International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

COPY RIGHT

IJIEMR Transactions, online available on 23rd Apr 2018. Link
:http://www.ijiemr.org/downloads.php?vol=Volume-7&issue=ISSUE-05

Title: **ANALYSIS OF DEFORESTATION IMAGES OF A REGION BY COLOR IMAGE SEGMENTATION**

Volume 07, Issue 05, Pages: 1–8.
Paper Authors

G. NAGA RAJU, DR.P V RAMA RAJU, CH.RAMYA PRIYA, G.PADMINI DEVI, I.AJAY KANTH, A.H.V.KIRAN KUMAR

SRKR Engineering College (A),Bhimavaram, India- 534204.

USE THIS BARCODE TO ACCESS YOUR ONLINE PAPER

To Secure Your Paper As Per UGC Guidelines We Are Providing A Electronic Bar Code

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

ANALYSIS OF DEFORESTATION IMAGES OF A REGION BY COLOR IMAGE SEGMENTATION

[1]G. NAGA RAJU, [2]DR.P V RAMA RAJU, [3]CH.RAMYA PRIYA, [4]G.PADMINI DEVI, [5]I.AJAY KANTH, [6]A.H.V.KIRAN KUMAR

[1]Asst. Professor, [6]Department of Electronics and Communication Engineering, SRKR Engineering College (A),Bhimavaram, India- 534204.

[2] Professor & HOD, [6]Department of Electronics and Communication Engineering, SRKR Engineering College (A),
Bhimavaram, India- 534204.

[3, 4, 5, 6]BTech Students,[3,4,5,6]Department of Electronics and Communication Engineering, SRKR Engineering College (A),Bhimavaram, India- 534204.

Corresponding author : [1] bhanu.raj.nikhil@gmail.com, +919010133466 [1], +918374924337 [3]

Abstract— Today, in the modern digital scenario, as compared to forest expansion by natural or planting, the deforestation rate is always higher. The need to be able to accurately monitor forest cover and quality is crucial to understanding the costs of deforestation. Understanding the loss of biodiversity and reduction of carbon sequestration capacity that results from deforestation becomes much more difficult. This paper deals with the analysis of the deforestation rate in different regions from satellite images of any region taken over years. In this paper, color segmentation algorithm is used on image and area of forest in a place over different year is calculated. As per simulation result it predicts deforestation has occurred over past years. In this paper, text to speech conversion algorithm is used to give out the result. Simulation is carried by using Matlab R2015a software.

Keywords—Color filtering, Color image segmentation, Deforestation, K-means clustering, l*a*b* color space.

I. Introduction

Deforestation is the major problem in the world. In the past, forest deparment would use field and aerial surveys to collect forest cover data, and aerial photography was used for plot-based analysis of forest stocks. With the advent of satellite imaging technology, it is much more common to use remote sensing techniques to monitor forest data, in particular tropical deforestation. Researchers have often used the US Geological Survey's Landsat satellite program and Worldwide Reference System to provide satellite imagery data to analyze forest changes. In areas like Indonesia, where tropical deforestation is widespread across a large geographic area, it is difficult to detect illegal logging from satellite imagery. Nevertheless, to detect changes over large areas, especially in more remote regions, satellite imagery provides an important resource in understanding and monitoring issues of deforestation. Other satellite technologies like radar and the light-based LiDAR imaging systems are able to complement optical imaging systems like Landsat. Image segmentation is considered as the most important part in image processing methods and techniques. This process is defined as the method of splitting a digital image into several segments which carries meaningful information and hence make it easy to analyze information. For segmentation, there

are many of techniques which can be applied on image. Image segmentation is useful for isolating the boundaries of any image in the form of multiple segments based on the properties of an image includes color, intensity, and texture of that image. But this paper use Clustering methodology. The most widely used image segmentation techniques are Edge based, Threshold based, Region based, Fuzzy based and Artificial Neural Network based segmentation. An unsupervised segmentation method automatically segments the images without the need of knowledge. This algorithm requires number of clusters to be specified. K-Means algorithm is an unsupervised segmentation algorithm among the available ones is adopted because of its simplicity. As L*A*B* color space is seen to be more identical to the way the human eyes perceive color, so, this color space is chosen for our color image segmentation task. This is a famous hard clustering algorithm best known for its simplicity. Usually hard clustering algorithm which assigns each object as member of one cluster that includes less mathematical computation in comparison to soft clustering algorithm. In soft clustering algorithms, it is also an unfavorable issue to determine the fuzziness factor. It distributes objects over all clusters. Due to these reasons, this paper has chosen hard clustering algorithm and adopted K-Means algorithm.

Literature Survey

L. Bragilevsky and I. V. Baj [1] discussed as deforestation in the Amazon basin causes devastating effects both on the ecosystem and the environment, there is urgent need to better understand and manage its changing landscape. Y. E. Shimabukuro, E. Arai, E. G. dos Santos and A. Jorge[2] proposed an approach which is used for monitoring deforestation and forest degradation using Landsat TM images .M. Yan, J. Cai, J. Gao and L. Luo [3] proposed k-means cluster based on color image enhancement. H. Yadav, P. Bansal and R. Kumar Sunkaria[4] discussed that the color image is converted into Lab (L=luminocity layer; a=chromaticity layer 1; b = chromaticity layer2). Clustering is a process to distinguish different kind of objects in an image and K Means clustering partitions the image, such that within each cluster same type of objects are as close as possible and each cluster must be distinguished. Having several clusters, it segment the nuclei into a separate image by recalling L layer. C. Wang and J. Watada [5] proposed an approach of image segmentation using a multi-threshold Otsu method to select the best thresholds from image histogram and a K-Means Clustering is used to merge the over-segmented regions so that better result even when the color image has a complicated structure in the background. Garg and B. Kaur, [6] discussed Color image segmentation is an upcoming topic of the research for researchers in image processing. Clustering is mostly used methodology for the segmentation of images. Color space has most starring impact on segmentation process, l*a*b* color space is uesd in the algorithm as l*a*b* color space is seen to be more identical to the way the human eyes perceive color.

II. Methodology

Images of different regions on earth are collected by imaging satellites operated by governments and businesses around the world. Satellite images provide necessary information to measure the rate of changes occurring in a region over years. The provided satellite images capture scenes from different regions and come in two formats, JPEG and GeoTIFF (Geo-referenced TIFF), both with resolution of 256 × 256.This paper, analyze imagery data from remote sensing satellites to detect forest cover changes over a period of years. For this

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

following methodology is proposed in this paper. The flow chart of the methodology is shown in figure3.

A. Color filtering

In this paper color filtering is done for the input satellite image. Color is related to light. Human eye perceives light as electromagnetic radiation with wavelengths approximately between 380nm and 760nm. The visible color spectrum has violet, indigo, blue, green, yellow, orange and red (VIBGYOR) colors. For Filtering a desired color, cfilter function is used. This function is used for separating each color from the entire VIBGYOR color spectrum in an image. This function modifies a given image in order to keep a specific hue (The property of colors by which they are seen as ranging from red through orange, yellow, green, blue, indigo, and violet, as determined by the dominant wavelength of the light) and to de-saturate the rest of the image. This procedure originates an image with black and white color map, excluding the parts colored with that hue.

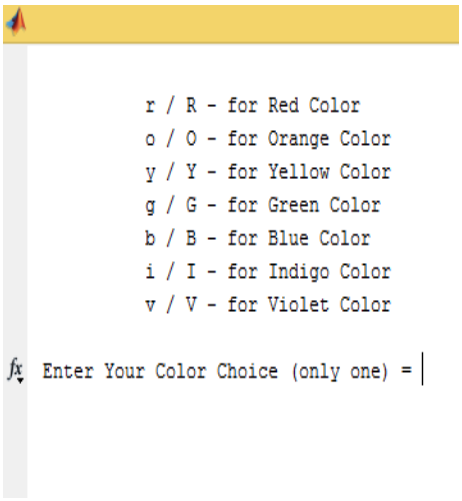

Fig.1 color selection

After importing the image, select the first letter of the color as shown in Fig. 1 to be separated. Select R option for red. This shows red color and rest of the image will be in various shades of grey, as shown in Fig. 2.

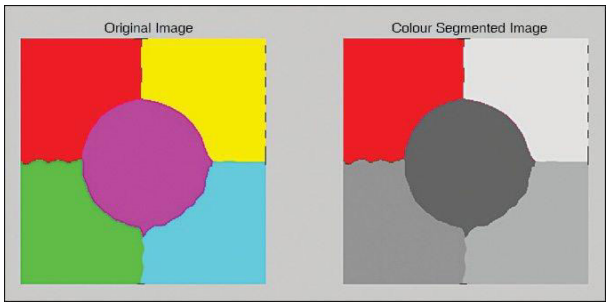

Fig.2 Output when red is given as input

The first image in Fig.2 is the original and the second image in Fig.2 is the color-segmented image.

B. Color segmentation

The K-means Clustering Algorithm

K means is an unsupervised classification i.e., it does not require knowledge to classify the features of the image. In this algorithm, a natural grouping of pixels takes place that is the grey level of pixels are observed and a threshold is set for selecting the number of classes in the image. This algorithm starts with finding number of cluster (K) and assuming the center of these clusters (centroid). It is an iterative technique which partition image into k clusters, cluster centers need to be chosen carefully to prevent from erroneous results. It partition image into K clusters, where each observation belongs to cluster with closest mean. It is a simple, fast and easy way to classify and group similar objects into one cluster.

Color segmentation using k-means Clustering

Partitioning of an image into multiple regions is called image segmentation. In this process, colors are segmented using l*a*b color space and k-means clustering. Initially images red which is a satellite image of a region. To separate the color of the image “decorrelation stretching” is applied which results in artificial enhancement of the color of the image. The RGB color space image is converted to l*a*b color space. L*a*b color space consists of

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

luminosity layer L*, chromaticity layer a* with Colors falls along the red-green axis and b* chromaticity layer where color falls along the blue-yellow axis. All color information is present in a * and b* layers. Clustering separate group of objects. K means clustering required to specify the number of clusters to be partitioned as the color information is present in a*b* space, objects are pixels with a* and b* values, K-means is used to cluster the objects into 3 clusters using Euclidean distance metric which is a straight line distance between two points in Euclidean space.For every object, k-means label every pixel in an image with an index. Using this* pixel labels, separation of objects in an image by colors takes place. The distance between object to cluster is calculated till clusters are stable. The object with minimum Euclidean distance group together to form clustering. In this way, objects with similar color group together. The required colored part in image is segmented using this algorithm.

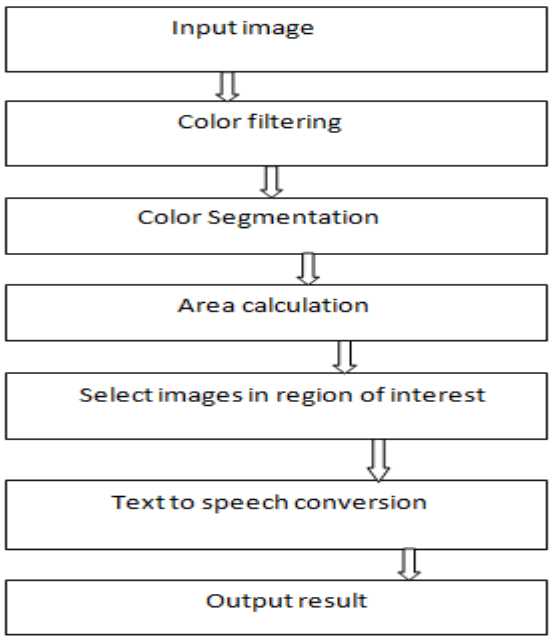

Fig.3 flow chart of methodology

C. Area Calculation and Select Images in region of interest

Area of required colored segmented image is calculated. Area of satellite images of region of every year is compared. Decrease in area predicts occurrence of deforestation. A threshold is set to display the satellite images of a region during the year in which deforestation has occurred severely.

D. Text to speech conversion

Speech synthesis is the artificial production of human speech. A computer used for this purpose called speech computer or speech synthesizer. It synthesis speech from string and speaks out. Speech is a means of communication between people. It produces speech by Grapheme to phoneme transcription. Grapheme contains alphabetic letters, digits, punctuations, symbols. Phoneme is smallest unit of sound to from meaningful utterances. The speech is close to human voice and is easily understood. These are important features of text to speech converter. This paper uses text to speech converter which speaks out the analyzed information from the simulated results. The speech generated will be helpful for visually challenged people to analyze the information easily.

III. Simulated Results

Case Study 1:

Images in fig.4 a), fig.5 a) and fig.6 a) are taken by NASA's Landsat 1 satellite during year 2000, 2005, and 2010 respectively. Within the proposed algorithm green color is chosen in color filtering as the satellite images of forest will be in green color. The green part of the image is segmented.Simulating the results of forest coverage in Amazon forest during year 2000 is shown in Fig.4, 2005 is shown in Fig.5 and during year 2010 is shown in Fig.6.The forest area is segmented by color image

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

segmentation using K-means clustering algorithm. Forest coverage is found with the proposed algorithm. Fig.4 c) gives a forest area of 6680.50 mm^2, fig.5 c) gives an forest area of 6348.12 mm^2 and fig.6 c) gives an area of 4942.91 mm^2. There is a Decrease in coverage area from year 2000 to 2010. As per simulation result it predicts deforestation has occurred in Amazon forest.

Fig.4 (a) Original satellite image of Amazon forest in 2000 (b) Segmented image (c) Calculated area

The simulated results reveal dramatic effects of clear-cutting for forest. This is because of the construction of a major north-south highway in the 1970s, according to NASA's Earth Observatory. Because these roads cut deep into the rain forest and then spread outwards, there's a much greater loss of habitat and species in Amazon forest. The rate of deforestation has been analyzed with proposed algorithm.

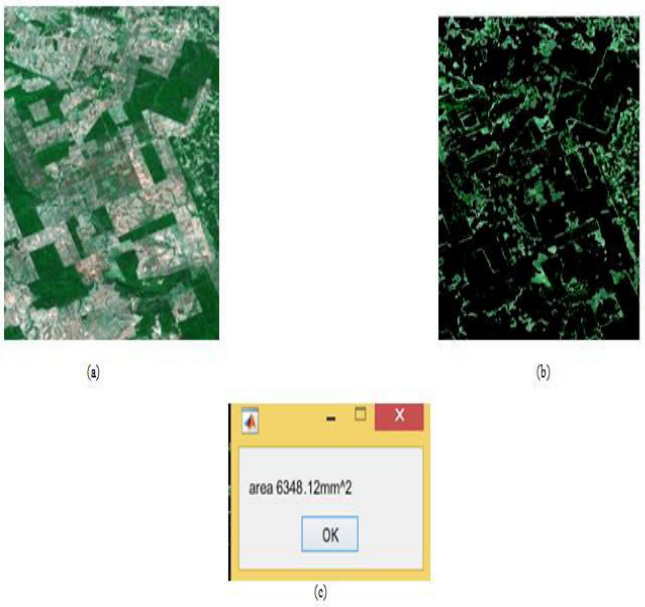

Fig.5 (a) Original satellite image of Amazon forest in 2005 (b) Segmented image (c) Calculated area

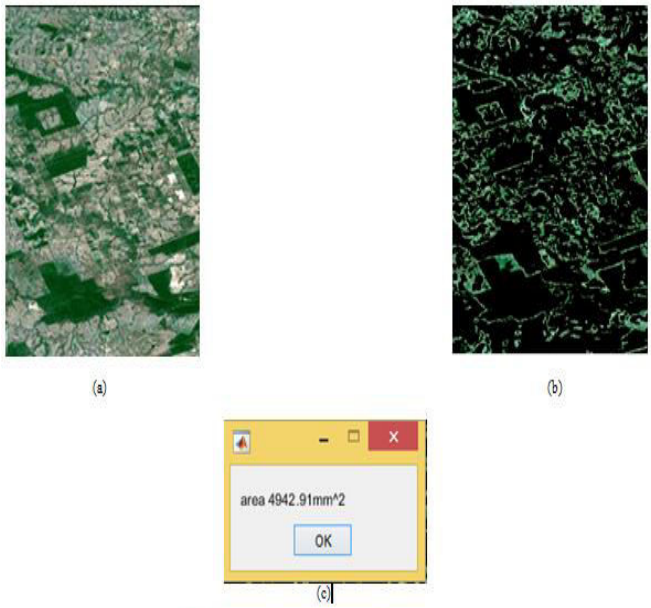

Fig.6 (a) Original satellite image of Amazon forest in 2010 (b) Segmented image (c) Calculated area

Case Study 2:

Simulating the results of forest coverage in Borneo near Indonesia during year 1950 shown in Fig.7 and 2005 shown in Fig.8 and year 2010 shown in fig.9.Forest coverage is found with the proposed algorithm. Fig.7 c) gives a forest area of 2724.28 mm^2, fig.8 c) gives a forest area of 1511.50 mm^2 and fig.9 c) gives

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

an area of 1160.44 mm^2. There is a Decrease in coverage area from year 1950 to 2010. As per simulation result it predicts deforestation has occurred in Borneo near Indonesia.

It is predicted that by 2022, 98% of the rainforests in Indonesia will be destroyed. The main ecosystem on Indonesia is rainforest and in these rainforests are a lot of endemic species. Out of all the species in Sumatra, 9% of the native species are endemic and 10% of the native mammals are endemic. In Borneo, 30% of Borneo's native species population is endemic and 48% of the native mammals are endemic. If all the rainforests are destroyed then these species are going down with them. Figures 7, 8, 9 give a visual of the amount destroyed.

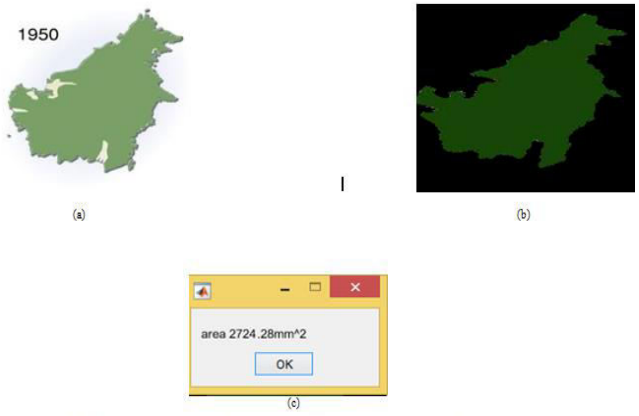

Fig.7 (a) Original satellite image of Borneo forest in 1950 (b) Segmented image (c) Calculated area

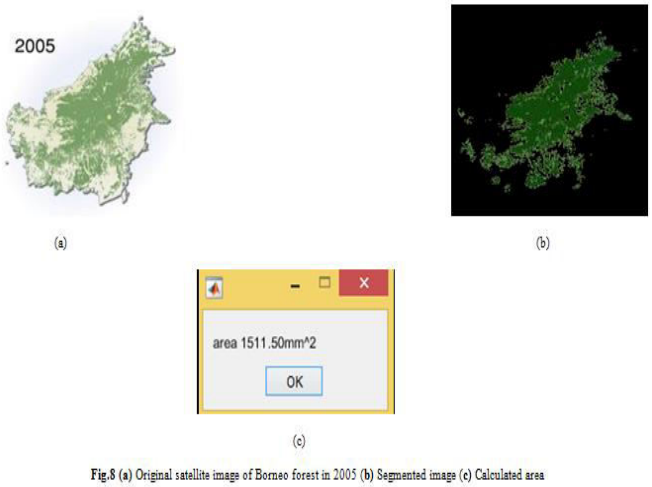

Fig.8 (a) Original satellite image of Borneo forest in 2005 (b) Segmented image (c) Calculated area

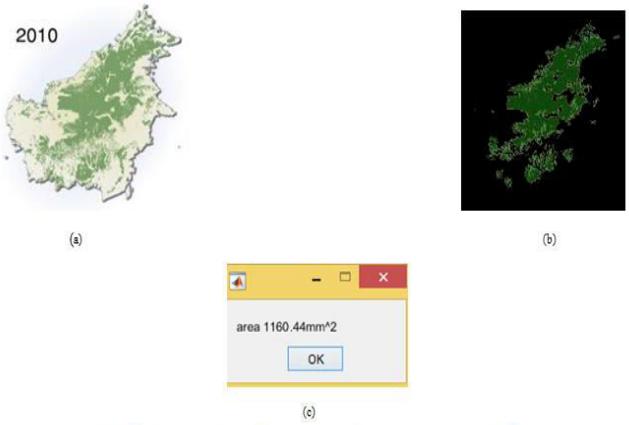

Fig.9 (a) Original satellite image of Borneo forest in 2010 (b) Segmented image (c) calculated Area

The test cases shows the rate of deforestation occurred in amazon forest and Borneo in indonesia with the algorithm proposed in this paper.

IV. Conclusion

In this paper deforestation rate in a region is analyzed from the satellite images. This used K-means clustering algorithm based on color image segmentation to segment the forest coverage region from the images. Forest coverage over every year in a particular region is analyzed and predicted that deforestation has occurred. This algorithm can be used for analysis of various factors like water coverage in an area, temperature variations over a region from the different satellite images of that region which shows water area in blue color, temperature information in red color. By selecting the required color based on requirement, information is obtained with the proposed algorithm.

References

[1] L. Bragilevsky and I. V. Bajić, (2017), *IEEE Pacific Rim Conference on Communications, Computers and Signal Processing (PACRIM)*, "Deep learning for Amazon satellite image analysis," Victoria, BC, pp. 1-5.

[2]Y. E. Shimabukuro, E. Arai, E. G. dos Santos and A. Jorge,(2017) ,*IEEE International Geoscience and Remote Sensing*

Symposium (IGARSS), "Monitoring deforestation and forest degradation using multi-temporal fraction images derived from Landsat sensor data in the Brazilian Amazon", Fort Worth, TX, pp. 165-168.

[3]M. Yan, J. Cai, J. Gao and L. Luo, (2012) , *International Conference on Bio Medical Engineering and Informatics*, "K-means cluster algorithm based on color image enhancement for cell segmentation," Chongqing, pp. 295-299.

[4]H. Yadav, P. Bansal and R. KumarSunkaria , (2015), *International Conference on Next Generation Computing Technologies (NGCT)*, "Color dependent K-means clustering for color image segmentation of colored medical images," Dehradun, pp. 858-862.

[5] C. Wang and J. Watada , (2011) ,*International Conference on Genetic and Evolutionary Computing*, "Robust Color Image Segmentation by Karhunen-Loeve Transform Based Otsu Multi-thresholding and K-means Clustering", Xiamen, pp. 377-380.

[6]Garg and B. Kaur, , (2016) , *International Conference on Computing for Sustainable Global Development (INDIACom)*, "Color based segmentation using K-mean clustering and watershed segmentation", New Delhi, pp. 3165-3169.

[7]Y. Jiang and J. Ma: (2014) , Lecture notes in computer science(LNCS) ,Fast and effective image segmentation via superpixels and adaptive thresholding, pp.568-57.

[8] P. Ganesan, B. S. Sathish and G. Sajiv,(2016) , *World Conference on Futuristic Trends in Research and Innovation for Social Welfare (Startup Conclave)*, "A comparative approach of identification and segmentation of forest fire region in high resolution satellite images", Coimbatore, pp. 1-6.

[9]K. Muthukannan and M. Merlin Moses, (2010), *International Conference on Communication and Computational Intelligence (INCOCCI)*, Erode, "Color image segmentation using k-means clustering and Optimal Fuzzy C-Means clustering", pp. 229-234.

[10] S. M. Syed Abdullah, (2012), *Conference on Data Mining and Optimization (DMO)*, "Spatial and temporal analysis of deforestation and forest degradation in Selangor: Implication to carbon stock above ground", Langkawi, pp. ix-ix.

[11] Dibya Jyoti Bora, Anil Kumar Gupta,(September 2014), *International Journal of Emerging Science and Engineering (IJESE)*, "A Novel Approach Towards Clustering Based Image Segmentation",vol. 2, no. 11, pp. 6-10, ISSN 2319-6378.

[12] A. Bali and S. N. Singh, , (2015), *International Conference on Advanced Computing & Communication Technologies*, "A Review on the Strategies and Techniques of Image Segmentation", Haryana, pp. 113-120.

[13] Thodeti Srikanth,, (2011), *(IJCSIT) International Journal of Computer Science and Information Technologies* , "Color Image Segmentation using WatershedAlgorithm",vol. 2, no. 5, pp. 2332-2334.

[14] K. Haris, S. N. Efstratiadis, N. Maglaveras and A. K. Katsaggelos, (Dec 1998), *IEEE Transactions on Image Processing*, "Hybrid image segmentation using watersheds and fast region merging",vol. 7, no. 12, pp. 1684-1699.

[15] O. P. Verma, M. Hanmandlu, S. Susan, M. Kulkarni and P. K. Jain,(2011), *International*

Conference on Communication Systems and Network Technologies, "A Simple Single Seeded Region Growing Algorithm for Color Image Segmentation using Adaptive Thresholding" , Katra, Jammu, pp. 500-503.

[16] J. Orlando, Tobias, Rui Seara, (2002), IEEE Transactions on Image Processing, "Image Segmentation by Histogram Thresholding Using Fuzzy Sets", Vol.11, Issue No.12, pp.1457-1465.

[17] S. Yadav and M. Biswas, *(*2017), *International Conference on Signal Processing and Integrated Networks (SPIN)*, " Improved color-based K-mean algorithm for clustering of satellite image," Noida, pp. 468-472.

[18] G Naga Raju, et. al.,(Nov 2017) ,Journal of Emerging Technologies and Innovative Research (JETIR), "Detection of Leukemia using Image Processing", vol 4, issue 11, pp. 123-127.

About Authors:

Dr. P.V.Rama Raju

Presently working as a Professor and HOD of Department of Electronics and Communication Engineering, S.R.K.R. Engineering College, AP, India. His research interests include Biomedical-Signal Processing, Signal Processing, Image Processing, VLSI Design, Antennas and Microwave Anechoic Chambers Design. He is author of several research studies published in national and international journals and conference proceedings.

G. Naga Raju

Presently working as assistant professor in Dept. of ECE, S.R.K.R. Engineering College, Bhimavaram, AP, India. He received B.Tech degree from S.R.K.R Engineering College, Bhimavaram in 2012, and M.Tech degree in Computer electronics specialization from Govt. College of Engg., Pune university in 2004. His current research interests include Image processing, digital security systems, Signal processing, Biomedical Signal processing, and VLSI Design.

Ch.RamyaPriya

Presently pursuing Bachelor of Engineering degree in Electronics & Communication engineering at S.R.K.R. Engineering College, AP, India

G. Naga Padmini Devi

Presently pursuing Bachelor of Engineering degree in Electronics & Communication engineering at S.R.K.R. Engineering College, AP, India.

I.Ajay Kanth

Presently pursuing Bachelor of Engineering degree in Electronics & Communication engineering at S.R.K.R. Engineering College, AP, India

A.H.V.Kiran kumar Presently pursuing Bachelor of engineering degree in E.C.E at S. R.K.R. Engineering College, AP, India