Volume 5, Issue 3, March 2015 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Survey on Shadow Detection and Reconstruction in VHR Images

Prof.S.S.Kulkarni, Kiran Hingmire, Pallavi Kute, Samiksha Kusalkar, Saylee Pethe
I.T., SAE, Pune, Maharashtra,
India

Abstract*— Shadow is an unwanted part of images .It causes loss of data and information. Shadow strongly affects the images .This is a big problem for both user and sellers. When we take the images from satellite for traffic control, we are not able to classify object clearly due to presence of this shadow. For this purpose it is necessary to detect the shadow from images and reconstruction of images so noise will be also removed from images. This paper presents an efficient and simple approach for shadow detection and reconstruction of images and also presents a review of the existing literature in these areas.

Keywords*— Shadow detection, shadow removal, image enhancement, image restoration, very high resolution (VHR) images.

I. INTRODUCTION

Shadow is an important part of remote sensing images .It is used to highlight the ground features in applications such as prehistory and aerial investigation .The main problem caused by shadow is abatement or depletion of object in an images. Shadow is an unwanted part of an image. Shadows can appulse negatively in the profiteering in VHR images.
This is important and big problem for both user and seller of remote sensing images. That's why there is need of shadow detection and reconstruction of an image. There are two type of shadow first is cast shadow and second is self-shadow. "A cast shadow is projected by the object in the direction of the light source, a self shadow is the part of the object which is not illuminated by direct light" [1].Cast shadow can reform object shape, while the self shadow reform object shape and it color. Due to this purpose shadow should be classified [1].
In literature survey there are main two aspects to detect shadow are model-based and shadow-property-based. Various classifiers techniques are used to detection and reconstruction of shadow region [2] .Detecting and removing shadow in VHR images is based on Radio metrically enhancing and use bimodal histogram algorithm for classified non-shadow region from shadow region [3].
The measurement of radiance in sunlight and shadowed areas was carried out to investigate the spectral characteristics of sunlight. The result showed that the radiance ratio (shadow/sunlit) increases as the sunlight gets weaker and the ratio becomes smaller as the wavelength gets longer. The darkness of shadow is also found to vary depending on the shadow-casting condition [4].
Novel height estimation method for buildings with complex rooftop profiles in monocular images using shadows was presented. The proposed method is capable of estimating accurate heights even under partial occlusions and interference by neighbouring buildings. Building shadows and shape constraints were used to estimate buildings' heights. A fitness function was introduced that employed fuzzy rules to evaluate height candidates. True height was retrieved using a genetic algorithm in the search space [5].
The different method is used to detecting the shadow .The method is based on physical properties of blackbody radiator. This method compute the parameter for a particular scene and image obtained with various radiance conditions. This method is not only used in remotely sensed data but also used in various resource and automation aeronautics areas [6].
Hue is the main property of a color .Origin image is RGB or a combination to two of them that way computer system image RGB values are disciple to hue-based modal color conversion HVS, HVS and HIS. Calculate the hue constancy of RGB sensor .Psycho-visually derived hue constant dada from swaying and barns. Hue constancy is in a log RGB adversary .The log RGB model can used to define hue constancy for color image application [7].

II. LITERATURE SURVEY

In color aerial images shadows launched by ethnic features may produce wrong color tone mislaying of feature information. Victor J.D.Tsai proposes an approach which presents self executing property based on approach for the detection and satisfaction of shadow regions with shape information preserved in complex urban color images. It uses spectral ratioing and automatic thresholding techniques. In this approach shape information is preserved, so no need of prorigeometric knowledge about the scene and the source of illumination [8].
Paper author dispense an optimization technique to find hue constant RGB sensors. The hue suggested is based on log RGB opponent color space that is in vacant to brightness and gamma. That is relevant in color engineering applications like searching RGB sensors for color image encodings [7].

This method is built on the use of in vacant color models to recognize and classify shadow in digital images. Processes are divided into two steps 1) Shadow candidate regions are executed.2) Shadow candidate pixels are grouped as self shadow points or as cast shadow points [1].

The application perspective of remotely sensed optical imaginary is enhanced through the increase in resolution spatial. Aliaksei Makarau mentions a method which uses black body radiator model for the description of the illumination model. Its results are robust and accurate [6].

A method to choose a threshold value from a grey level histogram is suggested by Noboyuki Otsu. This method is acquired from the perspective of discriminant analysis. [9]

Nishna Soman specifies a method based on classification which is accomplished by using state of the art SVM approach [10].

Paper dispenses a productive and robust approach for shadow segmentation and compensation in color satellite images with high spatial resolution. The approach employ normalized saturation-value difference index (NSVDI) in Hue-Saturation-Value (HSV) color space to detect shadows and utilize histogram matching to recuperate the information under shadows[11].

A technique to recover secular series of low-resolution images affected by clouds and associated shadows has been proposed in this paper. This nonparametric algorithm, which is based on Kohonen's SOM, does not need any statistical model to suitable the data. The training phase based on data issued from the scene to be processed for a thematic analysis [12].

An optimal threshold is pick by the differentiate criterion, namely, so as to maximize the separability of the resultant classes in grey levels. The method is very simple, utilizing only the zeroth and the first-order accumulative moments of the grey-level histogram [9].

III. METHODOLOGIES USED

A. Mask Construction

1) Binary Classification:

Binary classification used to distinguish shadow and non-shadow region of images. Binary classification procedure is implemented in a supervised way by means of a support vector machine (SVM).

2) Post Processing:

The output of binary classification contains unwanted data or information. To remove this unwanted part we need to use morphological filtering.

B. Border Creation

Image contains mixed pixels which are difficult to classify shadow and non-shadow part for this region. To avoid this problem use border between shadow and non-shadow Classes is defined in order to appropriately handle the border pixel.

C. Classification Maps

It conclude mainly 3 classifications

1) Multiclass Classification**:**

Main purpose of this classification is to distinguish between various predefined non-shadow classes at one side and various predefined shadow classes at other side.

2) Post Classification:

This classification is used to filter for removing label and smoothing the map.

3) Quality Control:

It is used to control the quality of images and decide if benefit is achievable or not.

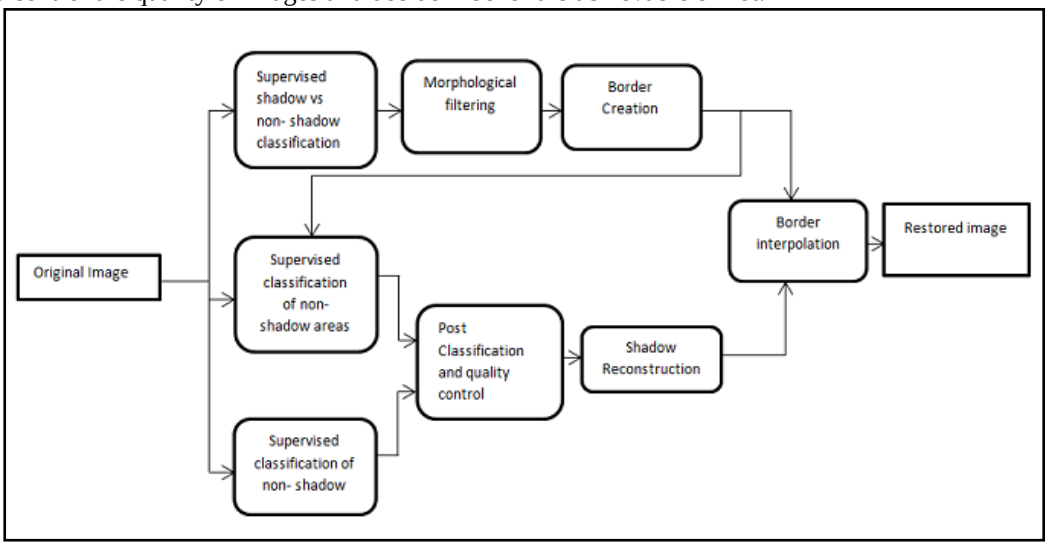

Fig.1: Stepwise Classification of shadow detection and reconstruction

D. Shadow Reconstruction

This is main step of this methodology. There is linear relationship between shadow classes and non-shadow classes. For reconstruction three estimation ways may be conceptualized.

1) Histogram estimation
2) Kernel density estimation
3) Parameter estimation

E. Border Reconstruction

After the reconstruction of shadow, process is not completely finished. Border between non-shadow and reconstructed shadow areas still present with their original aspects .Which may be in converse with two adjacent areas. In order to smooth such converse, pixels of the borders undergo an easy-to-implement and fast contextual linear interpolation.

IV. CONCLUSION AND FUTURE WORK

In this paper, we have provided survey of shadow detection and its removal. Also various shadow detection approaches have been reviewed and compare by discussing their advantages and disadvantages.

This paper proposes a method for shadow detection in high resolution images and reconstructing them by removal of shadow. It can be applied on videos also. This will serve a major role in detecting hidden objects from very high quality aerial images taken from satellite or military aircraft. Different techniques with more complexity will be able to identify and remove shadow more accurately and effectively.

ACKNOWLEDGEMENT

We would like to show our gratitude **Mr.S.S.Kulkarni, Project guide,** for giving us guidelines and valuable suggestions. The authors also would like to thank the anonymous reviewers for their comments and suggestions to improve this paper. We would also like to expand our deepest gratitude to all those who have directly and indirectly guided us in writing this Paper.

REFERENCES

[1] Shadow identification and classification using invariant color models. E. Salvador, A. Cavallaro, and T. Ebrahimi in Proc. IEEE Int. Conf. Acoust, Speech, Signal Process., 2001, vol. 3, pp. 1545–1548.

[2] A Complete Processing Chain for Shadow Detection and Reconstruction in VHR Images Luca Lorenzi, Student Member, IEEE, Farid Melgani, Senior Member, IEEE, and Grégoire Mercier, Senior Member, IEEE

[3] Shadow Analysis in High-Resolution Satellite Imagery of Urban Areas Paul M. Dare

[4] Characteristics of Shadow and Removal of Its Effects for Remote Sensing Imagery Fumio Yamazaki1), Wen Liu1), and Makiko Takasaki1)

[5] Height Estimation for Buildings with Complex Contours In Monocular Satellite/Airborne Images Based On Fuzzy Reasoning Mohammad Izadi and Parvaneh Saeedi School of Engineering Science, Simon Fraser University, Burnaby, BC, Canada .

[6] Adaptive Shadow Detection Using a Blackbody Radiator ModelAliaksei Makarau, Rudolf Richter, Rupert Müller, and Peter Reinartz.

[7] Optimization for Hue Constant RGB SensorsGraham D. Finlayson(1) and Sabine Süsstrunk(1,2) (1) School of Information Systems, University of East Anglia, Norwich, U.K. (2) Laboratory for Audiovisual Communications, Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland

[8] A Comparative Study on Shadow Compensation of Color Aerial Images in Invariant Color Models Victor J. D. Tsai

[9] A Tlreshold Selection Method from Gray-Level Histograms NOBUYUKI OTSU.

[10] An Advanced Approach towards Shadow Detection and Restoration in VHR Images, Nishna Soman.

[11] Shadow Segmentation And Compensation In High Resolution Satellite Images Haijian Ma Qiming Qin Xinyi Shen Institute of Remote Sensing and GIS, Peking University, Beijing, 100871, China.

[12] Preprocessing of Low-Resolution Time Series Contaminated by Clouds and Shadows Bassam Abdel Latif, Remi Lecerf,GregoireMercier,SeniorMember IEEE and Laurence Hubert-Moy.

