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Shadow detection from VHR Images using Clustering and Classification

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Abstract: This project mainly focus to get the high resolution color remote sensing image, and also undertaken to remove the shaded region in the both urban and rural area. Some of the existing projects are involved to detect the shaded region and then eliminate that region, but it has some drawbacks. The detection of the edges will be affected mostly by the application of the external parameters. The edge detection process can be more helpful in the detection of the objects so that the objects can be used for further processing. In this process we have implement the Scale Space algorithm is used to detect the shadow region and extract the feature from the shadow region. Scale Space is simplest in region-base image segmentation methods. The concept of Scale Space algorithm is check the neighboring pixels of the initial seed points. Then determine whether those neighboring pixels are added to the seed points or not. In the Scale Space threshold algorithm Pixels are placed in the region based on their properties or the properties of the nearby pixel values. Then the pixel containing the similar properties is grouped together and then the large numbers of pixels are distributed throughout the image.

KEYWORDS: *Shadow Detection, VHR, Scale Space Algorithm*

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Introduction

Now a day the man survive the large area of the world, so to monitor the land area satellite imaging is used to detect the earth locality. The shadow is occurred by the interfacing of building and the sun. In this process some of the problems occurred, due to the shadow area of an urban and rural area. So this project mainly focus to get the high resolution color remote sensing image, and also undertaken to remove the shaded region in the both urban and rural area. Because of the ambient light, the ratios of the two pixels are not same in all three color channels. These two pixels will be different not only in intensity, but also in hue and saturation. Thus, correcting just the intensity of the shadowed pixels does not remove the shadow, and we need to correct the chromaticity values as well. Using the shadow density, the shadow area is segmented into sunshine, penumbra and umbra regions. Since the lighting color of the umbra region is not always the same as that of the sunshine region, the color adjustment is performed between them. Then, the color average and variance of the umbra region are adjusted to be the same as those of the sunshine region. In the penumbra, color and brightness adjustments for small Deb et al.: Shadow Detection and Removal Based on regions are performed the same as they are for the umbra region. Finally, all boundaries between shadowed regions and neighboring lit regions are smoothed by convolving them with a Gaussian mask.

Scale Space Methods

The first region-growing method was the seeded Scale Space method. This method takes a set of seeds as input along with the image. The seeds mark each of the objects to be segmented. The regions are iteratively grown by comparing all unallocated neighboring pixels to the regions. The difference between a pixel's intensity value and the region's mean, is used as a measure of similarity. The pixel with the smallest difference measured this way is allocated to the respective region. This process continues until all pixels are allocated to a region.

Seeded Scale Space requires seeds as additional input. The segmentation results are dependent on the choice of seeds. Noise in the image can cause the seeds to be poorly placed. Unseeded Scale Space is a modified algorithm that doesn't

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require explicit seeds. It starts off with a single region – the pixel chosen here does not significantly influence final segmentation. At each iteration it considers the neighboring pixels in the same way as seeded Scale Space. It differs from seeded Scale Space in that if the minimum is less than a predefined threshold then it is added to the respective region. If not, then the pixel is considered significantly different from all current regions and a new region is created with this pixel.

One variant of this technique, proposed by Haralick and Shapiro (1985), is based on pixel intensities. The mean and scatter of the region and the intensity of the candidate pixel is used to compute a test statistic. If the test statistic is sufficiently small, the pixel is added to the region, and the region's mean and scatter are recomputed. Otherwise, the pixel is rejected, and is used to form a new region.

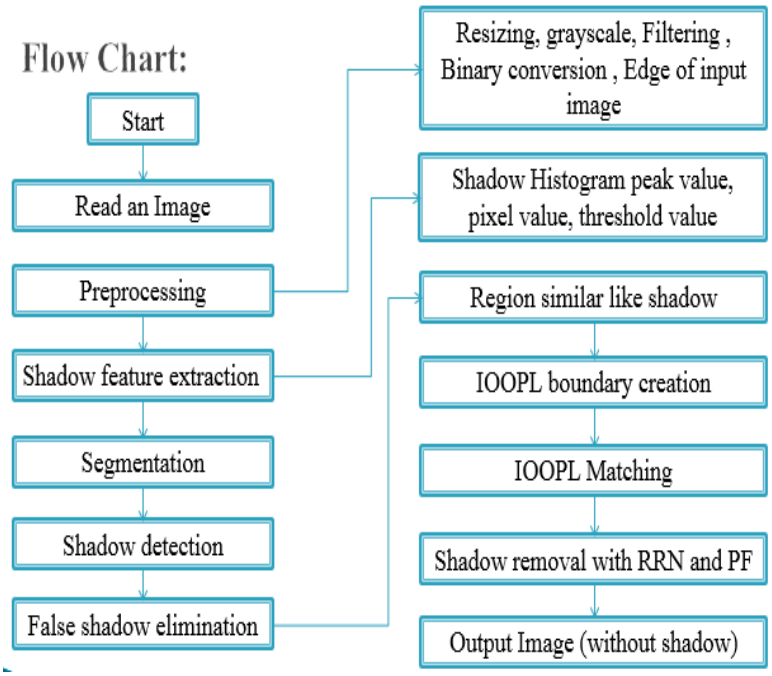
A special region-growing method is called -connected segmentation. It is based on pixel intensities and neighborhood-linking paths. A degree of connectivity (connectedness) will be calculated based on a path that is formed by pixels. For a certain value of , two pixels are called -connected if there is a path linking those two pixels and the connectedness of this path is at least-connectedness is an equivalence relation.

Proposed Work

Enhancement Method:

The proposed method and the existing method are implementing some of the algorithm to reduce the shadow region of the urban and rural area.The Enhanced algorithm used to eliminate the false shadow is, **Scale Space algorithm.** It is an easy way to construct regions from their borders and it is also easy to detect borders of existing regions.

Proposed System Flow



Proposed Methodology:

1. **Pre-processing**
2. **Feature Extraction**
3. **Segmentation**
4. **IOOPL Matching**

Methodology Description:

Pre-processing

- In this preprocessing, the input image is under going to convert the RGB image into the gray scale image.
- The converted gray scale image is resized into the specific resolution, hence the resolution is maintained till the further process.
- If the noise is occurred in the image, then the accuracy of the image is affect, so the filter is use to eliminate the noise present in the image.
- Then the noise free image is used for the further process.

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Pre-processing:

- In this method, the Pre-processing is carried out to resizing the image.
- Then the image is converted into the grayscale image.
- The grayscale image is then converted into the noise free image by using the filter 'medfilt2'.
- This filtered image is then converted into the binary image. The binary image is only having the pixel values of 0 and 1.
- The object region is consider as an 1 and the dark area is consider as an 0.

Feature Extraction:

- Feature extraction is the process of extracting the required data's from the region of interest.
- In this method, the shadow feature is extracted by detected with the Scale Space threshold method.
- Then the object properties such as spectral features and geometric features are combined with a spatial relationship, in which the false shadows are detected and eliminated.

Feature Extraction:

- In this technique, the feature extraction is carried to extract the features of the 5 major categories.
- The Average grayscale value of the image is extracted from the image.
- The peak value of the histogram which is obtained by the shadow peak histogram is extracted.
- Then the threshold value of the image is extracted.
- At the same time, the frequency of the image is also extracted from the image.
- At last the nearby pixel values are extracted from the same image from which the above features are extracted.

Segmentation:

- Segmentation is the process of separating the required part from the cluster of unwanted background. On the other words, the segmentation is the process of elimination of the background region.
- To segment the required object, the shape factor and the color factor is considered to remove the shadow, but the dark region of the image should not be eliminate.
- The parameter of the each image is recorded and then the variation in the shadow and the dark area is noted.

IOOPL Matching:

- **IOOPL** matching is a process of obtaining homogeneous sections by conducting similarity matching to the IOOPL section by section.
- If the correlation coefficient is small, then there is some abnormal parts representing some different types of objects exist in this section.

Algorithm Explanation:

Algorithm: Scale Space .

- In the **Scale Space threshold algorithm** Pixels are placed in the region based on their properties or the properties of the nearby pixel values.
- Then the pixel containing the similar properties is grouped together and then the large number of pixels is distributed throughout the image.

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- We are proposed the future enhancement based on the Scale Space segmentation method. The aim of region detection is to provide the possibility to characterize the detected object by parameter analysis (shape, position, size...)

- Edge-based segmentation: borders between regions. Region-based segmentation: direct construction of regions

- It is an easy way to construct regions from their borders and it is also easy to detect borders of existing regions.

- Segmentations resulting from edge-based methods and Scale Space methods are not usually exactly the same.

Scale Space is simplest in region-base image segmentationmethods. The concept of Scale Space algorithm is check the neighboring pixels of the initial seed points, then determine whether those neighboring pixels are added to the seed points or not.

Conclusion

Thus the shadow feature is extracted from the image and then the unwanted shadow obtained in the image is removed from the image. The picture quality of the image is obtained. In all the change detection applications based on remote sensing images, different purposes of application focus on different change information, so there is no universal change detection method. Aimed at such characteristic, this paper has summarized the change types during change detection and has managed the object features, based on which a multi-feature integrated object-level change detection method considering purposes of applications and properties of different types of object has been put forward.

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