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ANALIZA ALGORITMOV ZA MODELIRANJE 1D STALNEGA NEENAKOMERNEGA TOKA ZA POTREBE DISTRIBUIRANIH RAČUNSKIH POSTOPKOV

Povzetek

V Sloveniji in tudi drugod je s poplavami ogroženih vedno več območij, zato je postal cilj družbe obvladovanje poplavnih škod oziroma obvladovanje tveganja. Tako se na podlagi predhodne ocene opredelijo tista območja, kjer obstaja možnost znatne poplavne ogroženosti. Za takšna območja se izdelajo karte poplavne nevarnosti in ogroženosti. Problem pa je v tem, da so ponavadi ogrožena območja večja in topografsko zahtevna (razgiban teren). Rešitev je v visoko resolucijskih modelih, s katerimi lahko dobro upodobimo teren. Dobimo jih lahko z različnimi načini zajema prostorskih podatkov (klasične geodetske meritve, tehnologija LIDAR,…) in z računalniško obdelavo le-teh, kjer na koncu ustvarimo digitalni model reliefa, ki je vhodni podatek v hidravličnih modelih. Naslednji problem s katerim se srečamo, nastane takrat, ko poskušamo prostorske podatke obdelati. Slednjih je ogromno in potrebujejo veliko računalniškega spomina za obdelavo in vizualizacijo. Ideja je, da prostorske podatke razbijemo oziroma jih razdelimo v manjše spominsko obvladljive celice. Tako imamo območje razdeljeno na več celic in njihovo obdelavo (izdelava TIN-a, izvoz geometrije, idr.) distribuiramo med več računalniki. Naša naloga je, da priredimo hidravlične modele in celoten proces od prostorskih podatkov do poplavnih linij tako, da se celotna procedura (geometrija, hidravlični račun) izvede v eni celici, nato pa se robni pogoji prenesejo v drugo celico, kjer se račun nadaljuje. Tako sem se v seminarju posvetil iskanju in analiziranju algoritmov hidravličnih modelov, ki jih bom v diplomi preoblikoval za potrebe distribuiranega sistema. Dobili bomo avtomatizirano in hitro orodje, s katerim bomo lahko uporabili vse razpoložljive prostorske podatke.

Ključne besede: hidravlika, odprti vodotoki, 1D hidravlično modeliranje, distribuirani sistemi, algoritmi

Abstract

Because of the increasing flood risk, not just in Slovenia but also in other countries, protection against the natural disasters became the main aim of the society. To control such disasters we first have to define areas where possibility of flooding exists. For those areas floodplain mapping is done. That is often quite complicated because of the wide areas and an agitated ground. The solution to this problem is in high resolution spatial models, which can be made by computer spatial data handling. We can obtain spatial data by using different land surveying techniques (classical geodetic methods or LIDAR technology). As a result we get digital ground (surface) model which can be used as an input to our hydraulics models. When processing spatial data we can get enormous quantities of data, which is another problem. The idea is to create smaller cells which can be controlled by the computer. After dividing our area into smaller cells, we have to distribute them among more computers in order to process them (make TIN, export geometry …). Our job now is to arrange hydraulics model (and also the whole process) by converting spatial data into flood lines so that the whole procedure is performed in one cell. Later on boundary conditions can be transferred to another cell in which computation continues. The main topic of my seminar is to analyze the algorithms of hydraulics programs. Further on (in my diploma thesis) I would like to modify these algorithms and use them in a distributed system. If possible an automated and fast tool will be obtained, with which we will be able to handle all available spatial data.

Key words: hydraulics, open-channel, 1D hydraulic modeling, distributed system, algorithms