Detection of information related to disasters from monitoring cameras –detection of tornadoes or funnel clouds -

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The disaster-related images or footages have been recorded by the observer who happened to be the points of disaster. The development of the information technology has enabled the real-time monitoring of images of the disaster related targets such as volcanoes or meteorological phenomenon. On the other hand, improvement of computer vision and machine learning method such as deep learning has enabled the implementation of visual recognition ability comparable to human visual recognition to the computer. Tornadoes and funnel clouds occur at the high frequencies around the Tosa gulf in Kochi. We have expanded twelve monitoring cameras around Tosa gulf to detect the tornadoes or funnel clouds to promote studies of the mechanism of the tornadoes and for development of just before occurrence of tornadoes predicting system.
In this study, detection of funnel clouds from the monitoring camera images using convolutional neural networks (CNN) is examined. Two type of CNN for object detection and classification are examined. Furthermore, apparent velocity distribution was obtained by using optical flow to recognize the sign of tornado occurence by cloud movement. These methods are applied to the real footages on September 11, 2017, in which multiple funnel clouds are observed. The effectiveness of the proposed method is confirmed through the experiments using real images.

Keywords: tornado, funnel cloud, deep learning, disaster, footage, data mining