

Generation of global weather radar from satellite images by deep learning

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In this study we generate global weather radar images from meteorological satellite images by deep learning method. We use Pix2PixCC, which is based on conditional Generative Adversarial Network (cGAN) and has the advantage of generating scientific data. For training our model, we use GK2A satellite images as input and weather radar images on the Korean Peninsula as target. Our model was trained from October 2019 to July 2021 and evaluated the model in August 2021. We develop two models, daytime and nighttime. Our daytime model uses the visible, infrared and water vapor channels and our nighttime model uses infrared and water vapor channels as input. To evaluate our model, we compare our results with radar images in the Korea Peninsula using Pearson's Correlation Coefficient (CC), Root Mean Square Error (RMSE) and Critical Success Index (CSI). The averaged CC, RMSE, and CSI of our daytime model (nighttime model) are 0.79 (0.66), 5.37 dBZ (6.60 dBZ) and 0.61 (0.53), respectively. Our models are better than the rain rate algorithm of Korea meteorological administration and previous studies. Finally, we composite satellite images from GK2A, GOES-16, GOES-17 and Meteosat-11 to generate the global satellite images. We then generate global weather radar images from these composite images by our deep learning models. We expect that our global weather radar images can be provided to countries where there is no weather radar.

Key words: Deep learning, Satellite, Radar, GK2A, Precipitation