Radar Quantitative Precipitation Estimation using Long Short-Term Memory Networks

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Abstract

Accurate quantitative precipitation estimation plays an important role in hydrological modelling and prediction. Instantaneous quantitative precipitation estimation (QPE) by utilizing the weather radar data is a great applicability for operational hydrology in a catchment. Previously, regression technique performed between reflectivity (Z) and rain intensity (R) is used commonly to obtain radar QPEs. A novel, recent approaching method which might be applied in hydrological area for QPE is Long Short-Term Memory (LSTM) Networks. LSTM networks is a development and evolution of Recurrent Neuron Networks (RNNs) method that overcomes the limited memory capacity of RNNs and allows learning of long-term input-output dependencies. The advantages of LSTM compare to RNN technique is proven by previous works. In this study, LSTM networks is used to estimate the quantitative precipitation from weather radar for an urban catchment in South Korea. Radar information and rain-gauge data are used to evaluate and verify the estimation. The estimation results figure out that LSTM approaching method shows the accuracy and outperformance compared to Z-R relationship method. This study gives us the high potential of LSTM and its applications in urban hydrology.

Keywords: Quantitative Precipitation Estimation, QPE, Long Short-Term Memory, Urban Hydrology, Weather Radar.

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