An Advanced Road Structure Image Segmentation Method using Swt in Cnn

C.Krishnapriya, P.Sumalatha, B.Harichandana, K.Lavanya

Abstract: ***In this paper, the design of advanced road structure image segmentation approach using stroke width transformation (SWT) in convolution neural network (CNN) is proposed. The main intent of the proposed system is to acquire the aerial images for the vehicle. Basically, this image segmentation performs its operation in two forms they are operating phase and learning phase. Here the aerial image has enhanced by using the SWT transformation. Hence the main advantage of this proposes system is that it processes the entire operation in simple way with high speed. The SWT will capture the images of road areas in effective way. Hence the propose system has various features which will determine the color, width and many other.***

Key words: Aerial images, convolution neural networks, road detection; segmentation.

I. INTRODUCTION

The detection and tracking of vehicles has become more important for researchers. Hence the autonomous navigation of vehicle is introduced by the researchers. In the developed countries the autonomous driving vehicles produce a lot of problems because of environment conditions [1]. To mark the boundaries of the road, segmentation techniques are introduced. This segmentation technique will maintain the roads and clear the marks in the boundaries. The earlier introduced systems are not valid for the undeveloped areas and rural areas. The main intent of this paper is to focus on the road detection and segmentation system.

Basically, the information is extracted from the aerial image is a difficult task. Instead of that this extracted information is utilized in various applications for monitoring process. Generally, the most challenging concept for ground surfaces with road detection and segmentation [2]. Hence various types of image processing technique are introduced. To detect the images which are segmented mainly the analysis of texture is used. The aerial images have best features which represents about the context of the regions.

To detect the road authors introduced a texture based on convolution neural network. By using the photo mosaic generation the images are segmented. These segmented images are collected in a particular form. By using our proposed technique the gaps which are occurred in these images are avoided [3-4]. The flexible solution to avoid the gaps is to introduce the resolution in the system.

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Some of the authors implement the design using mixture model of Gaussian, cut graphics and sensor structure. But these designs do not give effective output. Hence in this paper stroke width transformation is introduced. This SWT will highlight the features of road information by combining the candidates of road. The regions of the road segmentation also detected by using the SWT transformation technique. The extracted regions of road are also detected from the background classes. Up to now the detection of road segmentation is performed. Now, to obtain efficient accuracy and robustness, convolution neural network is used. Hence in this paper, the operation of parallel image processing is done. This gives effective results in terms of speed and accuracy [5]. To obtain the best architecture various types of test are performed based on the system of training. This road structure refined approach will detect and track the images of aerial. The refined structure is based on the convolution neural network. By using the different classes the introduced method will segment the images into number of frames. In real time applications, the segmented image is classified based on the pixel wise classification. The state of art performance is obtained by recognizing the scenes of road detection. Different parameters are used to detect the road regions but here frequency parameter is used to modify the region of each class. The balancing of class will depend on the pixel number and this is less than the other. By using convolution neural network the weight of each class is maintained in effective way. In the data base, the function of classes is not coherent in nature. The aerial images will compute the frequency by using the combination of median filter response. The below equation shows the segmented image after detection in terms of frequency approximation.

$$\alpha c = \text{median freq} / \text{freq}(c) \qquad (1)$$

Here the number of pixels in an image which are divided by the number of pixels in class c. The neural network is initialized based on the weights of data base. Hence the images are segmented by configuring the network based on the layer of convolution. From below sections the discussion and overview of convolution neural network is given. After this the earlier introduced road detection and segmentation approaches are introduced. Next, the architecture of proposed approach is given in detail manner. At last results are discussed in effective way. Hence the proposed structure will give effective results compared to other systems.

II. CONVOLUTION NEURAL NETWORK (CNN)

In the computer vision applications, the convolution neural network plays important role. By using the raw pixels, the features of convolution neural networks are extracted and classified. By using convolution neural network the estimation and mapping process are performed based on regression. A multi layer perception is introduced in the neural network for the variations which are inspired biologically. Generally, Fukushima introduced the neural network by using the recognition of visual system. This system consists of various convolution layers and pooling layers. Hubel and Wiese introduce the architecture of neural network based on hierarchy. This system contains the cortex of visuality from the layers. LeCun introduce the convolution neural network by using the digit recognition system. This system mainly consists of gradient based method. This method will propagate the portion from background. After the propagation, the parameters are optimized. This optimization process is introduced by the Rumelhart.

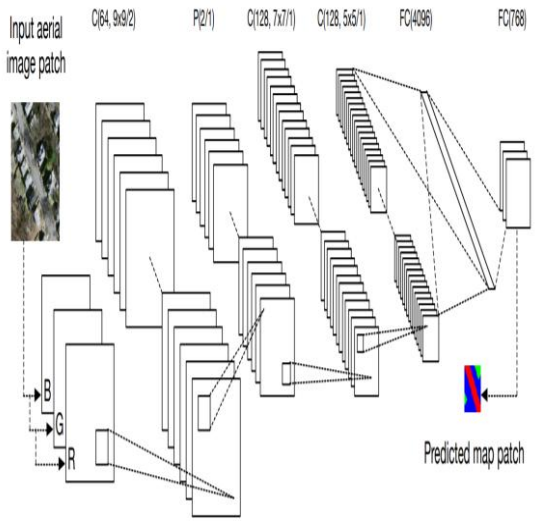

Fig.1. ARCHITECTURE OF CNN

The above figure (1) shows the architecture of CNN. There are convolution, pooling, and stacked layers in the system. Here mainly an pereptron is obtained by using the multi layers in the network. The filters which are used in the convoultion layer will extract the images. Here first an input image is given and extracted depend on the convolution procedure. To get the invaraince in the trasnlation process, sub sampling is performed. This is given to the lower layer which is attached to the output.

Here the filters which are maintained at fixed size. The filter size and filter number is represented by using the K and W terms. The N channel convolution neural network is given as W × W. This consists of images which are sized in particular format. Hence the K-Inputs and K-Outputs are obtained in the CNN system. This k-inputs and k-outputs are represented as

$(W - w + 1 \times W - w + 1)$.

The parameters which are used in this network are given as hp, qk and bk. These parameters will be optimized based on the stage of training set. There are K filters in the convolution layer have the size w × w and in the same way the strides in the network are given as

C (K × w × w/s).

The sub mapping process is performed in the CNN layer. Pooling layers gives effective terms based on the maximum value determined from the size. Now, at the interval of time 0 the size of the layer is introduced by the (w 0×w 0). This pooling layer is connected to the next layer which is very lower and full connected. From this various types of layers, CNN is attached with two connections which are randomly chosen. These randomly chosen bits are dropped and connected to each other. Because of this the over fitting problem is avoided in the system. Hence the CNN will increase the speed of operation based on the weight is preverted. The multiple channels usage will perform the operation to give maximum output. Here the number of filters usage also reduced in the CNN network.

III. RELATED WORK

The image segmentation technique was suggested by Havel Muhammad and David, et al. This technique of segmentation finds a contour that splits the image into images that are non-overlapping. This method of segmentation refers to homogeneous images of intensity. The benefit of this method is without any extra term, it is automatically proceeds in the right direction. This algorithm works on various regions of disjunction. The computational cost of solving the estimated PDEs is very high and the contour C is not known it is difficult to minimize the function. D.Selvaraj and R. Dhanasekaran suggested a new approach to brain MRI segmentation. This method is based on thresholding based on intensity to obtain ordinary brain tissues limits such as CSF, GM, and WM. This strategy consists of two pre-processing phases and the other is segmentation.

A. Thresholding Method

Thresholding methods are used for image segmentation and plays an important role in the system. The intensity of image is divided into number of pixel. The thresholding method mainly used to contrast the object from background. Compared to other objects, background will be lighter.

Based on the prior knowledge the selection is made. Basically, the thresholding method divided into three types they are

a) Global Thresholding,
b) Variable Thresholding,
c) Multiple Thresholding

The advantages of thresholding method is given as

- Implementation is simple
- Operation is faster compared to others
- For some kind of images performance is good.

B. Edge Based Methods

In image processing applications the edge detection method is most widely used. In this the regions are depend on the boundaries and this calculates the area effectively. Here the edges are identified depend on the detected area.

Here enclosing region boundaries are used to separate the rest of image. The edge detection technique will determine the boundaries of edges between two objects.

C. Region Based Methods

Compared to other methods region based method is very effective and also noise is mostly reduced in this section. Depend on the pre defined criteria that image is divided into number of regions. The region based segmentation is mainly divided into three types they are given as region growing, region splitting and region merging.

D. Clustering Based Methods

Dependent on shading highlights with K-means clustering unsupervised calculation novel image segmentation is shown. In this any preparation information didn't utilized. In two phases the whole work is isolated. First upgrade of shading partition of satellite image utilizing de relationship extending is conveyed and afterward the regions are gathered into a lot of five classes utilizing K-means grouping calculation. Utilizing two-stage process, it is conceivable to lessen the calculation overheads managing a strategic distance from highlight figuring for every pixel in the image.

IV. ROAD STRUCTURE IMAGE SEGMENTATION USING SWT IN CNN

The below figure (2) shows the architecture of proposed system. In this SWT, technique is enhanced. The regions of road are initialized in the SWT enchancement. This will mainly characterize the property of road geometry images. Along with that mainly, clustering process, connected component analysis, road detection process, KLT tracking process and holography alignment processes are done. Firstly an input image is given to SWT technique. This will transform the image perform the operation of pre processing technique. This pre processing technique will detect the text obtained in it. SWT will calculate the width of pixel in image which is given as input. Based on the pixel value p, the segment is computed from transformation.

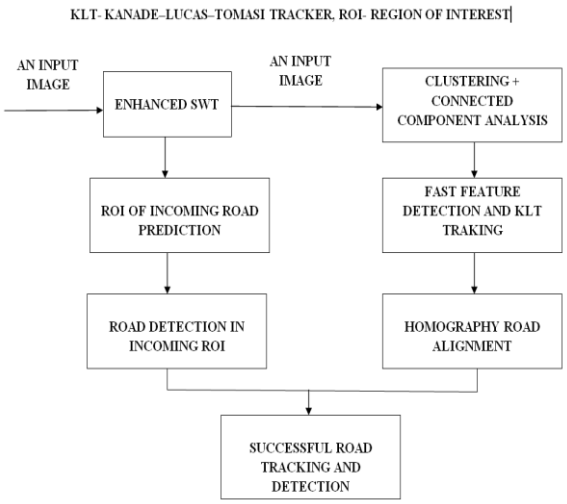

Fig.2. ARCHITECTURE OF ROAD STRUCTURE IMAGE SEGMENTATION APPROACH USING SWT

A set of data is divided into specific number of group in the clustering process. This clustering process is divided into many forms, but mainly used clustering method is K-Means clustering. Here the data is collected into number of partitions in K-Means clustering method. Basically, the K-Means clustering method divides the data into K number depend on the disjoint cluster. The K-means clustering method mainly divides into two phases. Coming to the first phase, here the data is calculated depend on the K centroid. Next in second phase, the data is calculated from the nearest centroid of respective data point. Various types of methods are available to calculate the nearest distance of centroid but among those all we mainly focus on the Euclidean distance.

Based on the centroid new grouping process is done. In this new grouping process it will recalculate the new centroid of each cluster. The new Euclidean distance will determine the distance between each centre and each data point. After determining the points are assigned in a cluster and produce minimum Euclidean distance. The cluster will define the partition depend on the member object and its centroid value. At last the distance from all objects in a cluster will be minimized. Hence from this, it can observe that each K means clustering algorithm will minimizes the sum distance from each object to its cluster centroid in effective way. This process is also known as iterative algorithm. Here the resolution x×y is considered for cluster and is extended to K number of clusters. The input pixels p(x, y) is assumed for a cluster and ck is assumed for clusters centre.

Clustering process is used to extract the features of cluster from output. After extracting the features of cluster, thresholding process is applied. In thresholding process, binary mask is applied to whole image. Because of this the dark pixels are converted into darker and white pixels are converted into brighter. Binary masking plays important role in entire system. Here while thresholding process is performed, the binary coefficients are compared with each other.

This threshold value depends on two conditions above threshold value and below threshold value. If the threshold value is below then zero is considered and if the threshold is above then one is considered. The threshold values which are above magnitudes will be retained easily.

In each frame the corners will be detected by the KLT tracker. There will be a strong relationship between current frame and the detected frame. Hence in this system the image is contrasted and they are very consecutive in nature. KLT tracker consists of some conditions and these conditions will be satisfied by the proposed system to get an effective output. The earlier systems are very complex in nature compared to the proposed system. The resolution of image obtained in proposed system is high. At last there will be detection of road and it is aligned by the road alignment process. Hence th road is successfully detected and tracked in certain format.

V. RESULTS

Fig.3. NON ROAD IMAGE

Fig.4. ROAD IMAGE

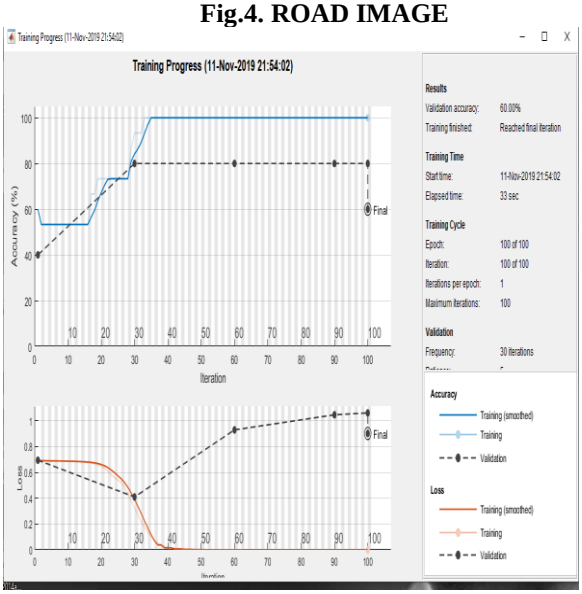

Fig.5. ROAD IMAGE CLASSIFICATION IS DONE BY SIMULATOR USING CNN ALGORITHMS

Table I: PERFORMANCE METRICS OF THE PROPOSED SYSTEM

Indicator/ Image	TP [$\times 10^3$]	TN [$\times 10^3$]	FP [$\times 10^3$]	FN [$\times 10^3$]	PPV [%]	ACC [%]
01	681	23307	1	11	99.8	99.9
02	3862	19996	139	3	96.5	99.4
Average 100 images	-	-	-	-	97.2	98.8

VI. CONCLUSION

The architecture of road structure image segmentation is introduced. In the entire system SWT plays important role. The main intent of this paper is to detect and segment the road images without any distractions. The road areas are propagated by using the KLT tracker. Effective results are obtained with high accuracy for the proposed system. By using the properties of distinctive geometry and radiometry in SWT, the features are extracted effectively. Hence the proposed system will detect and segment the road regions which are shown from the simulation results.

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