



FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF WATER RESOURCES ENGINEERING.

**SCS-CN METHOD TOOL FOR AUTOMATED CN AND
OPTIMAL INITIAL ABSTRACTION RATIO DETERMINATION**

BY

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This Final Year Project Report is submitted to the Department of Water Resources Engineering
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ABSTRACT

Delineating the boundaries of numerous watersheds is essential for hydrological analysis in the big data era. Various techniques, such as ArcGIS, have been developed to delineate watershed boundaries but consist of laborious manual processes. SCS-CN method is used to estimate the runoff of the catchments but when the model parameters are not modified to accurately reflect the local hydrological conditions of the area, it underestimates discharges for small basins and overestimates discharges for large basins which causes flood control structures to be over designed or under designed. The input data for this method like rainfall and curve numbers are obtained manually which is hectic and a limitation to application of the method. The research focused on automation of SCS-CN method and optimization of the initial abstraction ratio. Delineation was done in Matlab using topotoolbox which contains tools like @FLOWobj, @GRIDobj, @STREAMobj for flow accumulation, flow direction and streams. Daily Rainfall data downloaded from Chirps in raster format was processed to produce an excel sheet for daily rainfall of a catchment using the polyshape obtained by delineation. This research aims at reducing the time taken during the processing of data and also to reduce the hectic manual computation of these processes. This tool is able to assign curve numbers to the different combinations of land use land cover and hydrologic soil groups automatically. The tool is able to extract the rainfall data of any catchment and process it to give an excel sheet. This tool has been tested for different catchments with varying areas. The tool also extracts rainfall data for the catchment from raster data downloaded from CHIRPS data which has a NSE of over 0.92 with data downloaded from Climate engine.org and 0.83 for GIS processed data. Delineation and LULC classification were done in a shorter time compared to other tools. The tool has been tested on catchments of Kigwe, Mpanga and Aswa. The tool has proved to perform better than the other tools like GIS since it is automated, just set the inputs and wait for results. The processing of results was done in matlab. A tool has been developed for automation of the data input to SCS-CN method and shows a difference of less than 2 km in the area of catchment during delineation with that obtained from GIS. The initial abstraction estimation using this tool produced negative values of NSE ranging between 0 to -6 for three methods that is event based, estimated and optimized initial abstraction ratio which is due to poor calibration of curve numbers and inaccuracy of satellite data used in this testing of the tool.

DECLARATION

I TAYEBWA INNOCENT, declare that this research project report is my original work except where due acknowledgement has been made. I declare that this work has never been submitted to this university or any other institute for funding or for partial fulfillment for any award.

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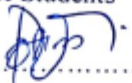
APPROVAL

This research project report submitted as a partial fulfilment for the award of Bachelor degree of science and water resources engineering of Busitema University, with my approval and the academic supervisors.

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DEDICATION

This report is dedicated to any of you who has added any effort in my academic journey.

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ABBREVIATIONS

AMC	Antecedent moisture content
CN	Curve number
DWRM	Directorate of Water Resources management
GIS	Geographical information system
HSG	Hydrologic soil group
LULC	land use land cover
MWE	Ministry of Water and Environment
NARO	National Agricultural Research Organization
SCS- CN	Soil Conservation Service curve number
WEAP	Water evaluation and planning