DCST BASED REGION OF INTEREST EXTRACTION FROM REMOTE SENSING IMAGES: A REVIEW

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ABSTRACT

Saliency object detection is considered as the pre processing technique to study the features of the specific area in the satellite images.Diversity in surroundings texture and objective clutter also adds up to the complicationin the problem of localizing saliency regions in satellite images. Extraction of a feature of an image is very difficult due to having to find the appropriate image segmentation techniques and combine diverse methods to detect the Region of Interest (ROI) most efficiently. In this paper we address the problem of the region extraction in various methods and suggested a novel technique based on the discretecosine stock well transform (DCST) for the generation of saliency map and for segmentation of the required area we suggest inhomogenity active contour model in order to provide high degree of results. The results in the proposed approach may increase the detection capability of the target region.

KEYWORDS: Region of interest, Inhomogenity active contour model, DCST.

1. INTRODUCTION

As remote sensing technology is increasing rapidly in various applications there is need to extract the saliency objects for further processing of images. The saliency object detection needs to detect the image with perfect edges and of high quality. Saliency detection of remote sensing images has various applications in the fields of image segmentation, image restoration and image compression etc. It is not an easy task to extract the saliency regions in the remote sensing images with our naked eye and if possible it is not accurate and in some images it turns into problematic. So, we develop an automatic detecting algorithm based on some features and certain conditions.

Automatic detection of military targets such as oil tanks, aircrafts, artillery, etc. in high resolution satellite imagery has great significance in military applications. With the rapid development of satellite imaging and geographic information systems, a large amount of high resolution images can be acquired effortlessly from Google Earth. The non-hyper spectral image data has been used in many civil and military applications. Various techniques and features have been proposed so far for automatic target detection in satellite imagery.

Target detection is an important aspect in many defence applications. A target generally means an object or a region of interest and importance, such as urban areas, roads, railway tracks, shipyards, etc. The task in target detection is to locate and label a particular target among non-targets in a scene. This task has been extensively studied in computer vision where the main steps are classification of the scene into regions of interest, looking for potential structures, making geometric analysis of these structures and finally confirming the presence or absence of a target using proper knowledge base. But, its application in remote sensing had been limited because of the inadequate ground resolution of the image available in the past. However, with resolution better than 30-40 m provided by the current remote sensing technology, it is now possible to a great extent to identify even smaller targets, like bridges, runways and buildings. Consequently, the scope of application of remotely-sensed imagery in defence has considerably widened.

2. SALIENCY OBJECT DETECTION TECHNIQUES IN SATELLITE IMAGES:

Wang Xiangyangt Hu Fengli Yang Hongying [2006] proposed a method based on the multiple features of the satellite image. In this method the area of interest is segmented based on the K-means clustering algorithm and gather color features from dominant color and its percentage and acquire shape feature from the pixel distribution and based on the these features and segmented region the saliency object is extracted [1]-[3]. But this method is applicable only for the simple background regions.

Hui-Zhong Chen, Ning Jing, Jun Wang, Yong-Guang Chen, and Luo Chen [2014] inferred that the saliency objects can be detected based on the SURF features of the image. In this work, two regions of the image are considered. They are highlight regions and the shadow regions for whichthe speed up robust features are calculated. A feature vector is generated for the region of interest, depending on this vector SVM classifier classifies the saliency regions are extracted from false detected and inconspious ones [4]-[6]. But the satellite image must contain both highlight and shadow regions clearly.

Libao Zhang, Kaina Yang, and Hao Li[2014] developed a fusion technique with two inputs obtained from the intensity saliency and orientation saliency. The intensity saliency is obtained from the Multiscale spectrum residuals method and orientation saliency is obtained from the interpolating biorthogonal integer wavelet transform. Then the orientation saliency map is thresholded and filtered. Then these two maps are weighted across by using Multiscale fusion at different scales to extract the saliency region [7]-[9]. This method considers only the bottom-up information which results to faults result.

Ashu Sharma, J.K. Ghosh [2015] extracts segments from the segmented image under the basis of the threshold value. If the saliency values of the clusters are superior or identical to the threshold value then they are segmented into the saliency region. Based on this process the saliency and non saliency regions are considered as foreground and background respectively. By segmenting them the saliency regions are extracted [10]-[12]. This method consists of only the saliency model for segmentation which results to the loss in extraction of edges accurately.

Libao Zhang, Xinran Lv, Jie Chen and Lan Zhang [2016] extract the saliency objects by following the three stages.In first stage the salient feature maps are constructed by calculating the spectrum information and histograms of multi spectral images.Next, based on the K-means clustering the salient features are selected by converting into the CIELAB color space and final saliency maps are generated fusing the information salient feature maps with common salient maps. Finally the saliency region is segmented by extracting ROI from the final saliency map [13]-[15]. But in this process the k-means clustering technique require selecting of k clusters for features generation which is a difficult task because the results are depend on this selection.

Samik Banerjee, Nitin Gupta, Sukhendu Das, Pinaki Roy Chowdhury and L K Sinha [2016] used an unsupervised saliency detection method by preprocessing the images for denoising and contrast enhancement. This technique is helpful to detect the potential regions of interest which reduces the search space. These regions are additionally processed by with some morphological operations to get probable regions of saliency objects and lastly a conical pyramid is constructed for template representation of the target samples [16]-[18]. But this technique is not applicable under foggy or cloudy conditions.

Warinthorn Kiadtikornthaweeyot, Adrian R.L. Tatnall [2016] extracted the saliency region by considering histogram and morphological operations. In this process, the segmentation is made based on the histogram equalization and ROI is estimated based on the masking operations obtained from the morphological operations. In this method the regions of forest, roads and buildings are detected individually [19]-[21]. But in this process histogram classification is done manually leads to inaccurate results.

Libao Zhang n, Jie Chen, Bingchang Qiu [2016] worked on the high resolution areas which contains fine details like edges, structure and texture. To preserve the fine details we considered a map based on the normal directional lifting wavelet transform. Next, we judge the spectral saliency map by acquiring the self information offered in the spectrum. Then the final saliency map is obtained by fusing these two maps [22]-[24].The region of interest is segmented from the absolute saliency map based on the segmentation techniques.It should be noted that the principle followed for selecting the optimal transform direction is critical in ND-LWT.

Danpei Zhao, Yuanyuan Ma, Zhiguo Jiang, and Zhenwei Shi [2017] consider both bottom-up and top-down features based on the target attribute to generate the saliency map by fusing them. In this process Latent Dirichlet allocation based learning stop criterion is introduced at each level to judge the state of saliency detection. A back level propagation mechanism is employed to reinforce the target levels and for detection of target it uses hierarchical reinforcement learning algorithm [25]-[27]. But this method is adaptable to high resolution satellite images.

Hui Wu, Hui Zhang, Jinfang Zhang, Fanjiang Xu [2015] proposed a new target detection structure based on the convolutional neural networks to automatically learn the presentations from the massive image data in order to provide more computational efficiency. CNN can learn rich features and based on these features the Edge boxes can generate smaller set of object proposals based on the edges [28]-[30]. If the edges of the objects are not perfect then the detection is difficult.

3. CONCLUSION

In this paper by reviewing all the techniques used for detecting the saliency object in satellite images reveals that the researches focus mainly on the histogram classification, wavelet transforms and neural networks for saliency map estimation. These techniques show best results only in some typical conditions. However, histogram classification and neural networks depend on the edges of the target objectswhich cannot be acquired accurately. Hence we suggested a novel technique based on the discrete cosine stock well transform for classification and in homogeneity contour model foe segmenting the saliency object in satellite images with accurate results in all conditions and with lower computational complexity.

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