A STUDY ON SPECTRAL CHARACTERISTICS EXTRACTION USING FOURIER APPROXIMATION THEORY

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1.INTRODUCTION

The technology of hyperspectral remote sensing combines the traditional image spatial dimensions and spectral dimension together, can acquire data related to ground from three dimensions, two spatial dimensions and one spectral dimension. How to analysis and mine effective information from such data always be one of the most important concerns in the field of hyperspectral remote sensing. Therefore, studying ground objects using spectral data of image pixels is best able to embody the characteristics of hyperspectral remote sensing.

The spectrum of every image pixel contains the information of corresponding ground objects. Hyperspectral remote sensing image always has dozens or even hundreds of bands, covers form visible light to the short-wave infrared and its spectral resolution can be achieved to 10nm. So the spectrum of each image pixel which can be realized as a continuous curve contains richer and finer information of ground object. Theoretically, spectral curve is determined by the characteristic of the ground object. The different kinds of objects' spectral curves are different, and the same or similar kinds of objects' curves are similar. The characteristics acquired from the analysis of spectral curve can be used to classified and recognized ground objects. This process is named as spectral feature analysis, whose main technology is converting the original hyperspectral image to a new feature space by filtration or recomputation the bands, and studying its character from regularity of distribution of original pixel in the new feature space.

2.METHODOLOGY

This research focuses on the "shape" feature analysis of spectral curve, regarding the ground object spectral curve as a continuous function in a certain range of spectrum, which can be expanded as Fourier series using the theory of series approach, and getting the Fourier coefficient of each component. These coefficients determining the shape of each component are perpendicular to each other, of different frequency sine or cosine functions, which define the shape of the original function. Therefore, the shape of original function is determined by Fourier coefficients. A new feature space is set up by Fourier coefficients after Fourier series expanding the continuous function of each hyperspectral image pixel, in which the data reflect the "shape" feature of spectral curve. This method is based on the continuous of spectral curve. Instead of the data of each band, it takes the curve of each image pixel as a whole for change, so it is more suitable for the analysis of spectral features.

3.CONCLUSION

It can be revealed from the simulation experiments that to spectral curves with considerable variation in shape, the parts of low frequency have obvious differences and to spectral curves similar in shape but different in details, the parts of low frequency are very similar but the high frequency are different. In classification of ground objects, it can be more convenient to get the result if the part of low frequency of spectral curve is the judgment standard, especially for the congeneric objects distributed in bright areas and dark areas in one image, as its spectral curve is similar in shape but different in numerical value, it can be accurately determine its category by the part of low frequency, effectively improve the classification accuracy. For target recognition, it requires to find differences from similar spectral curves, so it's a good way to study the features of high frequency parts. Otherwise, noises of sensor, which have minor impact to spectral curve, can be removed by filtering the high frequency parts properly.

4.REFERENCES

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