Method for Surveying the Landslide Caused Using Image Processing Approach

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Abstract

Landslides are attribute phenomena for the factor balanced out of the world's area. Significant rainfall and earthquake are the two main concerns for landslides. The appropriation of area dimension is the most important quantitative parameter of landslides. Along these collections, the inspiration behind this research is to explain the range and spatial comparison of rainfall actuated as compared and those of tremble persuaded landslides. Due to subsequent activities of rainfall and earth quake, huge improvements are regular risks to individuals' lifestyles. In this document, the elucidation of information is quantified as identification requirements. Multisource high-resolution information, for example, a SPOT satellite picture, And Ranging (Lidar) information, and antenna ortho-photographs were used to develop the attribute space for landslide research. Landslides were recognized by an object-oriented technique becoming a member of edge-based segmentation and a Supported Vector Machine (SVM) technique. The depiction results are evaluated in connection with those by guide elucidation. Two situations from Malin city landslide and Uttarakhand's substantial rainfall are tried. Both situations illustrate that the object-based SVM technique is excellent to a pixel-based system in collection precision.

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I. INTRODUCTION

Due to various reasons, quakes take place every day in some countries. Landslides activated by earth quakes become very common. The frequency of mishaps is on an increasing trend. To reduce the effect of mishaps, the efficient minimization techniques should be performed [1], [2], and [3]. The latest illustrations of such mishaps are Malin town landslide [7] and Uttarakhand’s huge rain fall [8]. There are three sorts of landslide research strategies exist: ground, aerial, and space-borne, or a hybrid [5]. Ground research can be exceedingly precise, yet is slowly. At the factor when disaster happens, accessibility is very low. Consequently, it is challenging to create the research in close constant or in a comprehensive opportunity area after a heavy rainfall. In beginning it was impossible to check whole landslide position, so it was very challenging for research. Ground research requires that well-trained experts determine landslides under a stereoscopic environment, which's time intense and labor-intensive Necessary to develop more efficient technique to identify landslide for research. After landslides take places, the position of disaster has to be analyzed and following additional hazards should be analyzed. To reduce the effect of mishaps, the efficient

minimization techniques should be performed. Earlier floor research was done for research of the landslide position, this procedure is very slowly. It is challenging create research of Large landslide position in floor research kind [4], [5].

In suggested program, edge-based segmentation technique is used for segmentation of satellite images. Object Oriented Analysis method(OOA) is used to extract the landslide functions. Support vector machine (SVM) is used to categorize and training segmented images SVM category outcomes give the landslide recognized areas and further processing of the research is done. Using the satellite (Spot) images and professional presentation technique, it is easy to cover the huge position. Because of these identify images, the procedure of landslide identification and research is as fast as compared to the floor research kind. The floor surveys are done by well qualified Geologist only. But in this program, there is no need of such qualified person. Thus, the position of the disaster is analyzed quickly. This program simply, first finds the landslide position and creates the research of that position. Later, it examines the causes of such landslide mishaps. It also creates the landslide identification procedure more efficient and reduces time duration required for the identification procedure.

The program is useful to identify and define the landslide caused due to huge rain fall and earth quake. Satellite images (spot images) are used for identification and depiction so the program can be used to identify and define landslide in various regions in the world. The program can be used to identify and define landslide caused due to huge rain fall and cut earth quake.

II. RELATED WORK

In this document [5], the presentation of information is quantified as identification criteria. Multisource high-determination information, for example, a SPOT satellite tv picture, Electronic Landscape Model (DTM) reduced from Light Detection and Ranging (LiDAR) information, and antenna ortho-photographs were used to build the trick area for landslide assessment. Landslides were recognized by a product oriented technique joining edge-based segmentation and a Reinforced Vector Device (SVM) technique. The collection outcomes are analyzed in connection with those by guide presentation. Two situations from northern and central Taiwan are tried. Both situations demonstrate that the object-based SVM technique is superior to a pixel-based program in agreement precision. Kuan-Tsung Alter received an OOA technique in this research to concentrate landslide Features. They interviewed its performance for precision in 2 situations managing multi-determination digital information, for example, antenna or satellite TV meaning, terrain information got from an viral Lidar indicator, and its additional pointers integrating downward slope and OHM in the landslide elucidation. They furthermore compared these information and an ordinary pixel-based SVM technique. They connected edge-based segmentation in the first position, and after that combined comparable qualities. Therefore, they chose areas of preparing illustrations for a SVM agreement.

In this document [2], the traditional program concentrates around visible perception of shade tone and geo morphometic functions of landslides on the antenna images. Both guide elucidation and automated identification of satellite TV images are furthermore used. The majority of the delayed autocrat depiction systems for landslides using images are focused around spectral functions other than topographic functions. Subsequently, landslides can't be effectively recognized. A delayed research is to create an brilliant technique with a application interface for helping visible elucidation of landslides [6]. Both spectral and spatial factors are used for the information of the application to back up the translator/administrator to perfectly understand and illustrate landslides. Automatic identification of landslides primarily on assumption of spectral information of digital images is proficient as far as time utilization, though the outcomes generally can't meet the requirements for

taking developing measures. In any case; guide presentation is so average there is no option meets the requirements for crisis reaction.

A multiple technique is to negotiate the points of interest of automated considerations with guide knowing. The removal of geo-morphornetric factors from viral LiDAR information is hence considered (or managing in the user-friendly interface to help the translation. To make an user-friendly presentation interface to help the arbitrator professional information of morphometric qualities of landslides are needed for entryways to automated identification criteria to highlight the potential areas of landslides in the structure. In this research, for understanding these qualities, Aerial overviews were completed with viral LiDAR and camera to get Weak and DSNi of 1 m collections and ortho-photos of 50cm collections.

In this document [3] Increase inventory used to be carried out by guide judgment of knowledgeable experts. It is a period spending and performs serious employment, to lead creating successful ordeal assessment and recovery plans incomprehensive. What's more let comprehensive scale disaster assessment can't continue easily because of restricted by hills or post-fiasco components, for example, street disruption. Along these collections, how to improve the automated and its performance of avalanche inventory is a paramount discovery theme. Along these collections, Vector Device (SVM) program is used. The depiction outcomes are analyzed in assessment with those of guide elucidation. Also, the distinctness investigation for the used peculiarities on rainfall impelled landslide knowing is additionally given. The distinctness assessment result shows that slant is a vital element to recognize the avalanche and different classes.

In this document [4], a nationwide geo-hazard applying venture using state-of-the-art advancement of synchronized viral LiDAR and photography is therefore released by Focal Geological Evaluation Taiwan. The outcomes integrate extremely itemized DEM and DSM of 1m collections and digital heavenly photo of 50 cm collections, and in addition a inventory of the geological terrible gadgets with the obtained LiDAR information and images. The real issues knowledgeable integrate substantial reasoning covers, greatly great terrain help, thick plants spread, and the wide opportunity of the research area. With the requirements of great dedication information and brief duration of task time, the test is to realize a plan to get a complete opportunity of information free of voids and relics. A nationwide venture for disaster applying is accordingly started and released. As specified in the presentation, the LiDAR summary is just a part of the nationwide geo-hazard applying venture. At the factor when the LiDAR items are communicated to Focal Geological Evaluation, experts will keep on discovering their applications.

III. IMPLIMENTATION DETAILS

A. System Architecture

User give the satellite image as an input, after that smoothening of image is done. Afterthe smoothening of image, the process of edge based segmentation is performed in whichsegmentation of images into regions. The result obtained by the segmentation is provideto the object based method, in object based method the data for the process of training isselected, for the classification process the SVM method is implemented and finally theclassification result is obtained.

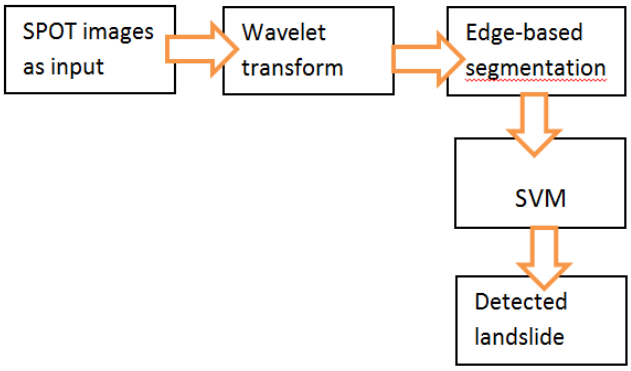

Fig 1: System Architecture of landslide detection system

B. Mathematical Model

Let the system S is represented as:
S = f I, S_g, F, C, D g

- Extracting Input Images

Consider I is a set for input images
I = f i_1, i_2,i_3,....,in g
Where, i_1,i_2,i_3,.... are the number of images fetching from satellite

- Edge Base Segmentation

Let, S_g is a set for segmentation base on edges
S_g = f e_1, e_2, e_3... en g
Where, e_1, e_2,..,e_n are the number of segmented edges

- OOA Method

Consider, F is used for extracting features
F= f f1, f2... f_ng
Where, f1, f2 ...f_n are the number of features

- SVM Classification

Consider, C is a set of classifier
C = f c1, c2, c3... cn g
Where, c1, c2, c3 ...are the number of classifier

- Detect Landslide for Analysis

Consider, D is a set for detection of landslide for analysis
D = f d_1, d_2,...,d_n g
Where, d_1, d2,....,d_n are the number of detections for analysis purpose.

c. Module Description

1. As input we will give spot images or satellite images.

Spot or satellite images are used as input to the system. We are using only satellite images which cover the all area where the landslide occurred.

2. Image smoothing using wavelet transform.

It is used to remove noise from the spot satellite images. Steps in Wavelet transform:

Step 1: Apply forward wavelet transform to a noisy image to get decomposed image.

Step 2: Apply threshold to decomposed image to remove noise.

Step 3: Apply inverse wavelet transform to threshold image to get a denoisedimage.

3. Segmentation of images can be done using edge-based Segmentation method.

(Segmentation of the image is done in regions) A basic task of segmentation algorithmsis the merging of image elements based on homogeneity parameters or onthe differentiation to neighboring regions (i.e., heterogeneity). Thus, segmentationmethods follow 2 strongly correlated principles of neighborhood and similarity ofpixel values.

Generally, edge-based segmentation method can be applied to partitiona scene into regions. This approach describe regions by their outlines, theseare generated through edge detection filtering, for examples, a sobel or canny operator,followed by an edge linking algorithm. Optionally, the transition from theoutlines to the interior region can be achieved by contour-filling methods such asthe morphological watershed algorithm.

4. OOA method is used to extract land slide features.

Object oriented method used to extract the landslide features. In this module thespot image as features are extracted using object oriented method. The extracted
Features are then use for further detection processing.

5. SVM (Support Vector Machine) method is used to classify and training thesegmented images.

Training of the Support Vector Machine is done after that classification of the segmented regions is done in the SVM. To recognize landslides the extracted OOAfeatures are used and the results of SVM are used.

C. ***Wavelets transform:***

There are two types of wavelet transform:

- Discrete wavelet transform
- Continuous wavelet transform

In our system we are using discrete wavelet transform. Discrete wavelet transform can be used for easy and fast denoising of a noisy signal. If we take only a limited number of highest coefficients of the discrete wavelet transform spectrum, and we perform an inverse transform (with the same wavelet basis) we can obtain more or less denoised signal.It is used to remove noise from the spot satellite imagesImage de-noising has remained a fundamental problem in the image processing. Wavelets gave a superior performance in image de- noising due to its properties such as multi-resolution.

Advantages of wavelet transform:

- Removes noise from an image.
- Due to Denoising of image further processing gets easier and results generated are better.

Steps in Wavelet transform:

Step 1: Apply forward wavelet transform to a noisy image to get decomposed image.

Step 2: Apply threshold to decomposed image to remove noise.

Step 3: Apply inverse wavelet transform to threshold image to get a de-noised image.

IV. RESULTS AND DISCUSSION

Experimental result shows that the time required for training of images in our proposed system is less than time required for training in existing system.

Fig 2: Time required for training images

Table 1: Time required for training image.

Number of images	Training Time in Sec Existing System	Proposed System
10	21	19
20	41	36
30	66	60
40	98	90
50	117	105

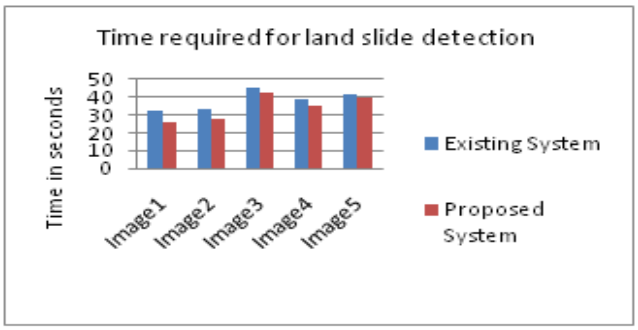

Fig 3: Time required for landslide detection.

Above fig 3 shows the time required for land slide detection in existing system and our proposed system, it shows that our proposed system required less time to detect.

V. CONCLUSION

We implemented an OOA technique in this research to draw out landslide features. We evaluated its efficiency for precision in 2 cases developing multi-resolution electronic information, for example, aerial or satellite TV visuals, landscape information based on an airborne LiDAR indicator, and its mixture signs including slope and OHM in the landslide presentation. We also compared this information with a traditional pixel-based SVM technique. We used edge-based segmentation first, and then merged similar functions.

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