as a vector variable and training trials are selected by block matching using the local window. Suchan LPG technique promises that only the sample blocks with related contents are used in the local statistics calculation for PCA transform estimation, so the local skins of the image can be well conserved after coefficient shrinkage in the PCA domain to remove the noise. The LPG-PCA denoising practice is repeated more than one time to additional improve the denoising performance, and the level of is adaptively adjusted in the second stage. LPG-PCA method gains very modest denoising performance, attractively in image fine structure preservation, in comparison with state-ofthe-art denoising algorithms when experimented on testimages [8].

Jean-Franc¸ Ois Aujol, Gilles Aubert, Laure BlancF´Eraud, Antonin Chambolle designed an algorithm that considers both the component of bounded variation and a component with textures and the noise and splits an image into a sum u + v . This disintegration is a work inspiration of Y. Meyer. The decomposition is carried out by reducing a convex function in which u and v are two variables alternately in each variable, the total variation reduction is based on the minimization of a projection algorithm. The mathematical study of our method is undertaken and some numerical results are presented. In particular, non-textured SAR image restoration of a component is shown [9].

Jukka Arvo, Mika Hirvikorpi. and Joonas Tyystjarvi stated in their work that most former soft shadow algorithms have either suffered from restricted self-shadowing capabilities, been too slow for interactive applications, or could only be used with a limited type of geometry. The proposed approach is an efficient image-based approach for computing soft shadows. The method is based on shadow mapping and provides the associated benefits. This technique uses pixel-based visibility computations for rendering penumbra regions directly into the screen-space. This is accomplished by using a modified flood fill algorithm which enables to implement the algorithm using programmable graphics hardware. Even though the resultant images are mostly of highest quality, the approach is not claimed to be actually correct. The time and memory calculations requirements for soft shadows depend on resolution of image and the lights that are present, not geometric scene complexity [10].

3. METHODOLOGY ADAPTED

Phase-I: *- Particular images of flood affected areas will be selected. The image can be either of satellite view or landscape view. Using GIS images can be collected. Mainly landscape images are used in this flood analysis. Images of areas before and after Flood crisis will be collected.*

Phase-II*: - Once the images are collected it will be processed and analyzed using MATLAB. It provides an interface to analyze and process the images. The RGB pixels of the after-flood image will be extracted and noted for further analysis. The pixels of area covered with water will be noted. based on these values the maximum and minimum range will be calculated.*

Phase-III: *-The histogram for the both RGB and Grayscale images will be generated. These provides the data regarding the tonal contrast of the images and the number of pixels that are present in the particular range. Based on these information approximate details about the water that has covered the land can be taken. These gives nearest values of water. Having all these data a suitable algorithm will be implemented.*

Phase-IV: *- The before flood and after flood images will be converted to its binary and matrix format. Converting the image to it binary will make it ready for processing it. Flood Fill algorithm will be used for analysis of flood affected areas. Getting the values from the image matrix all the areas, covered with water will be selected. Then these values will the noted. The values will be stored in tables. With these values the image will be compared with before flood image. The difference will be calculated and the total area affected by flood will be analyzed. This gives the approximate results.*

4. FLOW CHART

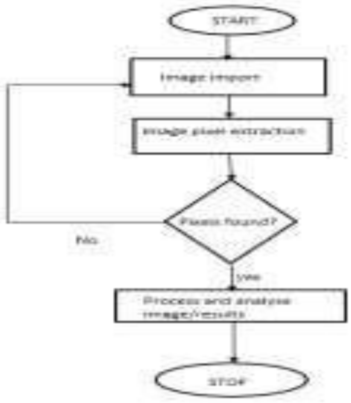

Fig 1 Flowchart of flood analysis

The above flowchart in fig 1 shows the flow of process that is been followed in the project. Starting from image import, the pixels of the image will be extracted and if the pixels of the region interested is found the image will be further processed. Or else the image needs to be imported again. Once the image is processed it will be analyzed and the results will be obtained

5. RESULTS

The data respective to the area affected (figure 2 and 3) by flood will be taken in prop tables. Once the segmentation is done and the area is analyzed using flood fill algorithm, approximate result is calculated. The resultant data will be plotted in graph as shown in the below figure 4. The values give the approximate results providing the area affected from flood in respective units.

Fig 2. Before Flood Image

Fig 3. After Flood

Fig 4 Final result of Flood analysis

The flood analysis gives a clear picture of the area that will be impacted from the flood. These data will help in taking the precautionary measures in case of flood or before the flood occurs. The area that is most prone to flood will be analyzed and victims of flood from the area can be evacuated when there is a chance of flood.

At the initial stage of flood, based on the water that is occupied in the area the results are calculated. In future private and governmental assets can be mapped with the image and the most approximate results can be provided showing the overall damage with respect to the properties. These results can be used to analyze the flood more efficiently.

6. *CONCLUSIONS*

Floods are a natural phenomenon. Floods of varying intensity have been happening in all the flood plains since time immemorial. However, the ever-increasing work of the flood-plains fallouts in massive loss of lives and indemnities, causing the floods to be named as 'disasters'. The problem is intricate so do the solution, if not elusive. The occupation of flood plains continues to rise due to rise in population and economic, industrial and other activities. Consequently, the flood damages also continue to increase.

There is no simple or fool-proof solution to the problem. Various measures, or a combination thereof, have to be adopted depending on the situation. Satellite Remote Sensing and GIS practices have developed as a commanding tool to deal with several facets of flood management in stoppage, alertness and relief management of flood disaster. They have greater role to play as an improvement over the existing methodologies. GIS is best suitable for different floodplain management activities such as mapping of base, mapping of topography, and verification of post disasters that are mapped with floodplain extents and depths. Remote sensing and GIS techniques can replace, supplement or complement the existing flood management system. Extensive use of these technologies has great prospect in creating long term database on flood proneness, risk assessment and relief management.

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