Time series of cloud cover during the night derived from an omnidirectional camera

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Surrounding atmospheric environment have a big influence on our lives. For example, fog causes various accidents due to poor isibility. Leisure facilities must be stopped when wind speed is high. Meteoropathy tends to increase depending on perature or weather. Therefore, environmental prediction with higher temporal and spatial resolution than that of daily ather forecast is needed. Cloud cover (CC) will have a large impact on prediction of environmental changes in other tities (e.g. temperature, humidity, wind speed and direction). The method for deriving CC from RGB images taken by an omnidirectional camera has been investigated so far. However, it was not applicable to nighttime images, which is usually grayscale images, due to low SN and low brightness. Therefore, we develop a method for deriving CC from grayscale images taken by an omnidirectional camera during the night using deep learning. Also, we investigate he distortion of the whole-sky images because CC measured in the celestial sphere has a different value from that measured in whole-sky images.We separate cloud areas from sky areas in the whole-sky images using a deep learning technique for semantic segmentation, U-net. U-net is a encoder-decoder type of convolutional neural network. Area under an ROC curve (AUC), which is an evaluation index commonly used in the discipline of machine learning, for nighttime images is 0.985 and that for rainy images during the night is 0.984. However, that for evening and morning images is lower than them, 0.952. Therefore, the proposed method may not be applicable to evening and morning images.

Keywords: Cloud cover

