

Synthetic storm sewer network for complex drainage system as used for urban flood simulation

Lea Dasallas*, Hyunuk An**, Seungsoo Lee***

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Abstract

An arbitrary representation of an urban drainage sewer system was devised using a geographic information system (GIS) tool in order to calculate the surface and subsurface flow interaction for simulating urban flood. The proposed methodology is a mean to supplement the unavailability of systematized drainage system using high-resolution digital elevation (DEM) data in under-developed countries. A modified DEM was also developed to represent the flood propagation through buildings and road system from digital surface models (DSM) and barely visible streams in digital terrain models (DTM). The manhole, sewer pipe and storm drain parameters are obtained through field validation and followed the guidelines from the Plumbing law of the Philippines.

The flow discharge from surface to the devised sewer pipes through the storm drains are calculated. The resulting flood simulation using the modified DEM was validated using the observed flood inundation during a rainfall event. The proposed methodology for constructing a hypothetical drainage system allows parameter adjustments such as size, elevation, location, slope, etc. which permits the flood depth prediction for variable factors the Plumbing law. The research can therefore be employed to simulate urban flood forecasts that can be utilized from traffic advisories to early warning procedures during extreme rainfall events.

Keywords : Urban flood modeling, digital elevation model, surface and subsurface interaction

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* Member · PhD candidate, Dept. of Agricultural, Eng and Life Sciences., Chungnam National University · E-mail : lea.dasallas@gmail.com