

Abstract

Mapping surface mines and mine activity is integral to both environmental preservation and tracking industrial production. West Virginia has a long history of coal and other types of surface mining, but detailed spatial information representing the extent of operations is limited. In developing nations, such information often does not exist in any form. While field collections of spatial feature data relating to mine activity are costly and resource-intensive, remotely sensed imagery presents a readily available tool to identify and map surface mines and their footprints on the Earth's surface.

Geographically referenced raster image datasets from sensors on board satellites in space as well as airborne vehicles can represent wavelengths of light well beyond the range of the visible spectrum. These types of multispectral datasets present grids of cells on the Earth's surface that each represent the luminance properties of the surface materials *at clearly defined wavelengths of light*. This study analyzed recently collected multispectral data from West Virginia by examining the reflectance values at each point on the ground and attempted to classify materials known to exist in high concentrations in large mounds or pilings that are typically adjacent to large-scale surface mines. By inputting the known spectral properties of these Earth minerals into the classification process, this study was able to automatically classify and map the signature features of surface mines without user input or analysis. The automated classification methodology developed and tested in this study accurately identified surface mine locations throughout the study area in West Virginia at a rate of over 98%, and the output feature dataset can be implemented immediately in a comprehensive impact study of mining operations on the surrounding environment and populations.