Integration of multi spectrum and high resolution remote sensing image for detecting geological disasters in mining areas

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Now detection of geological disasters and environment is one of the most important tasks in mining area in China. Through the investigation of the mineral geological environment, the present situation and the influence of geological disasters on the ecological environment in mining area are found out, which will be of great benefit to the reasonable development of mineral resources, and help to protect mining ecological environment, and realize the mine ecology restoration and reconstruction. The goal of adopting the remote sensing technology for detection of the mineral geological environment is to use multi-phases and multi-scale remote sensing image to interpret the typical features of geological disasters, and analyze the law of transition and destruction of geological disasters, and provide instructional data, reports and atlas for the protection of the mining geological environment. The typical geological disasters are opencast working site, gangue accumulation and waste residue sites, land crack, landslide and ground subsidence.

Research working sites are Dongshan mining area about 500 square kilometers and Pingshuo opencast mine area about 100 square kilometers in middle of China. The remote sensing data used for Dongshan mining area is TM, SPOT and high resolution aviation images, and for Pingshuo opencast mine area is IKONOS and Quickbird images. We also use some of relative GIS data for assistance interpretation in above two working sites. The RTK GPS is used in field surveying for getting the geometry correction control points and precision coordinates of boundary points of the disasters features. For SPOT, IKONOS and Quickbird images, the RPC models and GPS control points are used for getting precision orthoimages. The fusion of SPOT and TM data based on the Brovery multiplication transformations. The interpretation signature label are marked, and disasters features are classified in field works using the fusion data and the high resolution aviation images in the same region and PDA installed the GISTools software. The GISTools is a embedded GIS system in PDA environment developed by our group that can integrate GPS, RS and GIS data facilitated the data collection work and provided convenient and effective method for geological environment investigation in field works.

Since the high resolution aviation images are used at the same region, two kinds of

classification methods in Dongshan mining area are carried out, (1) the field classification based on high resolution aviation images, (2) supervised classification using the signature label file established by contrasting with remote sensing and aviation image for SPOT and TM fusion data. FOCAL transformation and elimination algorithms are used as the post-process of interpretation results of supervised classification. The results of accuracy analyzed indicate that the interpretation results of post-process supervised classification satisfies the requirement of 1: 10,000 geological disasters detection contrasting with the results of field sample surveying and aviation images. We also get the basic model of transition and destruction of geological disasters by contrasting with multi-phases remote sensing images using the algorithms of change detecting.

In Pingshuo opencast mining area we use the eCognition object-oriedted image process software to classify the features of geological disasters. The RPC model is used for IKONOS and Quickbird images geometry correction and orthoimage. The results of accuracy analyzed indicate that it satisfies the requirement of 1: 3000 fine geological investigations contrasting with the results of field sample surveying.