Satellite Image Upscaling using High Boost Bi-Cubic Interpolation

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Abstract:

In this study, a novel method to upscale the satellite images using high boost bi-cubic interpolation is proposed. Generally, the image upscaling can be broadly categorized into three classes: interpolation-based, reconstruction-based and example-based approaches. The benefit of the interpolation-based techniques is low computational complexity, which it directly affects to the speed of calculation time. However, the output image using the interpolation techniques is often over-smooth. In order to solve this problem, most researchers often apply some of the additional processes for sharpening the upscale image, which need more computing time.

This novel interpolation formula can be applied to upscale the satellite image resolution and control the image sharpness simultaneously. This formula combines the high boost operator and the third order polynomial. The Laplacian operator is employed to formulate the high boost operator. This operator will be applied to the third order polynomial for building our interpolation formula. The method to use formula is similar to the bi-cubic interpolation. The results show that our proposed method can be used to upscale and enhance the sharpness of the image result with calculation time very close to the bi-cubic method.

Keywords: image upscaling, super-resolution, high boost operator, bi-cubic interpolation,

Although recent satellite imaging systems are much improved, the cost for high resolution imaging system is still high. Moreover, to improve spatial resolution of stocked images,

Thank to the limitation of a satellite imaging system has many constraints. Thus, the high-resolution optical image system is very expensive. One way to build the low-cost high-resolution image can use the image upscaling technique. Generally, the image upscaling can be broadly categorized into three classes: interpolation-based, reconstruction-based and example-based approaches. The benefit of the interpolation-based techniques is low

computational complexity, which it directly affects to the speed of calculation time. However, the output image using the interpolation techniques often produce the smooth version of the original low-resolution image. In order to solve this problem, most researchers often apply some of the additional processes for sharpening the upscale image, which it spends more computing time.

In this paper, we propose the novel interpolation formula that can be applied to upscale the satellite image resolution and to control the image sharpness simultaneously. This formula is derived from a high boost operator and a third order polynomial. The Laplacian operator is employed to formulate the high boost operator. This operator will be applied to the third order polynomial for building our interpolation formula. The method to use formula is similar to the bi-cubic interpolation. The results show that our proposed method can be used to upscale and enhance the sharpness of the image result with calculation time very close to the bicubic method.

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