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Development of Flood Level Prediction Model for Hangang Jamsoo Bridge Using Weather Climate Data and Artificial Neural Networks

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Climate change has increased the frequency and intensity of intense rainfall events and the resulting flood damage is increasing every year. The accurate application of various runoff estimation methods is prone to subjective views among designers and experts. Physical models used for water resource management are difficult to build and require a high level of user understanding, including the selection of parameterization formulas. This can lead to unreliable results depending on the user, which affects the design and dimensional safety of river hydraulic structures. To compensate for these problems, artificial intelligence (AI) is increasingly being utilized. Therefore, in this study, a machine learning model was used to develop a flood level prediction model for the Han River submerged bridge, and the data of July 2011, August 2018, July 2020, August 2020, and July 2022, when heavy rainfall was concentrated, were trained and used for verification in August 2022 and July 2023. A model for predicting the water level of the submerged bridge was built using 10-minute rainfall (AWS Yongsan, Jung-gu, Seongdong, Gwangjin, Seocho, Songpa, Gangdong, and Guri) and Paldam Dam discharge as independent variables, and the water level of the submerged bridge with a 6-hour delay as the dependent variable. The models used for prediction were LSTM (Long Short-Term Memory), an artificial neural network model, and Bi-LSTM (Bi-directional Long Short-Term Memory), and the test results showed that the error of Bi-LSTM was less and the accuracy was higher, evaluating the usefulness of flood level prediction using the Bi-LSTM model.

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