Scale transformation of remote sensing image based on fractal theory

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In field of remote sensing applications, the issues of scale are mainly referred to: 1) methods to describe spatial heterogeneity from a remote sensing image; 2) methods of scaling among different resolution data.

For remote sensing image, projection from a three dimensional space into a two dimensional space, the gray level image can be understood as a Brown fractal surface, and its fractal dimension is the fractal normal vector of the three-dimensional surface. So the image fractal dimension may well reflect the fractal characteristics of the realistic ground surface.

In this paper a three-dimensional image is first established based on gray value for calculating its surface area using the triangular prism method. The relationship between surface area and scale and method of expressing the spatial heterogeneity are discussed. According to the principle “fractal dimension is an invariant when scaling” in geometry theory, a scaling model based on the fractal dimension is proposed. Finally, the scaling model is evaluated using two assessment indicators: spatial resolution and SSIM (structural similarity).

Key words: Scale, Spatial heterogeneity, Fractal, Scaling

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