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Inundation Model Integrating Building Effect and Real-time Simulations

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Recently, the highly developed urban area in Taiwan caused the concentrated population and result in densely distributed buildings. Buildings often affect the propagation of overland flow in urban areas. Building walls change the direction and velocity of flow, and can exclude interior spaces from flooding.
The study aims to develop an urban inundation model to represent the resistance and the storage effects of buildings and reveal the rapid simulation in urban flood modeling by coarse grids. Meanwhile, the inundation model of local refinement solves the non-inertia overland flow hydraulic equations using the coarse main grids in global domain; whereas the building e effect is applied to the fine grids to reflect the details of flood in high resolution. The computing of global domain and all the local regions were parallelized to different threads by parallel algorithm to improve the efficiency of the multi-scale inundation model
An ideal case was used for model calibration. The comparison of the simulation results demonstrated that urban inundation model has good accuracy. The model was applied on Typhoon Nari event in the central Taipei City for model verification. The results showed that the presented inundation model reproduces the inundation results more comparable with the observed flooding situation.
The model was further applied to the simulation of typhoon Morakot event in Zengwen river basin. The results of multi-scale simulation showed that the proposed model can maintain the accuracy in local refined area and has significant improvement in model efficiency.

Keywords: Urban inundation model, Multi-scale, Parallel algorithm, Building effect.