



IoT-based Flood Depth Sensors in Artificial Intelligent Urban Flood Warning Systems

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In the face of increasingly flood disasters, on-line regional flood inundation forecasting in urban areas is vital for city flood management, while it remains a significant challenge because of the complex interactions and disruptions associated with highly uncertain hydro-meteorological variables and the lack of high-resolution hydro-geomorphological data. Effective on-line flood forecasting models through the rapid dissemination of inundation information regarding threatened areas deserve to develop appropriate technologies for early warning and disaster prevention. Artificial Intelligence (AI) becomes one of the popular techniques in the study of flood forecasts in the last decades. We apply the AI techniques with the newly implemented IoT-based real-time monitoring flood depth data to build an urban AI flood warning system. The AI system integrates the self-organizing feature mapping networks (SOM) with the recurrent nonlinear autoregressive with exogenous inputs network (R-NARX) for modelling the regional flooding prediction. The proposed AI model with the IoT-based real-time monitoring flood depth datasets can increase the value-added application of diversified disaster prevention information and improve the accuracy of flood forecasting. We develop an on-line correction algorithm for continuously learning and correcting model's parameters, automatic operation modules, forecast results output modules, and web page display interface. The proposed AI system can provide the smart early flooding warnings in the urban area and help the Water Resources Agency to promote the intelligent water disaster prevention services.

Keywords:

Artificial Intelligence (AI); Artificial Neural Networks (ANN); Internet of Things (IoT); Regional flood inundation forecast; Spatial-temporal distribution