OptAll Pre-processing Software

Introduction

This note describes the pre-processing software for OptAll. The full package including soil moisture balance and optimisation routines may be obtained on request from Dr Robin Wardlaw at the University of Edinburgh. The pre-processor provides the means of defining the irrigation network files for the optimisation package.

Network and System Definition Data

The model network file controls the basic links in the data base for the model. The operational interface for creation of a network file is called OPTALL_NET.

OPTALL_NET is a computer program design to run under the Windows95 operating system. The program permits the graphical design of a network of nodes and reaches on top of a map. Each node and reach has a number of parameters, which can be edited through dialog forms. The network can be saved or loaded from a file with extension an *.OIS. In addition to the nodes and reaches, the program provides a set of graphic primitives to assist in creation of background schematics. Alternatively, DXF files can be imported to create a map background

When the network is completed a network file is created which is in the correct format for the optimisation model. The model can be executed from a within the OPTALL_NET program via a menu option, although it is unlikely that this option would be included in a fully functional system.

The current opening screen from OPTALL_NET is shown in Figure 1. The file option permits an existing file to be opened, or a new file to be created. This is a standard windows feature, and it thus possible to maintain good directory structures for model runs.

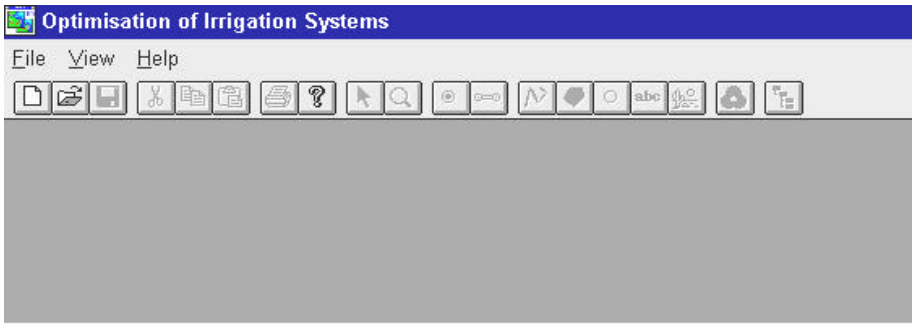

Figure 1 Opening screen for OPTALL_NET

When a file is opened, then the full editing menu shown in 2 appears.

a) Display

OPTALL_NET is a multi document application. This means that it is possible to create or edit more than one network at a time. Each network is shown in a scrolling window, which may contain a map. Maps can be loaded from DXF files from the menu option ‘Maps’->’Import DXF Maps’.

A window shows a view on a map and network. This can be the entire area or a zoom a view into a particular area. If the view is zoomed into an area the scroll bars on the left and bottom of the windows will permit scrolling to see different areas of the map.

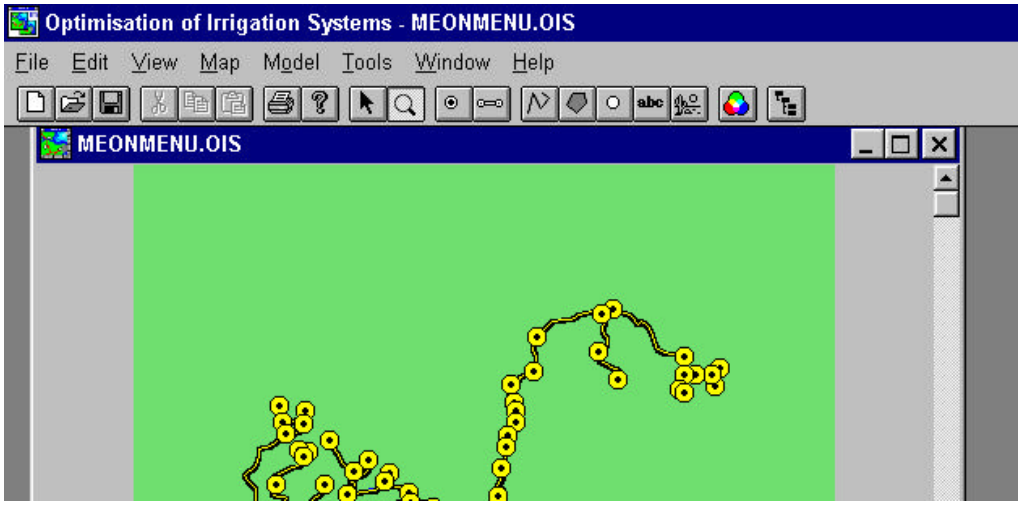

Figure 2 Editing screen on selection of a file or creation of a new file

The 'VIEW' menu contains options, which allow the display parameters to be changed. Here the area viewed on the map can be changed by selecting to zoom out (show more map) or show the entire map. To zoom into the map edit mode must be selected from the menu option 'Tools'->'Edit data' or the toolbar/toolbox icon which looks like a magnifying glass. Then a rectangular area can be click and dragged over the current map. There are menu options to go to a coordinate point or zoom to an area by entering the coordinates. A grid can also be displayed to show the coordinates.

b) Network

The OPTALL_NET program operates in 2 modes, Designer and User mode. The operating mode is selected from the menu option 'Tools'->'Edit data' for User mode or 'Tools'->'Select' , 'Nodes' , 'Reaches' , 'Lines', 'Polygon', 'Point', 'Text' or 'Bitmap' for design mode.

Alternatively the appropriate toolbar/toolbox icon can be selected. The icon that looks like a magnifying glass selects User mode. A list is given below of which toolbar/toolbox icons do what function. The toolbox operates in the same manner as the toolbar, but only contain the options for selecting user or design mode functions. The toolbox can be show or hidden by selecting the menu option 'View'->'ToolBox'. The toolbox window is shown in Figure 3.

Figure 3 Toolbox window

The toolbar/toolbox will indicate which mode has been selected by showing the appropriate icon depressed. Also the mouse cursor will change to reflect the mode.

Designer mode allows new nodes or reaches to be added to the network. The position of the node or reach can be changed by click and dragging components. A background schematic can be created by adding graphic primitives such as lines, polygons, text, points, or bitmaps.

User mode allows node and reach parameters to be edited without changing the display or structure of the network. Separating the program operation into 2 modes prevents accidental changes to the network display or structure when only the parameters are to be edited.

c) Design a Network

To start a new network the menu option 'File'->'New' is selected. A dialog is displayed asking for the coordinates of the area to be displayed to be entered. This can be modified at any time by selecting the menu option to zoom out or in. Pressing OK will accept the default.

To create a node the Node design mode is selected and then the mouse clicked on the view to create a node at that point. Node design mode is selected from the menu option 'Tools'->'Nodes', or from the toolbar/toolbox icon, which is a circle with a black center. The mouse cursor changes to a cross with a circle in the lower right. The mouse can be moved to the position on the screen where the node is to be created and the left mouse button clicked. The node will be created and a dialog will be shown on the screen (Figure 4).

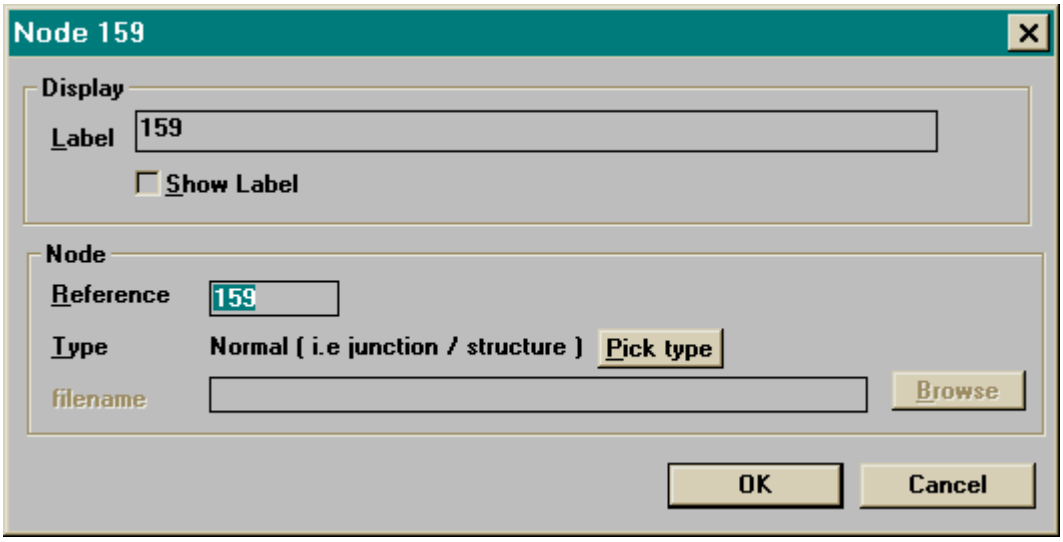

Figure 4. Node dialog.

The dialog allows the reference number for the node to be entered, the type of node to be defined, and optionally the ID label that is displayed on the map can be changed. The dialog has been designed for minimal typing. The edit cursor is positioned at the reference number for immediately entry of a new reference number. Pressing the Enter key at any time will select the ok button. The node types that can be selected are normal node for confluences and bifurcations, irrigation scheme node, and sink node. The filename and browse option buttons come into use when an irrigation scheme node type is specified, and although not used in the current test version, will associated the irrigation scheme data with the network. Also to be added to this screen will be a check box to indicate if a node received any external inflows. If it does then a browse and filename selection box will appear, and the filenames specified used in the creation of the inflows file for the network. The reference number will default to the next available reference by finding the largest node reference and adding one to the value.

A number of nodes may be created without connecting reaches by clicking the mouse on different map positions and entering a different reference number for each node. To zoom into the map it is necessary to select edit mode by selecting the menu option 'Tools'->'Edit data' or magnifying glass toolbar/toolbox icon. The mouse is then used to click and drag an area to be selected. The node edit mode must be reselected if more nodes are to be added.

When a few nodes have been created, reaches can be provided to connect the nodes together. To create a reach, reach design mode is selected. The mouse is then clicked on a node to start a reach.

After selecting whether the first node is upstream or downstream, the mouse can be clicked anywhere on the map to create 'waypoints' that the reach will follow, prior to clicking on a node to finish the reach. When the menu option 'Tools'->'Reaches' or the toolbar/toolbox icon which looks by a link connecting two nodes is selected, the mouse cursor will change to a cross hair with a line connecting 2 points in the lower left. The mouse is moved over a node and the left mouse button pressed. There is then a prompt for indicating if the node is at the upstream or downstream end of the reach (Figure 5).

Figure 5 Choose reach orientation dialog.

After selecting with the mouse, either upstream or downstream, it is possible to click on the view to create waypoints for the reach to follow. A number of waypoints can be created for the reach, although are not mandatory. To finish a reach, the mouse is moved over a node and the left mouse button pressed. The reach is then created created and the dialog shown in Figure 6 will be displayed on the screen.

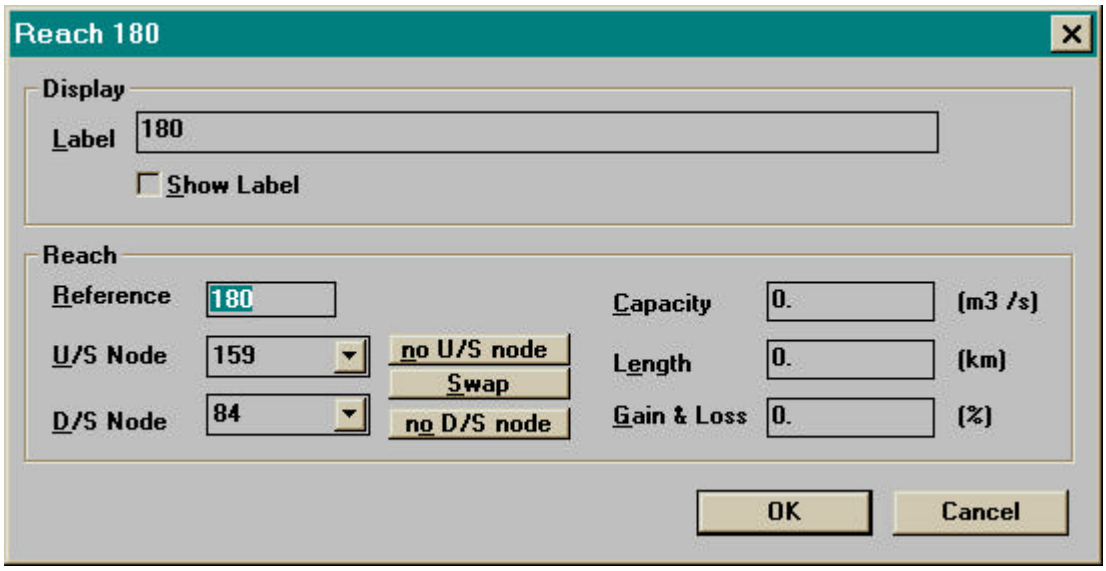

Figure 6 Reach dialog.

The dialog allows the reference number to be entered and the upstream and downstream nodes to be redefined. Reach capacity, reach length and gains & losses for the reach can also be entered. At present only the reach capacity is used in the model, but an additional objective function incorporating conveyance efficiency can be added. This dialog has also been designed for minimal typing. The edit cursor is positioned at the reference number for immediately entry of a new reference number. Pressing the enter key at any time will select the ok button. The reference number defaults to the next available reference by finding the largest reach reference and adding one to that value.

d) Moving network components

Selecting 'select design' mode, then by clicking and dragging components to a new position can change the position of nodes and reach waypoints. The menu option 'Tools'->'Select' or toolbar/toolbox icon which looks like a mouse arrow is selected and the mouse moved over a node and the left button pressed to highlight the node. The mouse cursor will change to a four arrow pointer indicating that the node can be moved. By clicking and holding down the left mouse button and moving the mouse the node can be dragged to a new position.

A connecting reach will only move its last waypoint to follow the node. To move reach waypoints the reach must be selected and each waypoint moved individually. The mouse is moved over a reach and the left mouse button pressed to select the reach. The reach and all waypoints will be highlighted. When the mouse is moved over a waypoint, the mouse cursor will change to a four-arrow pointer to denote that the waypoint can be moved. By clicking and holding down the left mouse button and moving the mouse the waypoint can be dragged to a new position.

e) Editing nodes and reaches

Although all the node and reaches parameters can be defined at creation of the node or reach, it is inevitable that some editing of parameters will be required. In order to edit parameters, user mode must be selected and then the mouse double clicked over the node or reach that is to be edited. The menu option 'Tools'->'Edit data' or the toolbar/toolbox icon that looks like a magnifying glass is selected and the mouse moved over the node or reach to be edited. A double click of the left mouse button displays the edit dialog.

f) Edit the background

The operation to create and edit graphic primitives such as lines, polygons, text and points is the same sequence of operations as for creation of nodes and reaches. The appropriate menu option or toolbar/toolbox icon is used to select the desired mode.

To save the network the menu option 'File'->'Save as' is selected to enter a filename.

g) Model

When the network and background schematic have been created and saved, it is possible to run the optimisation model. The model requires the network file to be created before it is run. The menu option 'Model'->'Build model files' is selected to show a file selector dialog. It is then possible to navigate to the directory where the network file is to be saved and to enter the filename with extension NTA. In a full implementation, this function would be extended to include creation of the inflow file, and checking for the existence of all other files required to run the model

The model can currently be run by selecting the menu option 'Model'->'Run Model' to show a file selector dialog. It is then possible to navigate to the model directory and select the program to be executed. When an executable is selected, the program will be spawned in a new window. The OPTALL_NET program will continue to function during the model run. In a full implementation, the model would be run from the main opening menu, rather than from the OPTALL_NET program.

A complete list of menu option and toolbar/toolbox icons and their descriptions is given below.

For information on other aspects of the OptAll data requirements, reference should by made to the project report (http://www.civ.ed.ac.uk/research/rbw). For an inexperienced user, the manner in which the cropping files are set up at present is rather complicated and a graphical interface in which the cropping calendar can be adjusted on screen would be more appropriate.

'File' menu

New — Create a new network. Program will ask you for the initial map coordinates to display

Open — Allows you to load a previously saved network file. Note that this is not the file created from the menu option Model->Build model files.

Close — Close the current network.

Save — Allows you to save the current network to a file. If this is a new network you will asked to enter a filename.

Save As — Allows you to save the current network under a new filename

Print — Print the current network on the selected printer

Print Preview — Show a print preview

Print Setup — Allows you to select the printer and its properties

Exit — Exits the program

'Edit' menu

Undo — Undo's the last data entry

Cut — Removes the highlight node, reach or graphic primitive from the display. Use this to remove nodes and reaches form the network

Copy — This option is not used

Paste — This option is not used

Root Object — This option shows the display and network as series of objects. This is used for defining background maps with auto mapping and changing the Z order of components. The use of these features is out of the scope of this manual. Any changes made here can cause the program to crash.

'View' menu

Full Map — Show the whole map and network

Zoom out — Zoom out the display too show more map

Previous Zoom — Return to previous view

Map Grid — Show/Hide the map grid

Goto Coordinate — Goto a coordinate, enter x,y in a dialog

Goto Area Set the view to show a map area from diagonal coordinates entered in a dialog

Background colour Change the map background colour

Solid colours only Enable/Disable colour half tones

Toolbox Show/Hide the toolbox. The toolbox contains the icon to select all the design modes And edit mode. This is a floating window which overlays the map

Toolbar Show/hide the toolbar

Status bar Show/hide the status bar. The Status bar shows the select object ID

Cross hair Show/hide a cross hair which shows the centre of the view

Legend Show/hide the legend

Show ID Show/hide the network IDS. You can optional define a label for your nodes and reaches rather than display the reference number. This enables you to give more meaning full names to structures in your network.

'Map' menu

Import DXF maps Allows you to import a DXF map which is display underneath the network. The DXF file must have the same coordinate system as the view. You can import as many DXF files as you wish, but all DXF imports are display at the same time. After selecting the map you will be able to select some import options, it is best to leave these at the default and press ok to continue. Note that the DXF file should have a not border defining the edges as this could be imported as a polgon positioned on topmost obscuring the detail underneath

Remove DXf map Allows you to remove a previously imported DXF map

'Model' menu

Build Model files Allows you to create the network file used by the model

Run Model Allows you to select a program to be run

'Tools' menu

Edit Data Selects User mode where you can only edit a nodes or reaches data. You will not be able to change the network structure such as creating new nodes or repositioning nodes

Select Selects Design mode to let you change the position of nodes and reach waypoints by click and dragging them. You can also reposition points and text graphic primitives and reposition the waypoints for lines and polygon graphic primitives. When in thus mode, you can double click on a reach or graphic primitive to show its structure dialog. This dialog allows you to change the colour. Note that the node's colour is based on its type.

Nodes Select design mode to create nodes by clicking the left mouse button on the view

Reaches Select design mode to create reaches by clicking on one node, then a number of waypoints to route the reach to the last a node.

Line Select design mode to create lines. Click the left mouse button to start the line, further clicks create addition segments to the line. Double click the left mouse button to end the line

Polygon Select design mode to create polygons. Click the left mouse button to start the line, further clicks create addition segments to the polygon. Double click the left mouse button to end the polygon.

Point Select design mode to create points. Click the left mouse button on the map to create a point. A point can be a circle, triangle or rectangle.

Text Select design mode to create text strings. Click the left mouse button on the map to create a text. A dialog will be shown for you to enter the string in the ID field and select the point size. The point size is based on map units.

Bitmap Select design mode to create bitmaps. Click the left mouse button on the map to create a bitmap. A dialog will be shown for you to enter the pathname in the ID field.

Colour Select the colour to be used when creating graphic primitives.

Transform coordinates This menu option is not used

Convert to line This menu option is only available if you have highlight a polygon. This will convert the highlighted polygon into a line.

Convert to region This menu option is only available if you have highlight a line. This will convert the highlighted line into a polgyon.