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Atmospheric Correction of Sentinel-2 Images for Accurate Identification of Vegetation Distribution

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Extended Abstract

As global warming becomes serious with the increase of greenhouse gases, interest in the impact of climate change on the global environment and human life is increasing. In addition, local abnormal climate phenomena frequently appear according to climate change, and changes in the ecosystem are starting to be detected. Indicators that reflect climate change are diverse, such as agriculture, plant and animal distribution, biological seasons and ecology, and health. Here, the impact on agricultural production in particular seems to be very important [1]. Satellite products such as NDVI (Normalized Difference Vegetation Index), LAI (Leaf Area Index), FPAR (Fraction of Photosynthetically Active Radiation), and PET (Potential EvapoTranspiration) that reflect the growth and vitality of vegetation exist. Through this, changes in agricultural land or forests can be identified. At this time, strict atmospheric correction for high-resolution satellite data is essential in order to use accurate product.

The radiation measured at a satellite sensor can have errors due to atmospheric effects such as scattering and absorption while transmitting from the land surface to the sensor. Absorption of sunlight by the atmosphere attenuates the radiation measured using the sensor. Since atmospheric effects in remote sensing cause uncertainty in surface observation, accurate atmospheric correction is an essential preprocessing step for the analysis of surface characterization and environmental monitoring [2]. Among atmospheric correction methods, the physical model-based method has the advantage of calculating the atmospheric contribution numerically using the precise Radiative Transfer Model (RTM) and using it for atmospheric correction to produce accurate results [3]. The widely used RTMs are MODErate resolution atmospheric TRANsmission (MODTRAN), HIgh-Resolution TRANsmission molecular absorption database (HITRAN), Second Simulation of a Satellite Signal in the Solar Spectrum (6S) and others.

6S calculates the scattering and absorption effects of atmospheric components such as water vapor, ozone, and aerosol for various geometric, atmospheric, and spectral conditions. In this experiment, the 6SV model, a vector version of 6S that can explain polarized radiation, will use. In order to improve the speed of atmospheric correction, we plan to implement an AutoML model with 6SV2.1 calculation values as reference standards and input conditions as input features. The correction results for each case will be analyzed with reflectance for each band and NDVI values. Through this, it is possible to closely observe changes in vegetation by generating NDVI of accurate quality.

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References

[1] J. Wang, R. Mendelsohn, A. Dinar, J. Huang, S. Rozelle, and L. Zhang, “The impact of climate change on China's agriculture,” *Agricultural Economics,* vol. 40, no. 3, pp. 323-337, May, 2009.
[2] Y. J. Kaufman, “Atmospheric effect on spectral signature—measurements,” *Advances in Space Research*, vol. 7, no. 11, pp. 203-206, Jan, 1987.
[3] K. H. Lee, and J. M. Yum, “A Review on Atmospheric Correction Technique Using Satellite Remote Sensing”, *Korean Journal of Remote Sensing*, vol. 35, no.6_1, pp. 1011-1030, Dec, 2019.