International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-8 Issue-6, August, 2019

Clustering of Trees from Panchromatic Images

Swathi Thotakura, Suvarna Vani Koneru, Praveen Kumar Kollu

Abstract*: *Tree Clustering from satellite images assists in ecological environmental protection. It also helps in managing green resources to provide sustainable development guidance. The automatic clustering of trees is a challenging task. Many models tend to give poor results when there is noise in the image. The aim is to propose a model for clustering of tree crown from panchromatic satellite image using image processing algorithms. In the proposed model we use Cartosat-2 satellite data and the image data is pre-processed to enhance the resulted image analyzed using segmentation models. The resulted image is trained using the clustering model which classifies the tree crowns from the panchromatic images. The proposed model can be able to classify tree crowns effectively from satellite imagery. The proposed model also calculates the tree crown height and width from satellite imagery.

Index Terms*: *Clustering, Cartosat-2 satellite, Image processing, panchromatic images, Tree-crown.

I. INTRODUCTION

Bhuvan, an application for internet mapping services, provides an extremely responsive, intuitive mapping interface with elaborated pictures and embedded map information. It's supported the' Open Layers Open supply project, that provides powerful, easy mapping technology for satellite information organization and map information [9]. A number of Bhuvan 2D's practicality is map navigation, map panning, and its ability to feature a degree, polygon, parcel line, add drawings, space of activity and parcel distance. There square measure a number of the prevailing features: visualizing multi-resolution, multi-sensor, multi-temporal image information, drawing second objects, urban style tools, relief map, drawing tools, 3D fly-through, navigating through the 3D read pop-up menu, etc.Image processing is a processing of an image and takes an image as an input; the image processing output may be either an image or a group of options. This includes enhancing pictures, removing noise, restoring, police investigation options, pressure, etc. Noise, blurring, incorrect color balance and poor distinction continuously have an effect on digital pictures. There square measure totally different operations during this image process numerous operations square measure administrated. They're an improvement of pictures, segmentation, and extraction of options, classification, and clustering.

Revised Manuscript Received on October 30, 2019.
* Correspondence Author
Swathi Thotakura*, Department of CSE, VRSEC, Vijayawada, India
Suvarna Vani Koneru, Department of CSE, VRSEC,Vijayawada, India.
Praveen Kumar Kollu,Department of CSE, VRSEC,Vijayawada, India.

II. RELATED WORK

Hongyu Huang, Xu Li, and Chongcheng Chen et.al [1] In this research, they implemented the bias field assessment, in which the very high-resolution UAV derived orthophoto is used in the segmentation of medical image to decrease the in-canopy spectral heterogeneity for detection and delineation of individual tree crowns.

Weijia Li, Conghui He, Haohuan Fu, and Wayne Luk et .al [2] In this article, they suggested and applied of tree crown detection strategy based on FPGA toward large-scale remote sensing pictures. As a multispectral image, they had taken input. This is the leading high-performance idea for the initial tree crown detection algorithm, the most commonly used technique of identification of tree crowns for centuries of optical remote sensing pictures.

Aravind Harikumar, Lorenzo Bruzzone et.al [3] This article introduces a new technique for classifying conifer species based on the performance of geometric characteristics that describe both the internal and external structures. The classification of tree species using LiDAR information within a class is a difficult issue when considering only the tree's internal crown features.

Claudia Paris, David Kelbe, Jan van Aardt, and Lorenzo Bruzzone et.al [4] Tree crown structural parameters are vital information to examine traversing forest flame dispersion, invasive species dynamics, but continually these parameters are hard to assess. In this paper, they had suggested airborne laser scanning affords compatible data and a uniform nadir view required for crown segmentation, the data attributes of terrestrial laser scanning make such crown segmentation energies much more complicated. Jian Yang, Yuhong He, John P. Caspersen, and Trevor A. Jones et.al[5] In this article Delineating ITCs in elevated spatial resolution pictures can aid intensify the inventory and management of forests. Earlier, single-band watershed segmentation procedures usually abandon to delineate wide leaf species, unusually when a single-scale parameter is applied to balance segments to reference crowns of numerous dimensions. Wen Xiao, Sudan Xu, Sander Oude Elberink, and George Vosselman et.al[6] Lidar is to afford a successful way to distinguish tridimensional (3-D) alterations in trees because laser beams can infiltrate within the leaves and thus afford whole coverage of trees. Their intention in this article is to detect variations in urban area trees using multi-temporal airborne lidar point clouds. Three datasets were classified into several groups, including trees, including a portion of Rotterdam, The Netherlands.

Due to the forces of three-dimensional structures, Chao-Cheng Wu, Shao-An Tsai, and Yu-Lun Wu et.al[7] suggested LiDAR information has performed while origins of stand-level tree height, stem quantity, and biomass estimation. High LiDAR information sampling extends a comprehensive vertical tree crown structure. In this multi-level morphological active contour algorithm, LiDAR pictures were suggested as the input for the description and delineation of the tree. Oystein Rudjord and Oivind Due Trier et.al [8] This article introduces a fresh technique for distinguishing spruce, pine, and birch, the dominant tree species in Norwegian forests. To this end, ALS and hyperspectral information are used concurrently. Laser scanning information was used in the hyperspectral information to conceal pixels with tiny or no vegetation.

III. METHODOLOGY

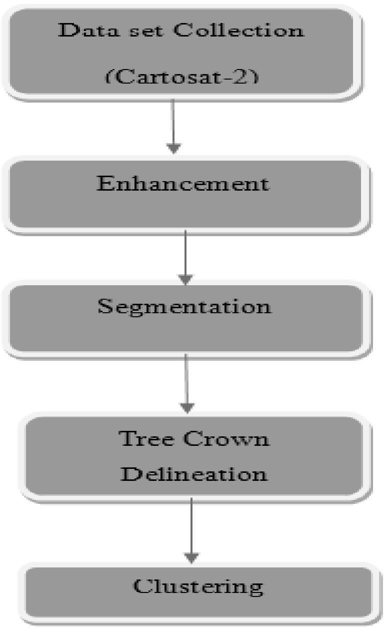


Fig1. Proposed Methodology

A. Data Set Collection

The data set was collected from NRSC Bhuvan, Hyderabad [9]. In this, we are taken 500 panchromatic images for clustering and it is in the form of .tiff extension respectively. Panchromatic images are taken by satellites, such as SPOT6/7 and Landsat's satellites. The panchromatic data is usually a representative of a range of wavelengths and bands. Cartosat-2 series satellite is PSLV-C38's main satellite. With the goal of giving high-resolution pictures, this remote sensing satellite is comparable in setup to previous series satellites.

B. Image Enhancement

The enhancement of the image is achieved by improving some contrast levels, saturation levels, and brightness so while to obtain a tremendous precision representation about the blood cells. The image is later transformed to grayscale.
The input pictures are pre-processed to suppress undesirable distortions, such as shadows and noise, dark spots, etc. This is also improving image quality of the image also. In this, we use image enhancement algorithms for enhancing an image.

Algorithm
Input: Panchromatic image
Output: Enhanced image
Step1: Read an input image
Step2: Using adaptive filter enhance the image
Step3: Apply Thresholding technique
Step4: Perform background subtraction
Step5: Getting an output-Enhanced image

C. Image Segmentation

In this, after completing the image enhancement we are taken output of enhancement phase for giving input to segmentation phase respectively. And image segmentation algorithms are used to detect objects and boundaries of tree crowns.

Algorithm –Thresholding and Contours
Input: Enhanced image
Output: Segmentation image
Step1: Read enhanced Image
Step2: Calculate the initial estimate for T
Step3: Segment the given image using T and to produce two group of pixels i.e. G1 and G2
Step4: Calculate the average G1 and G2
Step5: Apply contours for given result
Step6: Output image with detecting edges

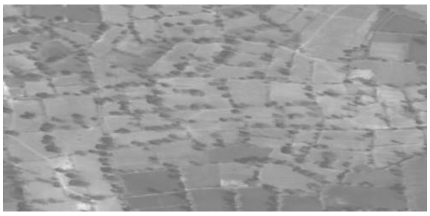
D. Tree Crown Delineation

In this phase, tree crown features were extracted, they are **height and width** of the tree crown, and **number of trees** will be extracted. By using these features clustering will be performed in this methodology.

E. Clustering

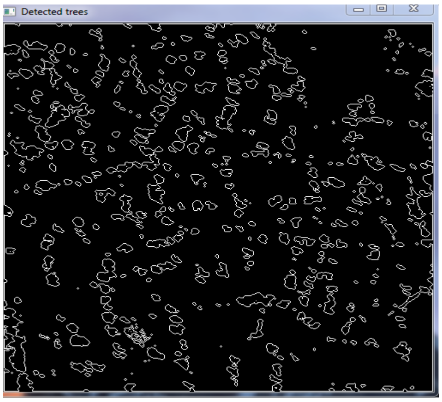
In this, K-means clustering was used to calculate the height and width of the tree crown and number of trees also. These are the features required to perform clustering of tree crown or trees respectively.

IV. RESULTS AND ANALYSIS

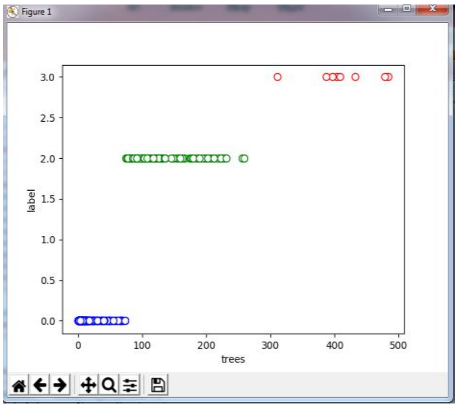


"Fig2. Input image"

International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-8 Issue-6, August, 2019



“Fig3. Extraction of Tree Crowns”



“Fig4.Clustering of Trees”

```
Number of trees are: 613
Number of small trees are:  117
Number of medium trees are:  487
Number of large trees are:  8
```

“Fig4. Analysis of Trees”

V. CONCLUSION

In this paper, we develop a model for clustering trees using panchromatic pictures using OpenCV and Python, respectively, image processing algorithms. This paper specifies mainly calculation of height and width of tree crown. By using these features we easily identify the different types of trees in a particular area respectively. The ultimate purpose knowledge obtained from this study is clustering of trees using panchromatic images was successfully completed.

REFERENCES

1. Huang H, Li X, Chen C. “Individual tree crown detection and delineation from very-high-resolution UAV images based on Bias field and marker-controlled watershed segmentation algorithms”. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing. 2018 Jul;11(7):2253-62.
2. Li W, He C, Fu H, Luk W. “An FPGA-based tree crown detection approach for remote sensing images”. In2017 International Conference on Field Programmable Technology (ICFPT) 2017 Dec 11 (pp. 231-234). IEEE.
3. Harikumar A, Bovolo F, Bruzzone L.”An internal crown geometric model for conifer species classification with high-density lidar data”. IEEE Transactions on Geoscience and Remote Sensing. 2017 May;55(5):2924-40.
4. Paris C, Kelbe D, Van Aardt J, Bruzzone L. “A novel automatic method for the fusion of ALS and TLS lidar data for robust assessment of tree crown structure”. IEEE Transactions on Geoscience and Remote Sensing. 2017 Jul;55(7):3679-93.
5. Yang J, He Y, Caspersen JP, Jones TA. “Delineating individual tree crowns in an uneven-aged, mixed broadleaf forest using multispectral watershed segmentation and multiscale fitting”. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing. 2016 Dec 30;10(4):1390-401.
6. Xiao W, Xu S, Elberink SO, Vosselman G. “Individual tree crown modeling and change detection from airborne lidar data. IEEE Journal of selected topics in applied earth observations and remote sensing”. 2016 Aug;9(8):3467-77.
7. Wu CC, Tsai SA, Wu YL. “Pollock model based multi-level morphological active contour algorithm for tree detection and crown delineation”. In2016 IEEE International Geoscience and Remote Sensing Symposium (IGARSS) 2016 Jul 10 (pp. 1356-1357). IEEE.
8. Rudjord Ø, Trier ØD. “Tree species classification with hyperspectral imaging and lidar”. In2016 8th Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS) 2016 Aug 21 (pp. 1-4). IEEE.
9. Cartosat-2 dataset available at https://nrsc.gov.in.

AUTHORS PROFILE

Thotakura Swathi is studying M.tech in Department of CSE, VRSEC. Areas of interest are deep learning, Machine learning, bioinformatics and cyber security.

Dr. Suvarna Vani Koneru is working as professor in Department of CSE, VRSEC and 20+ experiences in teaching .Her areas of interest are Bio-informatics, Machine learning, deep learning.

Praveen Kumar Kollu is working as Sr. Assistant professor in Department of CSE, VRSEC and He is having 15+ experiences in Teaching. His areas of interest are Network intrusion detection, deep learning, and Machine learning, bioinformatics and cyber security.