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Softwares for Hydrological Applications

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ABSTRACT

Because of growing demand of computers in the field of Hydrology, large number of softwares for hydrological as well as general pourpose applications are available. These softwares are required to be used for different applications. But since the information about the capabilities/requirements of these softwares are not available at a central place, it is very difficult to select an appropriate sortware for appropriate application at appropriate time.

In this Directory an attempt has been made to bring brief details about the softwares for hydrological as well as general purpose application available in the Institute. The brief detail about the capabilities of the software including hardware, sofrware and input requirement and output have also been provided.

Contents

1.0 SOFTWARES DEVELOPED at NIH

2.0 SOFTWARE PROCURED FROM OTHER AGENCIES

UNIT HYDROGRAPH DERIVATION

Purpose

This software can be used to derive unit hydrograph for small catchments using the storm rainfall-runoff data, as far as possible, for intense and short duration storms.

Description

The unit hydrograph technique is a simple tool being used by most of the water resources development organisations in different countries for estimation of direct surface runoff. Unit hydrograph, by definition, is the direct surface runoff hydrograph that would be observed at the outlet of the drainage area as a result of unit rainfall excess falling uniformly over the catchment in space as well as in time within the specified duration. The unit hydrograph technique assumes the catchment as a linear system which transforms the rainfall input into direct surface runoff as an output.

Inputs

The programme require the stationa rainfall alongwith their Thiessen weights and observed discharge hydrographs for the isolated events as input. The data interval for the observed rainfall hydrograph and observed discharge hydrograph should be the same.

Outputs

The programme gives the following outputs:

- The base flow hydrograph
- Direct surface runoff hydrograph
- Excess rainfall hydrograph
- The parameters N and K
- IUH and UH ordinates
- Computed discharge hydrograph.

Operational Requirements

The programmes have been developed at National Institute of Hydrology, Roorkee and tested on VAX-11/780 computer system. The programmes may run on other computer system, having FORTRAN compiler, after suitable modifications as per the software requirements of the system.

Form of Presentation

User's manual (UM-8) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

GRAPHICAL REPRESENTATION OF FLOW DURATION CURVE

Purpose

This generalized software package FLOW has specifically been developed to assist the designer to construct a flow duration curve for any drainage basin and to obtain the results in tabular or graphical form or both.

Description

Hydrologic design problems involving reservoir studies, low flow studies, river regulation policy formulations, study of geologic characteristics of drainage basins etc., need the knowledge of integrated flow characteristics of the stream over a given period of time. Such integrated flow characteristics for a given drainage basin can be represented through a flow duration curve representing the relationship between the flows and percentage of times they are equlled or exceeded over the specified period.

The programme consists of a main program and three subroutines with interactive features for assisting the designer to exercise suitable options. The program is flexible and can be updated by adding further subroutines for data processing etc. as per the need of the designer or the read statements suitably modified to suit the formats of any existing data file.

Inputs

To construct a flow duration curve generally the daily, weekly or monthly unregulated flows of a drainage basin under more or less stable, physical conditions during a given period are necessary.

Outputs

The output is in tabular or graphical form or both.

Operational Requirements

The program FLOW written in FORTRAN-77 language has been developed on 16-bit IBM-compatible personal computer (PC/XT) having a floating point/numeric coprocessor (INTEL 8087) and a PROFORT compiler. Standard software LOTUS 1-2-3 is used for graphical presentation of the results which are transferred by the program to the worksheet and a graphics printer compatible to the IBM compatible personal computer has been used for printing the results in tabular and graphics form.

Form of Presentation

User's manual (UM-27) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

A MODEL FOR SIMULATION OF MULTIRESERVOIR SYSTEM FOR CONSERVATION OPERATION

Purpose

To simulate a multipurpose multireservoir system for conservation operation. The various conservation purposes considered in the model are water supply for domestic and industrial purposes, irrigation, hydropower generation and minimum flow in the downstream river channel. In a multireservoir system, the model can help in finalizing the optimum rule levels for each storage location.

Description

The model simulates the operation of a system of reservoirs for the specified period. Based on the trial upper, middle and lower rule levels, it calculates the monthly time and volume reliability for each structure In addition, it also calculates the total number of months of failure, irrigation or power failure and water supply failure. It also calculates the number of months when the release from the reservoir is less than 75% of the total demands and thus calculates "Critical Failure" months.

In addition to calculating the reliability, a detailed operation table for each structure is optionally prepared. For each period, the table gives the year, month and period of operation, the initial storage, flow from intermediate catchment, evaporation, irrigation, water supply, hydropower and downstream demands, release made, power generated, spill from the structure, end level and middle and upper rule levels. Based on the observations from the tabular presentation, rule curve levels in particular period can be modified till the best operation performance is achieved.

Inputs

The data requirement of the model is full reservoir level, dead storage level, elevation-area-capacity table, various demands from the reservoir like water supply for domestic and industrial purposes, irrigation, hydropower demands and minimum flow requirements in the downstream channel, evaporation depths and local inflow from the intermediate/free catchment area. If the concerned location is to meet some demands of a downstream structure also, then the number of the node whose demands are to be met and the % age of demands is also to be specified in the input data.

Outputs

The output is as described above and is in tabular and graphical form.

Operational Requirements

An IBM compatible PC with FORTRAN language.

Form of Presentation

User's manual (UM-46) is vailable in National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

MASS CURVE ANALYSIS AND SEQUENT PEAK ALGORITHM

Purpose

This software can be used for determining the storage capacity of a reservoir.

Description

An interactive computer programme has been developed which can be used for mass curve analysis using computer graphics. The inflow data is read and the mass curve of inflows is plotted. The user is then asked to input the required release and a starting point from which the computations start. The capacity of resevior which would supply this relese is computed and displayed. The user is then again asked (optionally) to supply another value of required release and the computations are performed again. This way the user can carry the analysis for as many release values as desired and finally the results are tabulated.

The main programme is written in FORTRAN language. It calls a number of subroutines from IGL library for various graphical applications. The programme interactively prompts for the inputs from the user and displays the results as requested.

Input

The input data required are inflow data, value of required release and starting point. The input data is read from the data file.The input data may be in free format.

Output

The output from the program consists of Title of the problem and the basic parameters of the problem. A table showing stepwise computations is printed if requested. Finally the programme types the required storage capacity.

Operational Requirements

The progrmme is written in FORTRAN language. The graphical part is taken care of by the subroutines of PLOT-10 interactive graphics library. This program can be used on other computers after making suitable modifications.

Form of Presentation

User's manual (UM-20) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

GRAPHICAL REPRESENTATION OF INFORMATION RELATED WITH FLOODS

Purpose

To summarise the flood information through various statistics as well as through graphical representation.

Description

The programme has been developed on VAX-11/780 system and written in FORTRAN-77 language. The graphical part has been written using PLOT-10 IGL routines. The programme is very general and can be implemented on any other machine with slight modifications. A colour graphic terminal (TEK 4027) has been used to display graphs, bar chart and histogram. In case the IGL graphical routines are not available at the user's installation, the subroutines PLOT, PLOT1 and PLOT2 need be modified. If no graphical routines are available then the subroutines PLOT, PLOT1 and PLOT2 must be removed and all calls to it must be suppressed.

Inputs

Site name, Length of record, Flow data.

Outputs

Computed statistical parameters.

Operational Requirements

TEK-4027 colour graphic terminal for graphical display

Form of Presentation

User's manual (UM-22) containing program description and the sample solution is available with National Institute of Hydrology.

Technical Support

National Institute of Hydrology, Roorkee.

FLOOD CONTROL OPERATION OF A RESERVOIR

Purpose

To route the flood of different magnitudes at different elevations.

Description

The programme is written for the construction of spillway gate regulation curve which would assure that the reservoir operation to comply with the required conditions. This procedure can be used both in the planning and operation stage of a reservoir to analysis the spillway capacity required and the different level that should be maintained during high flood period. It is capable of coping with both FPS and MKS units.

Inputs

The data required for the computer programme are induced surcharge envelope curve as a table of releases and levels spillway discharge for different level at full gate opening, the flood hydrograph and different operation levels like FRL (static pool level), MWL (the top of surcharge - water level) and starting level.

Outputs

Analysed data. All important reservoir parameters are printed out.

Operational Requirements

The program can be used on machines with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-18) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

RESERVOIR ROUTING WITH GRAPHICAL REPRESENTATION

Purpose

To provide the various methods of routing under one generalised package.

Description

The following methods of reservoir routing are available :

- The Mass Curve Method
- The Puls Method
- The Modified Puls Method.
- The Wisler - Brater Method
- The Goodrich Method
- The Steinberg Method
- The Coefficient Method

The results are presented in a graphical form.

Inputs

Storage volume V/s elevation for the reservoir, water surface elevation V/s outflow, Inflow hydrograph, initial volume of storage, inflow and outflow, value of K (proportionality constant) for coefficient method which is the reciprocal of the slope of the storage curve.

Outputs

The output is in the graphical form.

Operational Requirements

IBM compatible PC-AT with Microsoft FORTRAN compiler.

Form of Presentation

User's manual (UM-29) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee

PROCESSING AND ANALYSIS OF RAIN FALL DATA

Purpose

Processing and analysis of rainfall data including storage of data on computer compatible devices, quality control, data conversion and further analysis.

Description

The package consists of 9 programs dealing with the following :

- Identification of missing rainfall data.
- Estimation of missing rainfall data using Normal Ratio Method.
- Estimation of missing rainfall data using Distance Power Method.
- Adjustment of data using Double Mass Curve
- Cumulated rainfall totals for 10-daily, monthly and seasonal periods.
- Determination of maximum rainfall for different duration (1, 2, 3, 4 and 5 days).
- Estimation of mean areal rainfall using Thiessen Weights.
- Estimation of mean areal rainfall using Isohytal Method.
- Conversion of daily rainfall data at non-recording raingauge stations into hourly rainfall using Mass Curve Technique.

Inputs

Inputs is from a 24 or 31 card format depending on whether the data pertains to a year after or before 1970, respectively. This card is the standard format in which IMD provides data.

Outputs

The output file consists of a header followed by the daily rainfall data. The header consists of the code, state name, district name followed by the name of the raingauge station. Each data card contains the catchment code, latitude and longitude of the station, the year, month or date followed by rainfall data.

Operational Requirements

The programs may be used on a computer with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-36) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee-247667

UNIT HYDROGARAPH ANALYSIS

Purpose

To carry out Unit Hydrograph Analysis

Description

The software consists of the following modules:

- Processing and Analysis of precipitation data
- Estimation of missing station rainfall data using Normal Ratio method
- Check for consistency of a particular record using Double Mass Curve
- Areal average rainfall due to a storm event using Theissen Polygon method
- Variation of depth over area over the catchment using Isohyetal method
- Conversion of daily rainfall data to hourly data
- Computation of discharge and ration curve analysis, discharge from velocity and rating curve of the form of Q=a(G-e)b
- Computation of excess rainfall, direct surface runoff, effective rainfall from discharge hydrographs and excess rainfall hyetograph using O-Index Method
- Unit hydrograph derivation
- Computation of unit hydrograph of specified duration from the direct surface runoff hydrograph of an isolated storm event
- Computation of unit hydrograph from multiperiod storm using Collin's Method, conventional Nash Model, Integer Nash Model, Clarke's Model
- Alteration of the duration of unit hydrograph by Superimposition Model
- Computation of unit hydrograph ordinate of new duration using S-Curve Technique & Computation of S-curve hydrograph from T-hour unit hydrograph
- Reproduction of direct surface runoff and estimation of flood hydrograph
- Computation of various error functions based on observed and computed direct surface runoff hydrographs
- Computation of direct surface runoff hydrograph from excess rainfall of the multiperiod storm and unit hydrograph

Inputs

The input file consists of record number, input lists, format and remarks.

Outputs

Rainfall at different staions after filling the missing records.

Operational Requirements

The programs may be used on a computer machines with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-25) is available in National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee-247667

TECHNIQUES FOR FLOOD FREQUENCY ANALYSIS

Purpose

To provide means of carrying out flood frequency analysis by commonly used probability methods.

Description

The software consists of eight programmes. The first five are for fitting of the following distributions:

- o Log Normal Two Parameter
- o Log Normal Three Parameter
- o Extreme Value Type I
- o Person Type III & Log Person Type III

The next three are for :

- o Computation of standard error of various distributions in fitting the annual flood series.
- o Best fit distribution using normalisation procedures and Chi-square criterion.
- o Flood frequency analysis using power transformation method.

Inputs

The continuous hydrologic data.

Outputs

Analysed data.

Operational Requirements

The program can be run on any microcomputers with minor modifications.

Form of Presentation

User's manual (UM-24) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical support

National Institute of Hydrology, Roorkee-247667

POWER TRANSFORMATION TECHNIQUE FOR FLOOD FREQUENCY

Purpose

To utilise Box and Cox transformation to obtain a near normal series from any data series.

Description

The program transforms the given series of annual maximum peak flood to near normal distribution using power transformation. It then performs the flood frequency analysis on this transformed series using the method of moments for estimating 50,100,200,500,1000 and 10000 years return period floods using two approaches based on the criteria that.

- o Coefficient of skewness is nearly zero
- o Coefficient of skewness is nearly and coefficient of Kurtosis nearly equal to 3.0

Inputs

Annual maximum series, Grid size used in the search method for determining the power transformation exponent which nearly normalises the series, recurrence interval,accuracy limit for coefficent of skewness, number of classes used in the Chi-square test.

Outputs

Table showing original, log transformed series in chronological order along with the statistical parameters of each series, probability of non-exceedance, flood peak estimates for required recurrence intervals.

Operationl Requrements

The program was devveloped on VAX-11/780 but may be used on other machines with BASIC compiler after minor alteration.

Form of Presentation

Users Manul (UM-32) containing program description and the sample solution is available with National Institute of Hydrology.

Technical Support

National Institute of Hydrology, Roorkee-247667

EVENT BASED DISTRIBUTED RAINFALL-RUNOFF MODEL

Purpose

To estimate desgn flood using simple distributed event based model.

Description

This model is useful in situations where the occurrence of rainfall is highly non-uniform in time and space domains (e.g. mountainous areas). It involves the development of isochronal maps and time area diagrams for the catchment using information from toposheets (preferably 1:50000). A uniform loss rate is considered for deriving the excess rainfall. The flow from each isochronal area is suitably lagged and then routed through a linear reservoir whose storage coefficient is optimised by Rosenbrock's method. The model is celebrated for two parameters viz. time of concentration and storage coefficient of linear reservoir based on the overall fit of the computed and observed hydrographs and efficiency of the model. The calibrated model may be used to simulate rainfall-runoff process and estimating the design floods.

Inputs

- o Rainfall information : Hourly average or station rainfall in various isochronal areas, corresponding weight of stations.
- o Observed Discharge : At the outlet of the catchment for the same interval as the rainfall, point of recession in terms of discharge for base flow calculations.
- o Optimisation Parameters : Vector of initial guesses and step sizes for variables, number of independent variables, maximum number of times the axes are to be rotated, number of successive failures encountered in all directions before termination, scaling factors for step size increase and reduction, improvement in objective function reached before termination, observed direct surface runoff, effective rainfall values, data time interval, numberof intervals of direct surface runoff. Vectorof optimised variables, computed direct surface runoff, table of excess rainfall, infiltration capacity obtained by constant loss rate method and computed hydrograph ordinates.

Outputs

The final results of the optimistion of the storage coefficient are given. The total observed flows are seperated into direct surface and base flow components and the excess rainfall is tabulated alongwith the values of the infiltration capacity obtained be constant loss rate method. Finally, the observed and computed hydrograph ardinates are tabulated side by side for easy comparison.

Operational Requirements

IBM compatible PC-AT with Microsoft FORTRAN complier.

Form of Presentation

User's manual (UM-39) is available in National Institute of Hydrology, Roorkee.

Technical Support

Nationl Institute of Hydrology, Roorkee-247667

FREQUENCY ANALYSIS

Purpose

To find out best fit distribution after testing various normalization procedures on the basis of chi-square statistic for different reasons/ months of the year.

Description

The computer programme for best fit distributions consists of the main routine and ten subroutines.

Input

Continuous data of Hydrologic variables.

Output

Analysed data.

Operational Requirements

The programs were developed on VAX-11/780 but may be used on other machines with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-2) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

MUSKINGUM CUNGE ROUTINE PROCEDURE

Purpose

The program can be use for routine of flood flows by Muskingum Cunge method while also incorporating variation in the width and slope instead of using averages.

Description

The program plots attenuation parameter α Vs peak discharge for each sub reach. It is more useful in routing a flood in long rivers. However, the effect of flow from tributaries in routing of flood is not considered.

Inputs

The input data required are Topographic map covering the entire river reach and information regarding few high records, as follows:

* An inundation map prepared for observed floods would be most preferable data. If this is not available peak discharge and corresponding water levels are required.
* Travel time observations or rating curves at gauging sites situated within the reach.
* Upstream hydrographs.
* Downstream hydrographs for calibration and testing.

Outputs

The programme prints:

* The length of the river reach the speed of the flood wave.
* The attenuation parameter the flood discharge.
* The number of nodes.
* The values of parameters.

Two plots are made as follows:

* Upstream, routed hydrographs.
* Observed and computed hydrographs.

The discrete values of the discharge were also written by the side of the plots.

Operational Requirements

The programs may be used on any computer with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-10) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

KALININ-MILYUKOV METHOD OF FLOOD ROUTING

Purpose

For utilising the flood routing method developed by Russian Scientists Kalinin and Milyukov.

Description

The Kalinin Milyukov method is a more appropriate method because it considers the water surface slope as well as the dynamic nature of the stage discharge relationship, approximately. The method aims at dividing a river reach into a number of characteristic lengths and routing the flood.

This method accounts for attenuation of flood approximately and can be used to study the effect of channel improvement schemes like construction of embankments etc.

Inputs

Slope of the reach, discharge increment, number of stage discharge pairs, stage discharge pairs.

Outputs

The programme prints a table giving the following details of Discharge, stage, average discharge, discharge difference, stage difference, slope of the river, characteristic length.

The programme also prints the average characteristic length to be used.

Operational Requirements

The programs may be used on any computer with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-13) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

MODEL PARAMETER EVALUATION USING CATCHMENT CHARACTERISTICS

Purpose

To estimate the discharge values for ungauged watersheds or sites within a region by using the Nash Model parameters of a nearby gauged catchment having similar hydrological characteristics.

Description

The program uses the number of observations of dependent variables (Model parameters for each catchment) and corresponding observations for dependent variables (Catchment characteristics) and estimates the regression coefficients, t-statistics and F-statistics, etc. Users may get desired number of regression equations at a time supplying the various combinations of independent variables. The program can accommodated a maximum of 100 observations and 50 independent variables.

Inputs

The data required are:

* Number of independent variables.
* Sample size.
* A vector containing the values of dependent variable.
* A matrix containing the values of independent variables.

Outputs

Standard error of estimate, standard error of regression coefficients, coefficient of correlation, t-statistics and F-statistics, etc.

Operational Requirements

The programs may be used on any computer with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-9) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

RATING CURVE ANALYSIS

Purpose

To summarize and interpret the records of streamflow, water quality and other hydrological factors that can be used to evaluate the available water resources or flood or drought hazards.

Description

The records of discharge are computed from the systematic record of stage, applying a rating. This rating may be simple or complex, depending on the number of interdependent variables. The shape of ratings a function of the geometry of the channel in the vianity of the gauging site, the rating curve is generally concave upward on rectangular coordinates. The relation is usually expressed in graphical form or in tabular form. They can be expressed in mathematical form also.

Input

To use subroutine INTPOL the necessary rating table has to be read in the main programme. A single stage value is to be sent into the subroutine INTPOL in each call for computing corresponding discharge values, through arguments.

Output

The output from the subroutine INTPOL is the discharge to the calling programme. The rating table is not altered by the subroutine.

Operational Requirements

The programs may be used on any computer with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-5) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

PREPARATION OF WORKING TABLE

Purpose

To analyse the impact of alternate working rules and to identify the best, amongst them.

Description

The model is capable of analysing systems of any configuration, given the specified policy, flow constraints of distribution components and demand. The level of demand satisfaction depends on the strange availability at any instant of time in the respective reservoirs from where individual users have the releases are to be made for meeting the demands and quantity of water that should be stored depends upon the user assigned working rules. Even though the model is capable of allocating water to meet the demands for power, irrigation water supply is considered to be primary.

Inputs

Read system configuration, period limits of links and nodes priority rank for storage and demands.

Outputs

Analysed data.

Operational Requirements

The programs may be used on any computer with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-6) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

HYDROLOGIC FLOOD ROUTING

Purpose

Used for its application to flood routing problems in river reaches and man made canals.

Description

This programme uses five routing methods to flood routing problems in river reaches and man made canals.

- o Muskingum method (single reach)
- o Lay and route method.
- o Muskingum method (multiple reach)
- o Two parameter gamma distribution in method (Nash model) and
- o Three parameter gamma distribution method.

All these methods are semi-empirical in nature due to the requirement of inflow and outflow information for determining the parameters of these method. These methods are generally classified in the literature under hydrologic routing methods.

Inputs

The inflow into the reach, the outflow from the reach and the pattern hydrograph for determining the lateral inflow hydrograph.

Output

Analysed data.

Operational Requirements

The programs may be used on any computer with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-11) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

STORAGE YIELD ANALYSIS

Purpose

To evolve a simulation technique to develop the storage. Yield relationship for a single purpose single reservoir taking reliability as a factor in capacity computation.

Description

The program employs Fibonacci search techniques for the computation of variables, reservoir capacity or annual yield, till desired reliability is achieved with permissible tolerance supplied by the user. The program also performs reservoir operation computations. Two basic options available to the user are.

- Computation of capacity of reservoir to meet the specific demands.
- Estimation of possible yield with a given reservoir capacity.

The initial condition of the reservoir yield analysis for monthly data, which can be changed depending on availability of space.

Inputs

Accuracy required in Fibonacci research method, monthly inflow to reservoir, annual yield, elevation-area-capacity table, allowable difference in evaporation computation for two successive iterations, monthly evaporation in term of depth of water from reservoir, conversation factor for evaporation computations, multiplying factor for converting monthly inflow rate to monthly inflow volume, first month and year of the \time series, total number of months of analysis, reliability desired, maximum storage/storage capacity of the reservoir, dead storage of the reservoir.

Output

The results consist of the following:

- Required storage to meet the yield or yield achieved with the given reservoir capacity at a specified reliability.
- Number of failures to meet the demand and reliability achieved.

If requested, a detail working table, showing stepwise water balance computations, is written in output file.

Operational Requirements

The programs may be used on any computer with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-16) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee

FLOOD FREQUENCY ANALYSIS ON A MICROCOMPUTER WITH BASIC LANGUAGE

Purpose

For flood frequency analysis with commonly used probability distributions.

Description

The program uses the following probability distributions:

- o Log normal two parameter.
- o Log normal three parameter
- o Extreme value type I distribution
- o Pearson type III distribution
- o Log Pearson type III distribution.

Parameters are estimated using the method of moments and method of maximum likelihood to compute 2,5,10,25, 50, 100 years return period floods using annual flood series data.

Input

Annual maximum discharge values and their number.

Output

Mean, standard deviation, coeff. of variation, skewness, standard error of mean, standard error of standard deviation.

Operational Requirements

The programs were developed on BBC microcomputer. It may be used on other machines with BASIC compiler after minor alteration.

Form of Presentation

User's manual (UM-19) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

OPTIMUM RESERVOIR OPERATION USING DYNAMIC PROGRAMMING

Purpose

To optimise the operation of a reservoir using the technique of Discrete Differential Dynamic Programming (DDDP).

Description

In DDDP the recursive equation of Dynamic Programming is solved within the restricted set of quantised values of the state variables. The computations start either with a known stage or a known policy. A rough grid is chosen and the optimisation yields the optimal trajectory which is used as the initial trajectory for the DDDP computations. After each stage of the computations the corridor width is halved. Further at each stage the computation cycle is repeated (through a backward computation procedure) a fixed number of times while keeping the width of the corridor fixed the programme consists of following three sub-routines.

Inputs

Title of the problem, maximum and minimum storage allowed, reservoir elevation area-storage release capacity table, initial reservoir storage, values of reservoir inflows and water demand starting from first period.

All inputs must be in MKS units, time in hours.

Outputs

The output is in the form of columns depicting number of time periods, computational time internal, maximum and minimum storage capacities, elevation-area-capacity-release capacity tables and for each computational period the Initial storage, inflow, demand, release and final storage.

Operational Requirements

The programs may be used on any computer with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-17) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

FINITE ELEMENT AQUIFER FLOW MODEL

Purpose

To model aquifer systems with AQUIFEM-1, a finite element aquifer model developed by Massachusseth Institute of Technology and implemented at the Institute of Regional Aquifer Studies.

Description

The model can be used for 2-dimensional groundwater flow problems and is based on the hydraulic equations defining the horizontal flow. However, it can also be used for the analysis of vertical cross sectional flow as well. The model utilises Galerkine finite element techniques for linear interpolation junction and basic triangular elements. Leakage from adjacent aquifer, pumping wells, lateral inflows and outflows, flowing wells, infiltration, evapotranspiration, rising water conditions and numerous other conditions are accounted for. The model can be used for both steady and transient flow problems for confined, unconfined or changing status aquifers. CROUTES algorithm is used for solving the equations.

Inputs

There are five groups of Inputs required.

- Nature of problem; aquifer status, steady, unsteady, etc.
- Space discretisation, nodal coordinates and element connectivity data.
- Aquifer properties: aquifer thickness, permeability, transmissivity, specific yield, bottom and top elevations, leakage parameters.
- Boundary and initial conditions: piezometric heads for head fixed boundary nodes, ground elevations, areal fluxes, element wire lateral fluzes along element sides, nodal fluxes and leakage conditions for mixed boundary conditions and nodal heads in a vertically adjacent aquifer separated from the aquifer under study by a semi perious zone, etc.
- Output controls.

Outputs

All major input data (for verification), nodal coordinates, element connectivities, integration parameters, element areas, error in convergence, source/sink inflows, volume rate of flow for nodal fluxes, leakage fluxes and lateral fluxes.

Operational Requirements

The programs may be used on any computer with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-7) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee

POLYNOMIAL REGRESSION

Purpose

To perform the regression analysis.

Description

The programme prints the regression coefficients and analysis of variance tables for polynomials of successively increasing degrees. The programme also optionally prints the table of residuals and a plot of Y values and Y estimates. The programme for polynomial regression can cater upto 100 observations and 10 th degree polynomial. To handle more observations, the dimensions in the main programme should be changed.

Input

Input data file contains control cards and data cards. Control cards consist of card no. variable, description and format and data cards consist of each pair of X and Y values in free format.

Outputs

The output of Polynomial regression programme includes :

- o Regression coefficients for successive degree polynomials
- o Analysis of variance for successive degree polynomials.
- o Table of residuals
- o Plot of Y values and Y estimates versus base variable X.

Operational Requirements

The programs may be used on any computer with FORTRAN compiler after minor alteration. The memory requirement depends upon the lenght of the data which will modify the dimension statement of the programme.

Form of Presentation

User's manual (UM-4) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

DATA STORAGE AND RETRIEVAL SYSTEM ON PERSONAL COMPUTER

Purpose

To store and retrieve the hydrological data. Data Storage and Retrieval System has been developed using the physical and logical data descriptions to extract the data items required by the users from the data base systematically.

Description

The package is an interactive type of menu driven, user friendly software. Password control has been provided in the system to prevent the unauthorized access to the data. The system can display in multiple colours if the colour monitor is used.

The data has been stored station wise. Suitable codes have been assigned to the stations. If a user forgets the code for a particular station, with the help of the package he can know it.

Some validation checks are also available in the system, which checks the format and range of the inputs supplied by the user. If the format is incorrect or the input is out of the range, the system displays the error message.

The characteristics of the developed System are :

* Physical and logical data independence
* Protection from loss or damage
* Easy data updating procedure
* Accuracy and consistency
* Privacy of use
* Timely data availability
* Integrity controls
* Controlled redundancy
* Fast Searching and retrieval.

Input

A collection of interrelated data records.

Output

Desired data.

Operational Requirements

An IBM compatible PC with following minimum configuration is required.

* 512 kb RAM, Hard disk space of minimum 20 Mb, MS Dos 3.0 or later.

Form of Presentation

User's manual (UM-30) is available in National Institute of Hydrology, Roorkee,

Technical Support

National Institute of Hydrology, Roorkee.

MULTIPLE LINEAR REGRESSION

Purpose

To utilise the concept of multiple linear regression for the derivation of relationship between Hydrologic variables.

Description

The program allows for selection of different sets of independent variables and for each such set outputs the mean and standard deviations, correlation. Coefficients, regression coefficients, standard errors, variance and residuals.

Inputs

Number of variables in an observation and the output vector containing the observation data.

Outputs

Mean and standard derivation of dependent and independent variables.

- Correlation coefficients between dependent and independent variables
- Regression coefficients and their standard error
- Computed values
- Multiple correlation coefficient, standard error of estimate, analysis of variance for multiple regression and table of residuals.

Operational Requirements

The programs may be used on any computer with FORTRAN compiler after minor alteration.

Former Presentation

User's manual (UM-3) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

APPLICATION OF TANK MODEL FOR DAILY RUNOFF ANALYSIS

Purpose

To simulate runoff of a basin using Tank model.

Description

The software can be used for daily flow analysis using Tank model for humid or snowfed basins with no consideration for river channel deformations.The programme occupies the larger part of the computer storage.To decrease the required storage capacity, decrease the number of rainfall stations at first, if possible. In case more than 10 stations are to be used, user may accordingly modify the DIMENSION statements. The execution time for the programme is different due to the number of rainfall stations and the number of years of data. The programme may also be used for non-humid basin with some modifications.

Inputs

(a) Data for the storm

(i) Year and month of beginning and end of data Number of rainfall stations.
(ii) Catchment area in sq.km. and name of basin
(iii) Observed discharge value of first year
(iv) Daily evapotranspiration data of first year (If option IEVAP=1)
(v) Observed precipitation values for first year for first station, second station and so on. Serial (iii), (iv) and (v) are repeated for subsequent years.
(vi) Monthly mean of daily evapotranspiration value (If option IEVAP= 0)

(b) Initial Parameter values

(i) Primary and secondary soil moisture depth (PS & SS)
(ii) Coefficient of discharge and initial loss heads of top tank, second tank, third tank and fourth tank and CP, WE and LAG of each rainfall station
(iii) Transfer velocity of water T1 and T2 and Initial storage for each tank

(c) Following are to be defined for the output

(i) Number of graphs to be plotted, number of scale points, range of plot, maximum and minimum value to be plotted
(ii) Scale points to define and output format to be supplied

Outputs

Simulated data graph.

Operational Requirements

The programme can run on a computer having FORTRAN compiler.

Form of Presentation

User's manual (UM-14) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

APPLICATION OF TANK MODEL FOR FLOOD ANALYSIS

Purpose

This program is based on the series storage type model which is called Tank Model with river channel modification. The program is used for flood analysis.

Description

The computer programme has been developed in FORTRAN-IV language. Main programme and eight subroutines form the structure of the programme for different computations.

Inputs

Following inputs are required :

- Number of graphs to be plotted, number of scale points range of plot, minimum and maximum values to the plotted.
- Scale points to the defined.
- Output format to be supplied.
- Input data to be analysed.

Outputs

Analysed data.

Operational Requirements

The programs may be used on a computer with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-15) containing program description and the sample solution is available with National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

BATS - BIOSPHERE ATMOSPHERE TRANSFER SCHEME

Purpose

The objectives of this software are to (i) calculate the transfers of momentum, heat and moisture between earth's surface and the atmosphere (ii) determine the values of wind, moisture and temperature in the atmosphere, within vegetation canopies and at the level of surface observations and (iii) determine (over land and sea ice) values of temperature and moisture (moisture content of the soil, the excess rainfall that goes into runoff etc.) quantities at the earth's surface.

Description

The Biosphere Atmosphere Transfer Scheme (BATS), developed at National Centre for Atmospheric Research, USA (Dickinson et al.1986) is a land surface parameterization scheme for coupling with Community Climate Model (CCM). However, it can also be used as a stand alone boundary package. Though, BATS is more complex than many other land surface parameterization schemes, it does not consider the variability in precipitation, soil and vegetation parameters within the grid. The model has been modified at Colorado State University, USA to allow for the variability in precipitation within the grid.

Inputs

In order to run the model the following input data are needed.

- Meteorological data, Soil data, Vegetation data, Snow data.

Besides the input data given above, the constants specified in subroutine BDCON are also required by the model.

Outputs

The model finally evaluates the following parameters at an interval of half an hour :

Temperature of air above canopy (K), Foliage temperature (K), Temperature of soil at surface (ground temperature) (K), Temperature of subsoil (K), Net absorbed solar radiation (W/m**2), Instantaneous sensible heat (W/m**2), Evaporation (W/m**2), Water on foliage (mm), Total soil water (mm), Water in upper soil (mm), Root zone soil water (mm), Surface runoff (mm/day), Total runoff (mm/day), Precipitation (mm/s), Anemometer westerly wind (m/s), Anemometer southerly wind (m/s), Bowen ratio, Respiration rate.

Operational Requirements

The model can be run on any powerful work station. In order to run it on a PC for point calculations, slight modifications need to be made in the program with regards to the dimension.

Form of Presentation

User's manual (UM-41) is available in National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

SWMHMS

Purpose

To obtain monthly values through summation of the daily estimates and to simulate monthly watershed runoff.

Description

In this software all model components are calculated on a daily basis. Monthly values are then obtained through summation of the daily estimates. Precipitation to be partitioned into three components which include soil infiltration, surface/vegetative interception, and surface runoff. Surface runoff is calculated using the Soil Conservation Service (SCS) curve number procedure.The rainfall amount partitioned for infiltration is placed in the soil zone reservoir. Evapotranspiration losses from the soil zone are determined using an equation developed by Blaney and Criddle.Excess soil water above field capacity is directed through percolation to the interflow/groundwater reservoir. Baseflow from the interflow/groundwater reservoir is then added to surface runoff to obtain the total runoff.

These parameters and variables are used in computing the major hydrologic components of the modelling program which include surface runoff, surface/vegetative interception, soil infiltration, soil evapotranspiration, soil percolation, soil zone water balance, baseflow, interflow/groundwater reservoir storage, and total runoff.

Inputs

The three types of input required for simulation run are daily precipitation, monthly data for evapotranspiration deremination and watershed parameter values.

Output

Besides estimated monthly runoff, the output includes predicted monthly values of soil evapotranspiration, surface/vegatative interception, soil infiltration, and baseflow. If the data is available, observed monthly runoff can be listed along with the estimated values for comparison purposes. Various statistics (means, standard deviation, skewness, correlation coefficient, linear regression constants) corresponding to the predicted or observed monthly hydrologic values are also provided as output.

Operational Requirements

To run SWMHMS, an IBM compatible PC with FORTRAN 77 programming language & DOS required.

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

Barry Allred & Tom Haan
Oklahoma State University

FLOOD FREQUENCY ANALYSIS (FFA)

Purpose

The program is used for analysing the flood frequency.

Description

All the HEC-FFA program have been written in an archive form and are labeled with the .ZIP extension. These files must be processed with the PKUNZIP utility program before they can be used, this is done automatically with the INSTALLA or INSTALLB batch files.

Inputs

The input is designed to be flexible and default values are provided for all decision variables. Any option or nonstandard item activated by the J1 or J2 record will remain in effect for all succeeding statin data or until modified by another J1 or J2 record. The only recors actually required for a flood frequency analysis at a station are three or more annual flood peaks (QR records) and the end-of-data (ED) record.

Outputs

The program output has been arranged t enable the tables to be copied for report purposes. When special conditions are encountered in the analysis, such as historic data, high or low outliers, etc., the preliminary results (based on the systematic data only) are output before the final results.

Output option allow for printing summary tables for multistation applications or to suppress unwanted prinout. There is also an option to output statistical summary records for each station analysed.

Operational requirements

HEC-FFA will run on a IBM compatible PC having :

* Minimum 640 KB of RAM
* MS DOS 5.0 or later
* 1 Megabyte free space on hard disk.

Form of presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

U.S. Army Corps of Engineers, Hydrologic Engineering Center, 609, Second Street, Davis, California 95616.

WMS - WATERSHED MODELLING SYSTEM

Purpose

WMS Basic can be used to create topological tree representations of watersheds and then using this tree diagram and a series of user-friendly dialogs, define all necessary input for an HEC-1 rainfall-runoff simulation. In addition to the capabilities in the basic version, WMS professional can be used to create terrain models from Triangulated Irregular Networks (TINs).The TIN can then be used to automatically delineate watersheds, streams and sub-basins.

Description

WMS is a sophisticated stand-alone computer program that performs hydrologic analysis of both simple and complex drainage basins. It can be used to determine runoff with many commonly used techniques and to model flood control measures such as detention basins with various outlet structures. WMS can also be used to create hydrographs, or read them in from an ASCII file. This information can be from actual excess rainfall hyetographs or synthetic distributions. Hydrographs can be imported or combined at any point and up to 100 hydrographs of any type can be stored in each data file.

The user can perform interdependent hydrologic operations with WMS and view the entire watershed computation sequence. When an upstream watershed is updated, the system is able to change the downstream results allowing easy sensitivity analysis that will save the hours of work.

Operational Requirements

To run WMS, an IBM compatible PC-386 or higher system with following minimum configuration is required:

- o 4 MB of RAM to run the program without the Help feature
- o 8 MB of RAM to run the program with the HELP feature.
- o Hard disk with at least 3 MB of free space
- o An EGA or VGA monitor
- o DOS version 3.3 or later

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

Brigham Young University, Engineering Computer Graphics Laboratory, 368B CB, Provo, Utah 84602.

Tele.-(801) 378-2812.
Fax.- (801) 378-2478

TYSON WEBER GROUNDWATER FLOW MODEL

Purpose

This software can be used for the solution of groundwater flow problem using the Tyson Weber Finite Differences method.

Description

The model can be used to predict the impact of any interference in the hydrological equilibrium of the basin. It can be applied to an unconfined aquifer, either single or double layered. Steady flow and transient flow (but not turbulent flow) problems can be studied. The model can handle saturated flow problems only. The effects of unsaturated flow are to be calculated and prescribed separately. Gauss-sieded solution technique is used to solve the resulting finite difference equations.

The program is divided into three independent modules which deal with: Geometry and discretisation details of study area, ground level contours and sand percentages (GEOMF.FOR), creation of recharge/abstraction file for the model program (MAIREC.FOR), the Tyson Weber Groundwater Model itself (TWGWM.FOR).

Inputs

For GEOMF.FOR.

Area and scale of the basin under consideration, depth of layers, details of polygons: relative nodes, face width and interconnecting lengths, nodal ground levels and sand percentage at the nodes.

For MAIREC.FOR:

Nodal rainfalls and forest area in the polygons, canal command area, CCA to polygon distribution, volume of water flowing through each distributary and run days of each distributary. The type of extraction devices and their seasonal extraction rates and the number of devices in each type within a block.

For TWGWM.FOR

- No. of time steps in case of transient study, number of interactions in each time step, permeability coefficients relaxation factor, boundary conditions, starting heads, pseudo nodes, relative nodes for internal boundaries additional recharge source/sinks, augmentation well details, boundary heads.

Outputs

Water balance and flow towards/away from boundaries.

Operational Requirements

It may be used on any computer with FORTRAN compiler after minor alteration.

Form of Presentation

User's manual (UM-1) is available in National Institute of Hydrology, Roorkee.

Technical Support

National Institute of Hydrology, Roorkee.

SWIM - SOIL WATER INFILTRATION & MOVEMENT

PURPOSE

Used for simulating water infiltration and movement in soils.

Description

SWIM provides a greater number and variety of features than similar models including the following:

- o Numerical solution of Richards equation.
- o Fast and accurate.
- o Conservation of mass, even in fast, approximate solutions.
- o Ability to handle nonuniform and layered soils.
- o Ability to handle unsaturated, saturated and ponded conditions
- o Caters for transient soil surface conductance and storage.
- o Calculates runoff and drainage.
- o Allows simultaneous transpiration by several vegetation types.
- o Extensive menus and help screens.
- o Ability to accept data in the preferred units.
- o Monochrome of color graphical output.

Inputs

Data for infiltration into a layered soil.

Outputs

Simulated data.

Operational Requirements

To run SWIM, an IBM compatible PC with following minimum system configuration is required:

- o A hard disk is desirable, though not essential.
- o numeric coprocessor
- o A graphics adapter is required to view output pictorially.

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

P.J. Ross, CSIRO Division of Soil, Davies Laboratory, Townsville, Qld 4814, Australia.

SWIFT - SANDIA WASTE ISOLATION FLOW AND TRANSPORT MODEL

Purpose

Used as an interface between the map output and the contouring program SURFER.

Description

The SWIFT/486 program consists of a main routine and approximately 90 supporting subroutines. The basic organisation is fucused upon the three global integration modules ITER, ITERS, & ITERC. Subroutine ITER solves the coupled partial differential equations for fluid flow, heat transport and brine transport under transient conditions, ITERS integrates the flow and brine equations under steady-state conditions and ITERC solves the coupled partial differential equations for transport of a radionuclide chain. All other routines provide support functions for the integration. The support funtion of interest in this report is that of data input.

Inputs

Name of the variables for that records and grid information.

Output

Numeric and analytical solution, a plot or table.

Operational Requirements

To run SWIFT, an IBM compatible PC with following minimum system configuration is required:

- Fortran 77 compiler
- Intel 486 CPU
- DOS 5.0
- WINDOWS 3.1

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

Geo Trans, Inc.
46050 Manekin Plaza, Suit 100, Sterling, Virginia 20166.

SOILPROP

Purpose

The pore size distribution of soil is controlled to a large extent by the size distribution of the soil particles, hydraulic properties, and thus the parameters in the BC and VG models, will vary with the particle size distribution of the soil in a way that is more or less predictable. The program SOILPROP provides a means for estimating BC and VG model parameters from particle size distribution data.

Description

SOILPROP is an interactive program for estimating soil hydraulic properties from particle size distribution (PSD) data. SOILPROP is basd on the premise that the soil-water retention function, reflects an underlying pore size distribution which can be deduced from the particle size distribution. It provides options for estimating parameters corresponding to true equilibrium relations or quasi-static relations.

Inputs

The user is first asked to select a scheme, following which SOILPROP prompts for the % mass fraction in each particle size class range. Altervatively, the user can specify his/her own PSD classification scheme by providing the number of classes, the maximum particle diameter for each class and the corresponding mass fraction in each class.

Output

The program output is written to a disk file which may be viewed on the screen or printed. The estimated water content vs capillary head function and relative conductivity vs water content function may be viewed graphically on screen.

Operational Requirements

To run SOILPROP, an IBM compatible PC with following minimum system configuration is required:

- o Math coprocessor
- o At least 360 KB RAM
- o A VGA, EGA or CGA graphics adapter and monitor.
- o DOS version 3.0 or later

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

Environmental System & Technologies, Inc.
2608 Sheffield Drive Blacksburg VA-24060-8270 USA.

Tele- 703-552-0685
Fax- 703-951-5307.

RUSLE

Purpose

RUSLE can be used to estimate the rate that erosion in removing soil from critical parts of the landscape and to guide the choice of conservation practices that will control erosion to a "soil loss tolerance" level.

Description

The Revised Universal Soil-Loss Equation (RUSLE) computes sheet and rill erosion from rainfall and the associated runoff. It is a powerful tool useful in conservation planning, inventory, assessment, and estimation of sediment yield.

RUSLE computes average annual sheet and rill erosion for a landscape profile. The soil loss value computed for that profile is representative of an area to the degree that the profile represents the area. It does not compute average sheet and rill erosion for a field unless soil loss is computed for several profiles and the results weighted according to the fraction of the field that each profile represents. RUSLE does not compute sediment yield.

Inputs

In stripcropping systems where the crops are rotated through each strip, the user specifies the number of years needed to complete the rotation cycle. For each year of the rotation, the user specifies the location of the lower edge of each strip and the cover-management conditions on each strip. The condition selected is the one that best describes the system during the 1/4 of the year when rainfall and runoff are most erosive and the soil is most susceptible to erosion. For buffer, filter, and stiff grass systems where the strips are permanent, only one year is used to compute P.

Output

The second Utility routine is used to print information in the Database. This gives two options: the first option prints a list of available sets within the Database and the second option provides a complete printout of all information associated with a chosen identifier.

Operational Requirements

The RUSLE computer code was written in the C programming language. To run RULSE, an IBM compatible PC with following minimum system configuration is required:

- o 640 KB of RAM
- o MS-DOS operating system (version 2.0 or later).

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

K.G. Renard, USDA-Agricultural Research Service, Southwest Watershed Research Center, 2000 East Allen Road, Tucson, AZ 85719.
Tele.: 520-670-6381

TRANSLATE

Purpose

TRANSLATE produces high quality screen, printer and vector plotter graphics on a wide variety of devices by translating a graphics metacode file (previously generated by a TECSOFT application program).

Description

TRANSLATE translates a metacode graphics file (previously generated by a TECHSOFT application program) for a specific graphics device. The graphics file may contain up to 500 pictures (plots) stacked sequentially as pictures in a camera. TRANSLATE permits selective skipping or plotting of specific pictures. Re-translation for another device is possible without exiting from the program. Paper size (A, B, C, D, E) may be selected through the program for applicable plotters. Serial port (plotters, printers), parallel port (printers) and baud rate (plotters) are also selected.

Inputs

Name of the graphics file to be translated.

Output

High quality screen, printer and vector plotter graphics.

Operational Requirements

To run TRANSLATE, an IBM compatible PC with following minimum system configuration is required:

- o Atleast 480 KB of memory for execution.
- o A math coprocessor is preferable, but not essential
- o DOS 2.0 or above

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

TECSOFT, INC.

Phone: (303) 225-2554
Fax: (303) 226-1770

PLOTCHEM

Purpose

PLOTCHEM is a menu driven program which produces diagrams for the graphical representation of the dissolved constituents of ground water and tests for the possible mixing of ground water from different sources.

Description

PLOTCHEM has been designed to produce a large number of geo-chemistry diagrams quickly and easily and to perform a comprehensive mixing analysis. During a single execution of PLOTCHEM, up to 100 (1000 for the Extended Memory version) sets of data may be processed using the PC version. Trilinear (Piper), Stiff and Radial diagrams, Pie and Bar charts may be produced. PLOTCHEM may also be used to check the postulated mixing (2-and 3-way) of all samples with the resultant percent errors being presented in a hardcopy output (print) file in tabular form.

Inputs

All data required for a successful execution of PLOTCHEM are contained in the batch file. The batch file contains the names of files as well as data required for diagram generation and mixing analysis. The input data required are:

* Project number, project name, site, laboratory information and
* Lebels and legends for Pie charts, Bar charts, Radial diagrams and Stiff diagrams.

Output

Trilinear (piper), Stiff and Radial diagrams, Pie and Bar charts may be produced. Four diagrams may be drawn on a single page. Two types of Trilinear diagrams may be produced.

Operational Requirements

To run PLOTHEM, an IBM compatible PC with following minimum system configuration is required:

PC Version

- o 640 KB RAM, 3.5" or 5.25 high density floppy drive
- o MS-DOS (Version 3.0 or higher), Math co-processor
- o Hard disk

EM Version

- o 2 MB Extended Memory, 3.5" or 5.25 high density floppy drive
- o MS-DOS (Version 5.0 or higher), Hard drive

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

TECSOFT, INC.
Phone: (303) 225-2554, Fax: (303) 226-1770

FLOWCAD

Purpose

FLOWCAD is a powerful and easy-to-use tool for two-dimensional numerical aquifer analysis. FLOWCAD allows to calculate transient hydraulic head and drawdown distributions, groundwater velocities, and water balances.

Description

It is based on the finite-difference method and uses the reliable IADI method to solve the governing equations for transient groundwater flow. As a result of this and the detailed data checking performed by FLOWCAD, the reliability of the model is high and errors due to input of faulty data are almost entirely eliminated.

FLOWCAD satisfies the most demanding post-processing needs. An extensive graphics package allows direct output to the screen, printer, plotter, or a number of graphics files. It interfaces directly with AUTOCAD and the GIS system PC ARC/INFO. AUTOCAD drawings can be imported into FLOWCAD as base maps and FLOWCAD's results can also be exported to AUTOCAD. Many other graphical file exchange formats are also available.

Operational Requirements

To run FLOWCAD, an IBM compatible PC with following minimum system configuration is required:

- o 640 KB RAM, with approximately 520 KB free;
- o A 3.5" high-density floppy drive for software installation;
- o A hard disk with at least 2 MB free;
- o A graphics card and a suitable monitor;
- o DOS 2.0 or higher.

Inputs

The data set which is to be calculated or analysed.

Output

It gives an Echoprint of data sets and also produces graphical output.

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

Thomos Franz & Nilson Guiguer, Waterloo Hydrogeologic, Inc., 200, Candlewood Crescent, Waterloo, Ontario, Canada N2L 5Y9.

Tele- (519) 746-1798.
Fax - (519) 885-5262.

SWEEP/W

Purpose

Used to model the movement and pore-water pressure distribution within porous materials such as soil and rock. The comprehensive formulation makes it possible to analyze both simple and highly complex seepage problems. SEEP/W has application in the analysis and design of geotechnical, civil, hydrotechnical, and mining engineering facilities.

Description

The following highlights the features and capabilities of SEEP/W:

- Saturated and unsaturated flow analysis, steady-state and transient conditions.
- Two-dimensional and axisymmetric problems, unbounded flow problems with infinite elements, selective viewing and printing of drawings.
- Multiple soil types, anisotropic hydraulic conductivity coefficients.
- Flow directions and quantities,Interactive graphing of results over distance.
- Finite element mesh generation, staged addition and removal of elements.
- Sorting and optimization of mesh node numbering.
- Contour plotting of computed parameters, display of flow directions with vectors.
- Interactive display of information at any node or element.
- No specific limits on the number of elements, nodels, and material types that can be used to define a problem, graphical definition of problem geometry.
- Integration with companion slope stability, stress-deformation, and contaminant transport software packages, isoparametric quadrilateral and triangular finite elements.

SEEP/W CONTOUR graphically displays the seepage analysis results computed by SOLVE. The results can be presented as contours, graphs, tables of values, velocity vectors, flux values, and a series of piezometric lines in the case of a transient analysis.

Inputs

Numeric parameters to be analysed.

Output

The results can be presented as contours, graphs, tables of values, velocity vectors, flux values and a series of piezometric lines in the case of a transient analysis.

Operational Requirements

An IBM compatible PC with Microsoft Windows 3.1 or later is required.

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

GEO-SLOPE International Ltd., Calgary, Alberta, Canada

COREL PHOTO-PAINT

Purpose

Photo Paint is used for Photo editing and Bit map creating.

Description

Corel Photo Paint allows to open vector files as well as bitmaps. Vector files are converted to bitmaps (rasterized) when opened. In addition to Corel PHOTO-PAINT format (.CPT) a number of different file formats are supported including BMP, TIFF, PCX. Kodak PhotoCD, Scitex CT, JPEG Bitmap, Targa, Postscript Interpreted (.EPS), HPGL Plotter File, Adobe Illustrator 1.1, 88, 3.0, Micrografx 2.x,3.x, AutoCAD DXF, GEM, Lotus PIC, and Macintosh PICT. Any of the following Corel application files can be opened : CorelDRAW, CorelCHART, CorelTRACE, and Corel Presentation Exchange.

Inputs

Prepare existing artwork or create new material from scratch and give
- Quality of job
- Kind of desktop printer.
- Imagesetter with resolution and screen frequency.
- Printing shop specifications

Output

Printing considerations are aw varied and plentiful as the types of artwork generated with the Corel family of products: black and white, grayscale and color reproductions, schematics, business charts, business cards, product packaging, coffee mugs etc.

Operational Requirements

To run COREL Photo-Paint, an IBM compatible PC with microsoft windows is required.

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

Corel Corporation, 1600 Carling Avenue, OTTAWA, ONTARIO, CANADA K1Z 8R7.

Tele.: 1-613-728-8200
Fax : 1-613-728-9790

TECHWORDS

Purpose

TechWords contains over 70,000 technical words missing from popular word processing spell checkers. TechWords includes words from over 100 technical disciplines not provided in standard spelling checkers.

Description

The disciplines are divided into the categories like chemistry & chemical engineering, computer science & electronics, earth & planetary sciences, engineering, physics & mathematics and scientific units & abbreviations

Inputs

Singular version of the word and name of the dictionary.

Output

Checks the spelling of the word and will display the alternatives to misspelled words. In some word processors it will NOT display the alternatives to misspelled word.

Operational Requirements

To run TECHWORD, an IBM compatible PC with following minimum system configuration is required:

* A hard disk having free space of 10 KB to 450 KB (depending on the number of categories selected)
* Temporary disk space of an additional 10 to 450 KB (again depending on the number of categories selected) during installation.
* Any word processor

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

GEOCOMP Corporation
66 Commonwealth Avenue, Concord, MA,01742, USA.

Tele.-(508) 369-8304 Fax- (508) 369-4392

CTRAN/W

Purpose

To model the movement of contaminants through porous materials such as soil and rock. The comprehensive formulation of makes it possible to analyze problems varying from simple particle tracking in response to the movement of water, up to complex processes involving diffusion, dispersion, adsorption, and radioactive decay.

Description

CTRAN/W is a powerful and comprehensive software product that uses finite element numerical analysis techniques to mathematically model the advection-dispersion processes. To model these processes, it is necessary to know the water flow velocity that CTRAN/W acquires from a SEEP/W analysis. The two software products consequently must be used together. First, it is necessary to run a SEEP/W analysis to compute the flow velocity; CTRAN/W can then be used to compute the migration of the contaminant. Features include:

- o Saturated and unsaturated flow analysis, steady-state and transient conditions.
- o Two-dimensional and axisymmetric problems, onfined and unconfined problems.
- o Unbounded flow problems with infinite elements, Multiple soil types.
- o Anisotropic hydraulic conductivity coefficients.
- o Flow directions and quantities, transient boundary conditions.
- o Finite element mesh generation, staged addition and removal of elements.
- o Sorting and optimization of mesh node numbering.
- o Selective viewing and printing of drawings, text labelling of drawings.
- o Stopping and restarting of main processing, contour plotting of computed parameters, display of flow directions with vectors.
- o Interactive graphing of results over distance or time, Interactive display of information at any node or element, Isoparametric quadrilateral and triangular finite elements export of drawings to other Windows or CAD applications.
- o No specific limits on the number of elements, nodes, and material types that can be used to define a problem, & graphical definition of problem geometry.

Inputs

Water flow velocity or parameters to be computed.

Output

- Computed flow velocity, contour plotting of computed parameters.
- Graphical identification of problem geometry.

Operational Requirements

An IBM compatible PC withmicrosoft windows 3.1 graphical user interface.

Form of Presentation

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Technical Support

GEOCOMP Corporation, 66 Commonwealth Avenue, Concord, MA 01742.
Tele.-(508) 369-8304

FLOWMASTER

Purpose

FlowMaster is an easy-to-use program that helps civil engineers with the hydraulics design and analysis of pipes, ditches, open channels, and more. It also calculates rating tables, and plots and cross sections.

Description

Flow Master replaces many solutions such as nomographs, spreadsheets, and BASIC programs. It gives immediate results and can quickly generate different output. It can give hydraulic calculations while taking advantage of Windows many features. Some examples of ways to can use Flow Master are to analyze various hydraulic designs, evaluate different kinds of flow elements, prepare data for other HMI programs, generate professional-looking reports for clients etc..

Inputs

Variables, data and units

Output

Rating tables, and plots curves and cross sections.

Operational Requirements

To run FLOWMASTER, an IBM compatible PC with following minimum system configuration is required:

- o MInimum 25 MHz or faster speed
- o 8 MB RAM minimum
- o Hard disk with atleast 3.5 MB free disk space
- o VGA graphics adapter and monitor, colour recommended
- o Mouse
- o Microsoft Windows 3.1 or later, or Windows NT

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

HAESTAD Methods, 37 Brookside Rd., Waterbury, CA 06708-1499.

PSI-PLOT

Purpose

PSI-Plot is a technical plotting and data processing program designed to assist in creating publication-quality 2D and 3D graphs quickly and easily.

Description

It's a complete system that will help to manage the data and plot more effectively. More importantly, PSI-Plot can actually help in achieving the research and development goals, whether it is to prepare graphs for presentation, or analyze data for a proposal, or solve technical problems for the research.

PSI-Plot provides a data sheet window called Sheet Window where data can be edited and analyzed, and a graphics editing window called Plot Window where the data can be plotted on the screen or printed at high resolution on dot-matrix printers, laser printers and plotters.

PSI-Plot is a powerful yet easy-to-use tool for scientists and engineers, as well as college students. It integrates the entire process of designing and analysing data and graphs in the graphics environment running under Microsoft Windows 3.0 or later.

Inputs

Create a new sheet window, choose the file/new, give coloumn name and enter data.

Output

In the form of a graph/ plot.

Operational Requirements

To run PSIPLOT, an IBM compatible PC with following minimum system configuration is required:

- o MS-Windows version 3.0 or later & mouse.
- o Minimum 2 MB of RAM
- o A hard disk with at least 4 MB free disk space and a floppy disk drive.

A number of optional hardware components are supported.

- o A math coprocessor is recommended, but it is not essential.
- o For high quality graphics output, a 24-pin dot-matrix printer or laser printer is recommended.

Form of Presentation

Manual is available in National Institute of Hydrology, Roorkee.

Technical Support

Poly Software International, P.O. Box 526368, Salt Lake City, UT 84152, USA.

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