Generating and Correcting Rational Polynomial Coefficients using Image Correction Model

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ABSTRACT: We propose a method to regenerate and correct Rational Polynomial Coefficients (RPCs) using KOMPSAT-3A imagery. Physical sensor model of KOMPSAT-3A and virtual grid over the target area were used to estimate the new RPCs. Three different image correction models (image coordinate translation model, shift and drift model, and affine transformation model) were used to remove image space error. We tested our method in Seoul and Goheung area. When using un-corrected new RPCs, the results showed a 20-30 pixel error. After applying image correction models, the error reduced to 1.8 to 5.5 pixels. The expected error map was generated from the error propagation analysis using Gauss-Markov Model.

1. INTRODUCTION

Rational Functional Model is used to replace physical sensor models in satellite positioning systems. Since the accuracy of the Rational Polynomial Coefficient provided by the satellite imager is inferior, a method of correcting the RPC or correcting it in the image space is used. In this study, we updated the RPC of satellite images using the virtual grid and performed the correction method in the image space using an indirect method rather than a direct survey.

2. METHODOLOGY

In this study, the virtual image points corresponding to each point of the virtual lattice and the virtual lattice were generated using the physical sensor model provided by the metadata of DEM and satellite image. An RPC was generated using each position of the virtual grid and the virtual image, and the correction was performed in the image space using the ground reference point.

3. DATA PREPERATION

ASTER GDEM V2 was used to create the virtual grid, and the size of the virtual grid was 20X20X20. RPC was extracted using GMM, and the accuracy of RPC was confirmed using GCP. In order to obtain GCP for correction in image space, ground coordinates were acquired by using aerial orthoimage and digital map provided by National Geographic Information Institute. After performing the correction in the image space using three different methods, the results were compared.

4. RESULT

The experiment was conducted in two areas, Seoul and Goheung. When the initial RPC was used, the error was about 20-30 pixels in the distance direction. When corrected using the 2-parameter, 4-parameter, and 6-parameter methods, the error was less than 6 pixels in Seoul and 15.6 pixels in Goheung.

5. CONCLUSION

In the case of RPC generation of KOMPSAT-3A, the error was large when it was not corrected, and the error was large when it was corrected by the 2, 4, and 6-parameter methods. The difference between each method was not largely confirmed.

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