High Resolution Remote Sensing Images using Shadow Detection and Shadow Removal

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***Abstract*— *High-resolution remote sensing images offer great possibilities for urban mapping. Unfortunately, shadows cast by buildings during this some problems occurred .This paper mainly focus to get the high resolution colour remote sensing image, and also undertaken to remove the shaded region in the both urban and rural areas. The region growing thresholding algorithm is used to detect the shadow and extract the features from shadow region. Then determine whether those neighboring pixels are added to the seed points or not. In the region growing threshold algorithm, Pixels are placed in the region based on their properties or the properties of nearby pixel values. Then the pixels containing similar properties are grouped together and distributed throughout the image. IOOPL matching is used for removing shadow from image. This method proves it can remove 80% shaded region from image efficiently.*

Keywords— ***region growing thresholding, IOOPL (inner-outer outline profile line)***

1. INTRODUCTION

Now a days, the man survive large area of the world, so to monitor land area satellite imaging is used to detect the earth locality from the satellites of IKONOS, QUICKBIRD and RESOURSE3. The shadow is occurred by interfacing of building and sun. A shadow occurs when an object partially or totally occludes direct light from a source of illumination [1]. Shadows can be divided into two classes: self and cast shadows. A self-shadow occurs in the portion of an object which is not illuminated by direct light.A cast shadow is projected by the object in the direction of the light source. The part of a cast shadow where direct light is completely blocked by an object is called the umbra, while the part where direct light is partially blocked is called the penumbra. The shadow formation is shown in Fig.1. This paper mainly focuses on the shadows in the cast shadow area of the remote sensing images by using region growing thresholding.

In this process some of the problems occurred, due to the shadow of an urban and rural area. Many effective algorithms have been proposed for shadow detection. Many seminal papers proposed some methods to detect& eliminate shaded region by using edge detection methods,
but it has some drawbacks are no image calibration for the intensity and, illumination adjustment. So this paper mainly focus to get the high resolution colour remote sensing image, and also undertaken to remove the shaded region in both urban and rural areas. Because of the ambient light, the ratios of the two pixels are not same in all three colour 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 colour of the umbra region is not always the same as that of the sunshine region, colour adjustment is performed between them. Then, the colour average and variance of the umbra region are adjusted to be the same as those of sunshine region. In the penumbra, colour and brightness adjustments for small Deb et al.: Shadow Detection and Removal Based on regions are performed the same as they are for umbra region. Finally, all boundaries between shadowed regions and neighboring regions are smoothed by convolving them with a Gaussian mask.

2. EXISTING SYSTEM

Existing shadow detection method can be roughly categorized into two groups.

- Model based method.
- Shadow-feature based method.

The first group uses prior information such as scene, moving objectives and camera altitude to construct shadow models. This group of methods is often used in some specific scene conditions such as aerial image analysis and video monitoring. The second group of methods identifies shadow areas with information such as grey scale, brightness, saturation, and texture. An improved algorithm exists that combines thetwo methods. First, the Shadow areas are estimated according to the space coordinates of buildings calculated from digital surface models and the altitude and azimuth of the sun. Then, to accurately identify a shadow, the threshold value is obtained from the estimated grayscale value of the shadow areas [3]. However information such as scene and camera altitude is not usually readily available. Consequently, most shadow detection algorithms are based on shadow features. For example, the shadow region appears as a low grayscale value in the image, and the threshold is chosen between two peaks in the grayscale histogram of the image data to separate the shadow from the non-shadow region.An illuminate invariance model has been used to detect shadows this method can obtain a comparatively complete shadow outline from a complex scene and derive the shadow-free image by using certain neutral interface reflecting assumptions [2]. In a related study, images are converted into different invariant colour spaces (HSV, HCV, YIQ, and YCbCr) to obtain shadows with Otsu's algorithm [4]. This can effectively get rid of the false shadows created by vegetation in certain invariant spaces. Based on that work, a successive thresholding scheme was proposed to detect shadows.A variety of image enhancement methods have been proposed for shadow removal, such as histogram matching, several enhancement methods were analyze to recover shadows, namely, gamma correction, LCC, and histogram matching.

DEMERITS

- Images are converted into different invariant colour spaces to obtain shadows.
- This can effectively get rid of the false shadows created by vegetation in certain invariant spaces.
- Less accuracy and efficiency.

3. PROPOSED SYSTEM

Due to the shortcomings of pixel-level shadow detection, we propose a new technique: an object-oriented shadow detection and removal method. First, the shadow features are evaluated through image segmentation, and suspected shadows are detected with the threshold method..Second, object properties such as spectral features and geometric features are combined with a spatial relationship in which the false shadows. Shadow removal employs a series of steps. We extract the inner and outer outline lines of the boundary of shadows. The grayscale values of the corresponding points on the inner and outer outline lines are indicated by the inner– outer outline profile lines (IOOPLs).Homogeneous sections are obtained through IOOPL sectional matching. Finally, using the homogeneous sections the relative radiation calibration parameters between the shadow and non-shadow regions are obtained and shadow removal is performed.

4. SHADOW DETECTION

Shadows are created because the light source has been blocked by something. There are two types of shadows

- Self-shadow
- Cast shadow

A self-shadow is the shadow on a subject on the side that is not directly facing the light source. A cast shadow is the shadow of a subject falling on the surface of another subject because the former subject has blocked the light source. A cast shadow consists of two parts: the umbra and the penumbra.The umbra is created because the direct light has been completely blocked, while the penumbra is created by something partly blocking the direct light. In this paper, we mainly focus on the shadows in the cast shadow area of the remote sensing images.

A. Image Segmentation Considering Shadow Features

Images with higher resolution contain richer spatial information. The spectral differences of neighbouring pixels within an object increase gradually. Pixel-based methods may pay too much attention to the details of an object when processing high resolution images, Making it difficult to obtain overall structural information about the object.In order to use spatial information to detect shadows, image segmentation is needed. We adopt convexity model (CM) constraints for segmentation [5]. Traditional image segmentation methods are likely to result in insufficient segmentation, which makes it difficult to separate shadows from dark objects. The CM constraints can improve the situation to a certain degree.

***B.** Detection of Suspected Shadow*

For shadow detection, a properly set threshold can separate shadow from non-shadow without too many pixels being misclassified. Researchers have used several different methods to find the threshold to accurately separate shadow and non- shadow area.We attain the threshold according to the histogram of the original image and then find the suspected shadow objects by comparing the threshold and grayscale average of each object obtained in segmentation.

***C.** Elimination of False Shadow*

Dark objects may be included in the suspected shadows, so more accurate shadow detection results are needed to eliminate these dark objects. Rayleigh scattering results in a smaller grayscale difference between a shadow area and non-shadow area in the blue (B) waveband than in the red (R) and green (G) wavebands. Consequently, for the majority of shadows, the grayscale average at the blue waveband *Gb* is slightly larger than the grayscale average at the green waveband *Gg*. Also, the properties of green vegetation itself make *Gg* significantly larger than *Gb*, so false shadows from vegetation can be ruled out by comparing the *Gb* and *Gg* of all suspected shadows. Namely, for the object *i*, when $Gb + Ga < Gg$, *i* can be defined to be vegetation and be ruled out. *Ga* is the correction parameter determined by the image type.

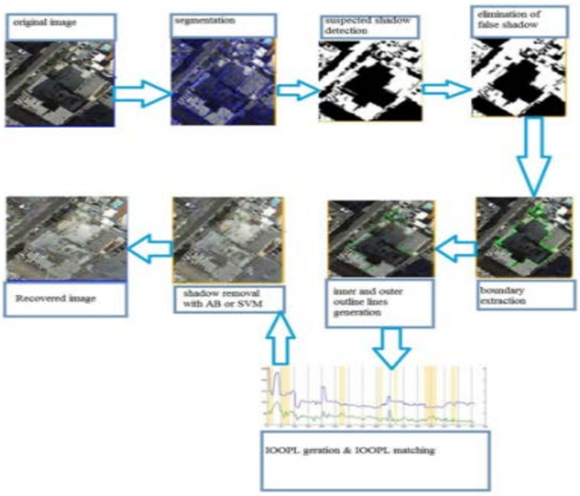
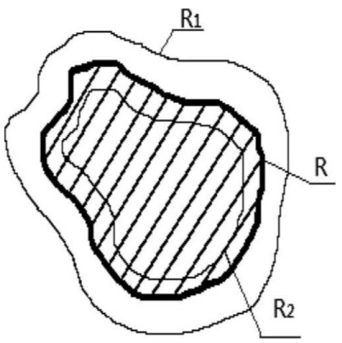


Fig 1: Structure of object-oriented shadow detection and removal from urban high-resolution remote sensing images



5. SHADOW REMOVAL

To recover the shadow areas in an image, we use a shadow removal method based on IOOPL matching. There is a large probability that both shadow and non-shadow areas in close range on both sides of the shadow boundary belong to the same type of object. The inner and outer outlines can be obtained by contacting the shadow boundary inward and expanding it outward, respectively. Then, the inner and outer outline profile lines are generated along the inner and outer outline lines to determine the radiation features of the same type of object on both sides.The objects on both sides of the shadow boundary linked with a building forming a shadow are usually not homogeneous, and the corresponding inner and outer outline profile line sections are not reliable. In addition, the abnormal sections on the inner and outer outlines that cannot represent homogeneous objects need to be ruled out. Consequently, similarity matching needs to be applied to the IOOPL section by section to rule out the two kinds of nonhomogeneous sections mentioned previously. The parameters for shadow removal are obtained by analysing the grayscale distribution characteristics of the inner and outer homogeneous IOOPL sections.

A. IOOPL Matching

IOOPL matching is a process of obtaining homogeneous sections by conducting similarity the process, Gaussian smoothing is performed to simplify the view of IOOPL. The Gaussian smoothing template parameters [1]. To rule out the non-homogeneous sections, the IOOPL is divided into average sections with the same standard.

B. Implementation of Shadow Removal

Shadows are removed by using the homogeneous section obtained by line pair matching. There are two approaches for shadow removal. One approach calculates the radiation parameter according to the homogeneous points of each object and then applies the support vector machine to each object. The other approach collects and analyses all the homogeneous sections for Adaboost (AB) and retrieves all shadows directly with the obtained fitting parameters.

1) Adaboost Algorithm

Boosting is an approach to machine learning based on the idea of creating a highly accurate prediction rule by combining many relatively weak and inaccurate rules.adabost has been widely and rapidly improved for use in pattern recognition. Adaboost linearly combines several classifier in to strong classifier are tuned by minimizing an empirical exponential risk. The classification method exhibits high performance in various field.

- An iterative procedure of adaboost for minimizing the empirical exponential risk.
- Let {F} = {f::Rq → G} be a set of classification functions, where G= {1…g} is the label set.
- Find classification f in F and co-efficient β that jointly minimize empirical risk Rexp (βf).
- Consider empirical risk Rexp (β1f1+ βf) with β1f1 from the previous step then find classification function fε | F1 and coefficient β that minimize the empirical risk.
- This procedure is repeated T-times and the final classification function fr= β1f1+ βrfr is obtained.

- Test vector x ε Rq is classified into the label maximizing the final function Fr(x,k) with respect to k ε G.By applying IOOPL matching to each shadow, homogeneous sections that specify objects of the same category in different lighting conditions are obtained.

2) Support Vector Machine

Support vector machine have often been to provide better classification result the other widely used pattern recognition method such as like hood. The support vector machine are very attractive for the classification of remotely sensed data.In gradients Training set J= {xi, yi} i= λi…m xi is structured input

yi is structure output

λi is a graph labelling

Future Function

ϕ(x, y): express relation between x and y has constant dimensionality. ϕ(x, y) may be a pair of image. Set of active/in active association=mεi=∧ distantancei .yi. This method has rectified the problem of not being able to obtain the inner and outer out lines of the minor.

MERITS

Method can obtain a combatively complete shadow outline from a complex scene and derive the shadow-free image. To recover the shadow removal method based on IOOPL matching. High performance and efficiency.

6. RESULT AND DISCUSSION

The experimental results revealed the following.-The shadow detection method proposed in this paper can stably and accurately identify shadows.

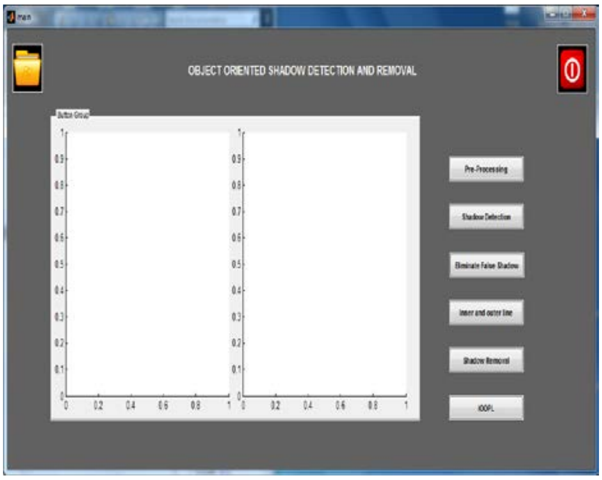


Fig: 6.1Designing representation

6.2 IMPLEMENTATION OF SHADOW REMOVAL

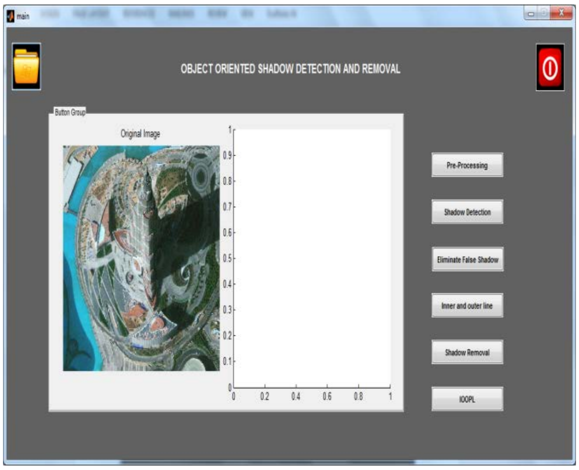


Fig:6.2 Implementation of Shadow Removal:

6.3 PRE-PROCESSING

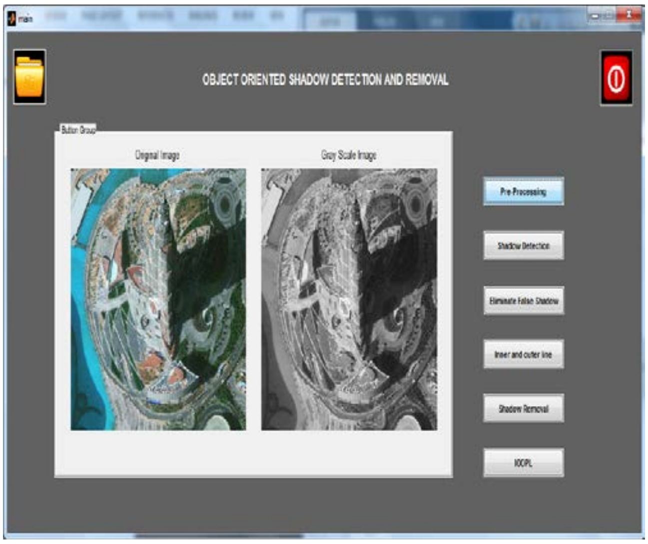


Fig:6.3 Pre-Processing:

6.4 SHADOW DETECTION

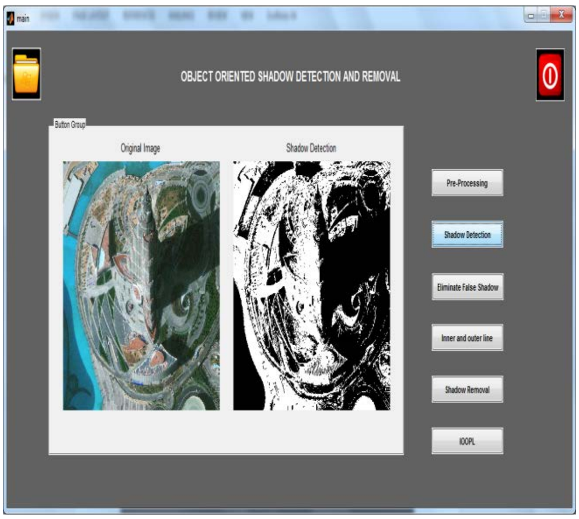


Fig:6.4 Shadow detection:

6.5 ELIMINATION OF FALSE SHADOWS

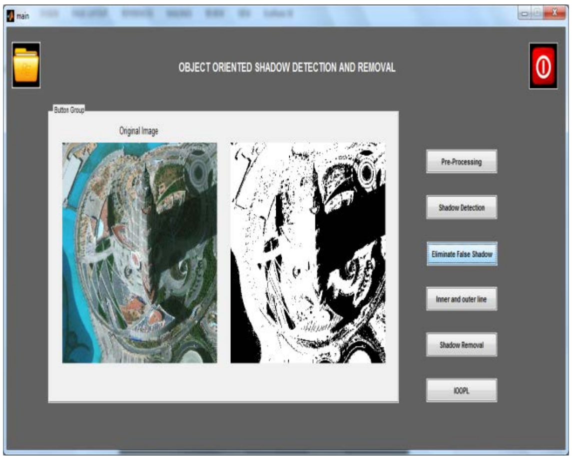


Fig:6.5 Elimination of False Shadows :

6.6 INDICATING IN RGB COLOUR MODEL

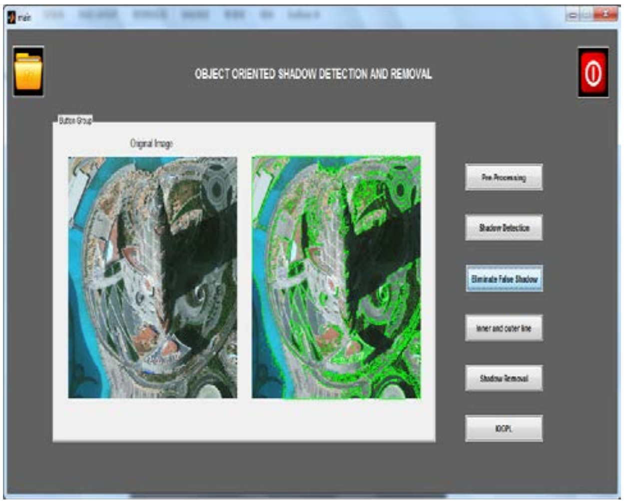


Fig:6.6 Indicating in RGB colour model

6.7 *Inner and outer lines*

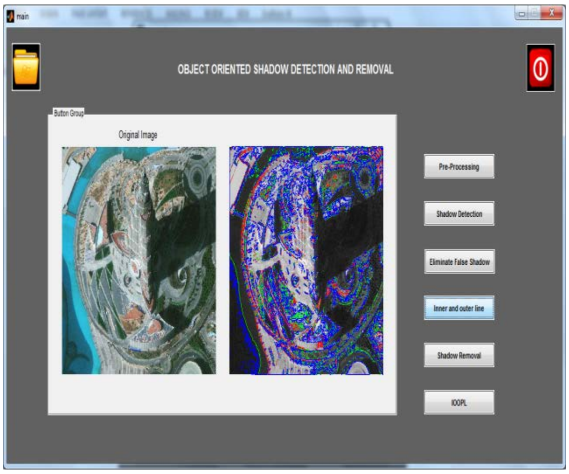


Fig:6.7 Inner and outer lines:

5.8 IOOPL MATCHING

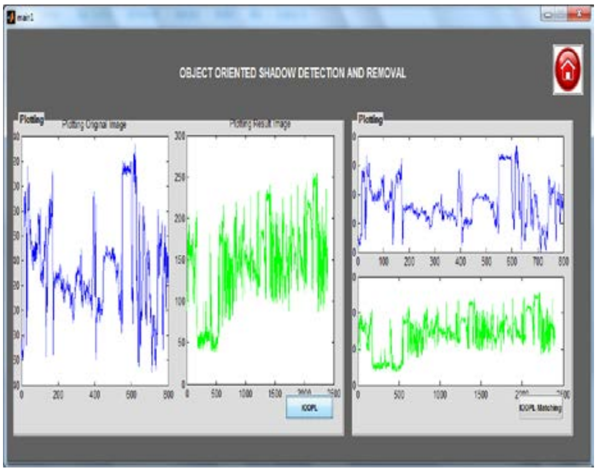


Fig:6.8 IOOPL Matching

6.9 GRAYSCALE VALUE OF IMAGE

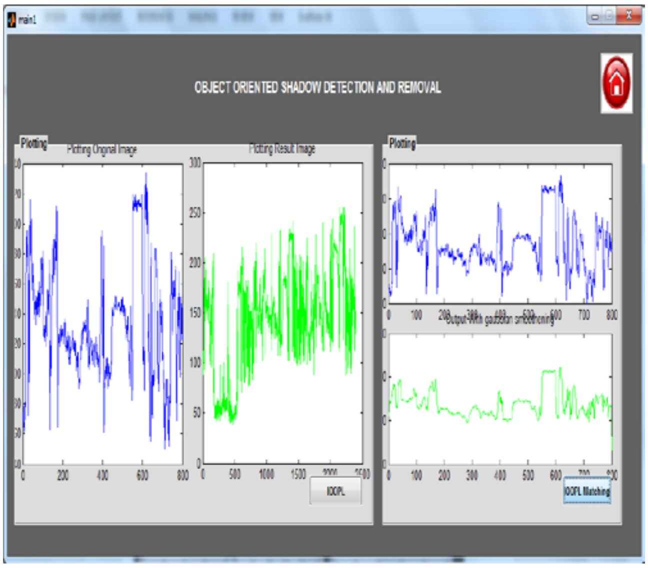
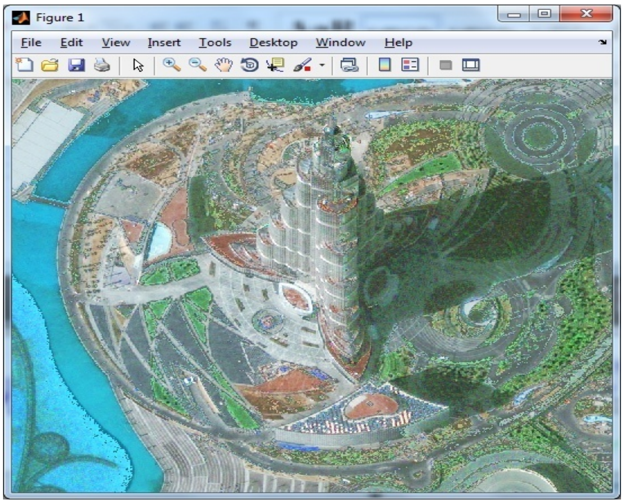


Fig:6.9 Grayscale value of image

6.10 SHADOW REMOVED IMAGE



7. CONCLUSION

In order to get a shadow detection result, image segmentation considering shadows is applied first. Then,suspected shadows are selected through spectral features and spatial information of objects, and false shadows are ruled out. The subsequent shadow detection experiments compared traditional image segmentation and the segmentation considering shadows, as well as results from traditional pixel-level threshold detection and object-oriented detection. Meanwhile, they also show the effects of different steps with the proposed method. For shadow removal, after the homogeneous sections have been obtained by IOOPL matching, we put forward two strategies: relative radiation correction for the objects one at a time, and removal of all shadows directly after PF is applied to all the Homogeneous sections and correction parameters are obtained.

REFERENCES

[1] S. Ji and X. Yuan, "A method for shadow detection and change detection of man-made objects," Remote Sens., vol. 11, no. 3, pp. 323–329, 2007.

[2] G. Finlayson, S. Hordley, and M. Drew, "Removing shadows from images," in Proc. ECCV, May 28–31, 2002, pp. 823–836, Vision-Part IV.

[3] K.-L. Chung, Y.-R. Lin, and Y.-H. Huang, "Efficient shadow detection of colour aerial images based on successive thresholding scheme," IEEE Trans. Geosci. Remote Sens., vol. 47, no. 2, pp. 671–682, Feb. 2009.

[4] H. Ma, Q. Qin, and X. Shen, "Shadow segmentation and compensation in high resolution satellite images," in Proc. IEEE IGARSS, Jul. 2008, vol. 2, pp. 1036–1039.

[5] K. Sun, D. Li, and H. Sui, "An object-oriented image smoothing algorithm based on the convexity model and multi-scale segmentation," Geomatics Inf. Sci. Wuhan Univ., vol. 34, no. 4, pp. 423–426, 2009

[6] Z. Zhu and C. E. Woodcock, "Object-based cloud and cloud shadow detection in Landsat imagery," Remote Sens. Environ., vol.118, pp. 83–94, 2012.

[7] A. Makarau, R. Richter, R. Muller et al., "Adaptive shadow detection using a blackbody radiator model," IEEE Trans. Geosci. Remote Sens., vol. 49, no. 6, pp. 2049–2059, 2011.

[8] L. Lorenzi, F. Melgani, and G. Mercier, "A complete processing chain for shadow detection and reconstruction in VHR images," IEEE TransGeosci. Remote Sens., vol. 50, no. 9, pp. 3440–3452, 2012.

[9] P. Sarabandi, F. Yamazaki, M. Matsuoka et al., "Shadow detection and radiometric restoration in satellite high resolution images," in Proc. IEEE IGARSS, Sep. 2004, vol. 6, pp. 3744–3747.

[10] J. S.-P. Shu and H. Freeman, "Cloud shadow removal from aerial photographs," Pattern Recog, vol. 23, no. 6, pp. 647–656, 1990.

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