Algorithm and Software for Simulation and Visualization of Water Flooding in Thailand Based on Shallow Water Equation

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Abstract: Water flooding has very often occurred in Thailand. They caused many related problems such as flooding, landslide, health problems, etc. This paper proposes algorithm and software for simulation and visualization of water flooding in Thailand. The algorithm provides three cases of flooding caused by sea water level, continuously heavy rain and collapsed dam, respectively. We used shallow water equation to describe the flooding model and used the finite volume method (FVM) to solve the system of equations. The numerical method for solving partial differential equations (PDEs) and image processing are combined and implemented in our algorithms for visualizing the simulated data in 2D and 3D space. The resolution of each grid cell from earth topography (ETOPO) data is 92.5 meters by 92.5 meters. The algorithm provides simultaneously simulation of three cases computation. Cloud satellite images and radar images can be used as input data of rainfall in the software. The results from the simulation show the water propagation from sources of water to the risk regions. The software so-called VirtualFlood3D written in Delphi programming and OpenGL library is useful for the preliminary water resources management and disaster prevention from water flooding. The software can be used to simulate flooding for any region based on ETOPO data.

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