Abstract

Multispectral optical data are sensitive to the physical properties of the ground objects and express their spectral features. While SAR data are more influenced by the geometric properties and express backscatter information. Therefore, this study demonstrates the integration of Landsat ETM-8 and ERS-1 data for improved information, more specific inferences and increased interpretation capabilities. Since SAR images are affected by speckle, some standard speckle reduction filters like Lee-Sigma, Frost, and Gamma-Map were compared. Our focus was on the impact of the fusion on enhancing subsurface features for geological exploration. The fusion was performed using different algorithms namely; Intensity–Hue–Saturation (IHS), Multiplicative Transform (MT), and Gram-Schmidt (GS). The experimental results showed complementary spatial and spectral resolution characteristics. The joint processing contains the details beneath the surface cover of the respective ERS-1 data while maintaining the basic color content of the original ETM-8 data. The fused images have potentially enhanced subsurface features such as structures, paleo drainage, several deposits, and reveals the fluvial features which are not observable in the ETM-8 image. In addition to the visual interpretation, the performance of each method was further quantitatively analyzed by applying the following three measures: The High Pass Correlation Coefficient (HPCC), the Root Mean Squared Error (RMSE) and the Structural Similarity Index Measure.
(SSIM) which depicted that the Gram-Schmidt (GS) method gives the best synthesized results and outperformed the other methods.

References


Index Terms

Computer Science

Information Sciences

Keywords

Fusion algorithms  Speckle filters  ETM-8 and ERS-1 data.