WATER RESOURCE ENGINEERING

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“Hydrological Modelling”

PCRaster Dynamic Model Representing Simplified Hydrological Runoff Model Of Hilly Catchment.

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ACKNOWLEDGMENTS

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ABSTRACT

PCRaster provides ideal conditions for modelling environmental processes such as surface runoff (Burrough et al., 2005). It links a dynamic environmental modelling language to a GIS. The modelling language of PCRaster is specifically developed for the modelling of environmental process. It can easily be used by environmental researchers to construct dynamic environmental models that are adapted to particular problems being studied (Burrough et al., 2005; Dijck, 2000). The integrated idea behind PCRaster allows for a more flexible and adoptable approach. It offers the researcher the freedom to focus on the processes deemed most relevant for a particular study and for which sufficient input data are available (Burrough et al., 2005; DeRoo et al., 2000; Pfeffer, 2003). Models designed in PCRaster can range in complexity from very simple empirical based models to more complex physical based approaches.

This demo gives an introduction to the Dynamic Modelling Language which is considered to be the core of the PCRaster package. The Dynamic Modelling language allows for building spatio-temporal models (*dynamic models*) inside a Geographical Information System (GIS). The text is supported by computer batch/bash files that will automatically execute the operations and models described. It is assumed you have PCRaster correctly installed.

The application is named: “A simplified hydrological runoff model of Hilly Catchment”.

INTRODUCTION

PCRaster is Combination of two word PC and Raster. It is a dynamic modelling tool means that it represents behaviour of an object over time. This model is used for studying and analyzing rainfall-runoff with timestep. **ILWIS** software is used for generating input maps for PCRaster.

PCRaster runs on Linux and Windows operating and is a open source software and also free to use. It contains a scripting model development environment and it allows users to develop their own simulation models. Scripting languages supported include PCRcalc and Python and executes models very fast.

PCRaster is mainly applied in environmental modelling: geography, hydrology, ecology to name a few. But also other models can be constructed. Examples include rainfall-runoff models, vegetation competition models and slope stability models.

PCRaster is developed in cooperation with the PCRaster group at **Utrecht University.** Commercial support and sales is through **PCRaster Environmental Software BV.**

CHAPTER 3

INSTALLATION

PCRaster is a free and open source software. It is easily available online.

It can be installed from official site (http://pcraster.geo.uu.nl/downloads/latest-release/).

The Demo folder is also available at there official site which can be downloaded (http://pcraster.geo.uu.nl/downloads/demo-data/).

THEORY

The Terminologies commonly used in the simulation :-

1) **RASTER :-** A raster consists of a matrix (data-structure) of cells (or pixels) organized into rows and columns (or a grid) where each cell contains a value representing geographic data, such as temperature or rainfall etc.
2) **HYDRAULIC MODELLING :-** It is a mathematical model of a water/sewer/storm system and is used to analyse the system's hydraulic behaviour.
3) **DYNAMIC MODELLING :-** A dynamic model represents the behaviour of an object over time.
4) **GEOGRAPHIC INFORMATION SYSTEM (GIS) :-** it is a system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data.
5) **CURVE NUMBER :-** it is an empirical parameter used in hydrology for predicting direct runoff or infiltration from rainfall excess.The runoff curve number is based on the area's hydrologic soil group, land use, treatment and hydrologic condition.

PROJECT DESCRIPTION AND ANALYSIS

CHAPTER 6

CASE STUDY AND RESULTS

CHAPTER 7

CONCLUSIONS

1. The study showed that PCRaster was a valuable tool to quantify the rate of surface runoff and assess the impacts of different land use/ cover types on runoff generation.
2. Water flows from high elevation to its local low elevation depth.
3. Maximum runoff will be at lowest elevation point.
4. Runoff depends on many factors including amount of rainfall, infiltration capacity of soil cover and losses.
5. Runoff is a dynamic process that is dependant on factors that vary both spatially and temporally.
6. The excess water or surface runoff was routed using the local drain direction map produced from the DEM

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Thank You