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[1] - Orientation of the Sun (solar azimuth)
[2]- Solar elevation angle
[3] - Nadir view
[4] - Off-nadir view

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Cos i   .

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$$\cos i = \cos(90 - \theta_s)\cos\theta_n + \sin(90 - \theta_s) \quad\quad .(\quad)$$

$$\sin\theta_n\cos(\phi_s - \phi_n) \quad\quad .$$

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i   (   ) (Path-Row)

ϕ_s θ_s (   )

ϕ_n θ_n .

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$i = (90 - \theta_s)$.

"   "   (K)   /   RMS

.   (RGB)

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K

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$$\log(BV_{observed\lambda}\cos e) = \log BV_{normal\lambda} +$$

$$K\log(\cos i \cos e) \quad\quad\quad\quad (RGB)$$

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$$BV_{normal\lambda} = (BV_{observeed\lambda}\cos e)/(\cos^k i \cos^k e)$$

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(GIS) $BV_{normal\lambda}$

.   (DEM)   Cos e $BV_{observed\lambda}$

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(cos i)

(MLC)   .

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TM1									
TM2									
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TM1												
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TM1							
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Studying the Effects of Topographic Normalization on Satellite Imageries Using Minnaert Constant

A.Sepehry[1]

Abstract

Vegetation mapping is one of the important aims phytosociologists are after. Ever-increasing improvement of satellite images in terms of their spatial and spectral resolution made them suitable for vegetation mapping. Satellites capture electromagnetic radiation reflected or emitted by objects on the earth. Electromagnetic radiation itself is a function of spectral property of the object, sun position (sun azimuth and elevation), and surface terrain. As a result, a given plant cover on different aspects of the terrain may be detected differently. This is especially true for images from mountainous environments. Thus, it is necessary to use techniques that can improve the amount of information obtained from such images. Several such techniques have evolved over the years, including the odeling of illumination effects using a DEM[2] and the calculation of surface roughness index such as Minnaert constant to adjust over correction caused by non lambertian models. This research attempts to apply such method to study the effects of topographic normalization on classification accuracy of Landsat TM image acquired for the preserved mountainous area of Jahan-nama in province of Golestan. The study area was classified using MLC[3] method on images, which had been topographically normalized by applying Minnaert constant. The results of comparing topographically normalized thematic map with original thematic map show that the topographic normalization method applied over corrects the image, and that the overall classification accuracy on corrected image is lower than the uncorrected one. The over-correction seems to be due to the quality of DEM used in the procedure. Using the information about the sun position which is available from the Landsat header file, is probably the other source of over-correction. This is because it is the position of sun relative to the center of the image while the study area was located at the extreme end of the image. The research suggests that calculating the position of sun for all pixels involved may help deriving better results.

Key words: Topographic normalization, Minnaert constant, Landsat, TM, Vegetation, Classification, Jahan nama, Golestan

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[2] Digital Elevation Model
[3] Maximum Likelihood Classification