CE816 HYPERSPECTRAL IMAGE PROCESSING

Multispectral and hyperspectral remote sensing, Comparison of multispectral and Hyperspectral Image Data, Spectral signatures and BRDF in the Visible, Near Infrared and Shortwave Infrared regions of EMR, Hyperspectral Issues.

Scanner types and characterization, Specifications of various sensors, Spectrographic imagers- hyper spectral sensors, Design tradeoffs, Data formats and systems, AVIRIS, CASI, NASA Terra moderate resolution imaging Spectrometer (MODIS), Hyperion.

Hyperspectral Data cube, Hyperspectral profiles, Data Redundancy, Problems with dimensionality, Principal component, Minimum noise fraction (MNF), Atmospheric correction, Atmospheric correction measures, Flat field correction, Empirical line calibration, Empirical flat field optimized, Reflectance transformation (EFFORT), Continuum removal, Spectral feature fitting.

Virtual dimensionality –Representation systems – Hypercube – Red edge – Indices – Hughes phenomenon – Multivariate analysis for data reduction – Data calibration, Normalization-Spectral library- Response functions – MNF transformation –Library matching, Spectral angle mapper, Spectral mixture analysis – End member extraction – Spectral unmixing, Principal component factor, Principal component analysis, Weighted principal component analysis, Band detection, Reduction and selection principles–Data compression.

Application to lithology, Mineral exploration, Agricultural crop systems – Stress detection, Plant production, Soil moisture ,Soil characteristics, Degradation status – Forestry canopy characters, Ecosystem, Forest health, Biodiversity, Gap dynamics, Environmental and resource management.

References

1. Schowengerdt,R.A., 1997. Remote sensing –Models and Methods, for Image Processing, Academic Press, London.
2. Jensen J. R., 1996. Introductory Digital Image Processing: A Remote Sensing Perspective. Prentice Hall, 2nd Edition.
3. Mather P. M., 1987. Computer processing of remotely sensed images- An introduction, St. Edmundsbury Press Ltd.
4. Thomas M. Lillesand and Keifer R W., 2000. Remote Sensing and image interpretation. John Wiley & sons, Inc.
5. Pramod K. Varshney and Arora M.K., 2004. Advanced Image Processing Techniques for Remotely Sensed Hyperspectral Data, Springer publication.