Material Class Mapping By Reflectance Matching Of Hyper/multispectral Imagery

A Dissertation submitted towards the partial fulfilment of
the requirement for the award of degree of

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Submitted by
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CERTIFICATE

This is to certify that the dissertation title "**Material Class Mapping By Reflectance Matching Of Hyper/multispectral Imagery**" submitted by **Mr. RISHI PATEL, Roll. No. 2K15/SPD/13**, in partial fulfilment for the award of degree of Master of Technology in "**Signal Processing and Digital Design (SPDD)",** run by Department of Electronics & Communication Engineering in Delhi Technological University during the year 2015-2017, is a bonafide record of student's own work carried out by him under my supervision and guidance in the academic session 2016-17. To the best of my belief and knowledge the matter embodied in dissertation has not been submitted for the award of any other degree or certificate in this or any other university or institute.

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DECLARATION

I hereby declare that all the information in this document has been obtained and presented in accordance with academic rules and ethical conduct. This report is my own work to the best of my belief and knowledge. I have fully cited all material by others which I have used in my work. It is being submitted for the degree of Master of Technology in Signal Processing & Digital Design at the Delhi Technological University. To the best of my belief and knowledge it has not been submitted before for any degree or examination in any other university.

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ABSTRACT

The main objective of this study is material mapping in hyperspectral image with the help of spectral reflectance matching. Presence of reflectance curve is the heart and soul of any operation performed, considering hyperspectral imagery. Certain material shows unique or characteristic reflectance plot known as signature plot or footprint within the range of spectrum. This feature of Hyperspectral image is exploited in case of material mapping. Visible materials like road, plantation, rooftops etc or even invisible materials like, soil constituents (carbonates, Na, K salts, water presence) or even the presence of ores of minerals (e.g. cuprite, alunite) beneath the surface of the earth can be predicted with sufficient accuracy. Hyperspectral data pose challenges to image interpretation, because of the need for calibration, redundancy in information, and high data volume due to large dimensionality of the feature space.

In this project, hyperspectral image classification, band reduction and new technique for hyperspectral image classification is proposed and implemented. Both visual and quantitative results are calculated with the help of matlab. This project also designs a basic toolbox in MATLAB for processing and classification of hyperspectral image. Processing of hyperspectral image is divided into five modules, each performing specific operation. First, Acquisition of hyper-multispectral image and display of its basic properties. Second, Formulation of classes with the help of user selecting points over displayed hyper-multispectral image. For the images in which signature reflectance library is already available user help for the selection of spectral signature is not required. Third, Reduction of Dimension of hyperspectral image up to user specified number of bands and calculation of the amount of information lost. Fourth, Material class mapping by reflectance Matching of hyper\multispectral image using traditional SAS, SDS, SCS deterministic approach. New method proposed for material classification over traditional SAS, SDS, SCS approach, (regression transform is used over reflectance curve to obtained separate regression distance class matrix) displaying the result using windowing technique and enhancing the output using Floyd dithering technique. Fifth, this part calculates the number of pixels, amount of area classified under each class, processing time, accuracy comparison between traditional and proposed techniques.

Proposed method shows considerable improvement both visually and quantitatively over previous method. For the data set downloaded who's ground truth is not available, pictorial result is shown and quantitative analysis is done for the images with ground truth present.

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