



ROADPAC '14

DTM Digital Terrain Model

User Guide

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1. Introduction

DTM program performs calculation of digital terrain model. It is a part of program package RoadPAC 2004, but it can also work as independent program.

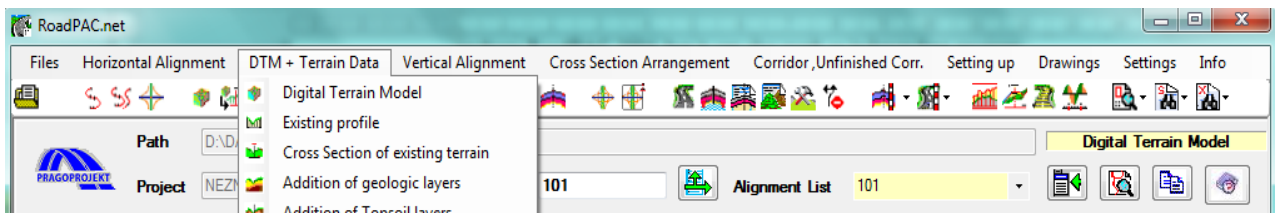
There are two versions of the program - basic model DTM and program DTM+, which allows processing of multilayer terrain model. The number of layers is not limited.

Program DTM is connected to RoadPAC package through standard data files of type .SHB, .SSS (input files) and .SPP, .VPP, .SPR, .VPR, .TER (output files).

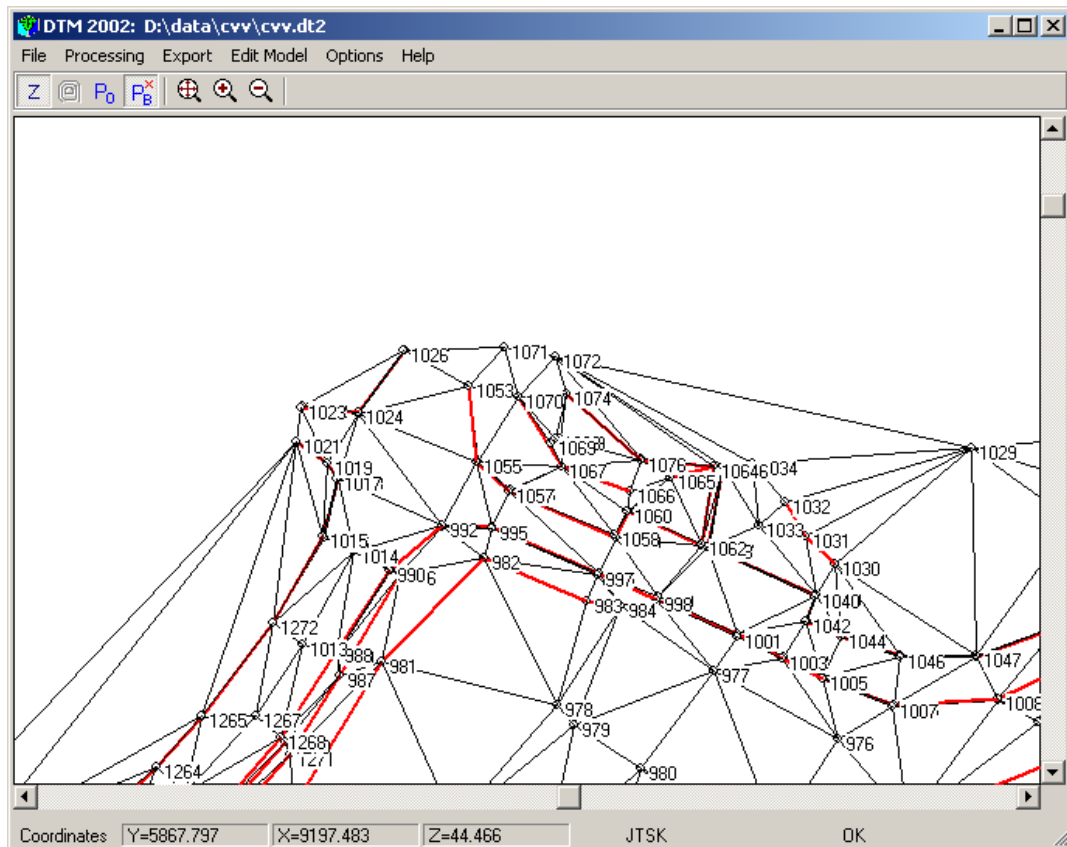
2. Start of the program, description of environment

Use command **DTM | Switch on DTM** (picture 1) to start the program DTM from menu of main window of RoadPAC program. Program DTM can be also started from command line from RoadPAC directory or by icon or shortcut. The program communicates with RoadPAC system through file CONFIG.RDP, where are saved data about current project, active directory and active road. Data on current project settings and active Road are also stored in this file.

Picture 1



Picture 2



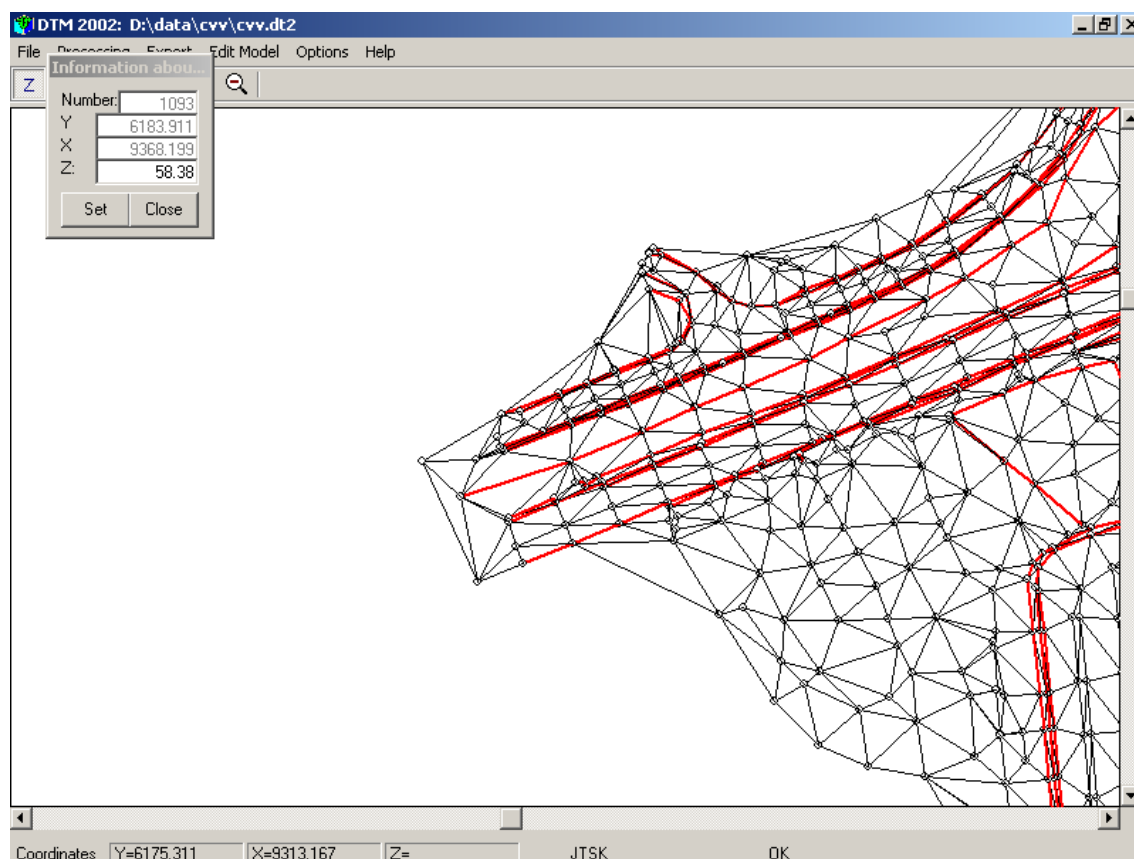
Toolbar above the model window (picture 2) includes icons that control model display. When icon **Z** is switched on actual elevation is displayed together with coordinates on bottom bar while moving a mouse.

Yellow icon toggles display of contour lines. Contour lines must be calculated first. Click on icon **P_O** to show chainage of IP with edges of triangles at sections through model. Icon **P_B** switches on and off displaying of numbers of points in model.

Other icons (**Show on everything**, **Zoom in**, **Zoom out**) have the same functions as known from standard applications Windows and AutoCAD. Press left button of mouse and drag over required window to see detailed window at display.

When only small window surrounding point is chosen (measured absolutely in pixels, it does not depend on zoom factor), program performs selection of point (identification). In that case a form (picture 3) with information on chosen point is displayed. That form allows editing of elevation of point without recalculation of terrain model.

Picture 3



3. Description of functions

3.1 Menu FILE

- | | |
|-------------------|---------------------------------------|
| Open model | - opens model inscribed in file .DT2. |
| Save model | - saves model in format .DT2. |

Load points - loads points saved in file .SOU.

Points file (.SOU) is ASCII file, where each record refers to one point of terrain model. Points are written in format:

<i>No. point</i>	<i>Y</i>	<i>X</i>	<i>Z</i>
<i>e.g.</i>			
605	5432.157	9121.387	24.220
856	5433.216	9181.272	22.380

For separation of items in record use one or more blanks or tab character.

Action **Load points** can be repeated. Other points are added to model when loading another file .SOU. Already existing points (identified by equal point number) are ignored during loading. This method can be used to associate more models. It is necessary to renumber single models to avoid duplicity during later loading. Use menu **MODEL EDIT** or **EXPORT** for renumbering. After renumbering export points and break lines (see menu **EXPORT**). Created input files can be now loaded into DTM to form final model. Then perform triangulation and save the final model.

Load Breaklines (.DVO or .PSP) - loads breaklines saved in format .DVO or .PSP

Breaklines file (.DVO) is ASCII file where each record refers to one breakline of terrain model. Data are written in format:

<i>number point1</i>	<i>number point2</i>
<i>e.g.</i>	
844	845
845	851
851	853
855	858

Breaklines file (.PSP) is ASCII file where breaklines are written as polygons. File of this type is used in DTM Atlas program. Each group of records refer to one breakline of terrain model. Data are written in format:

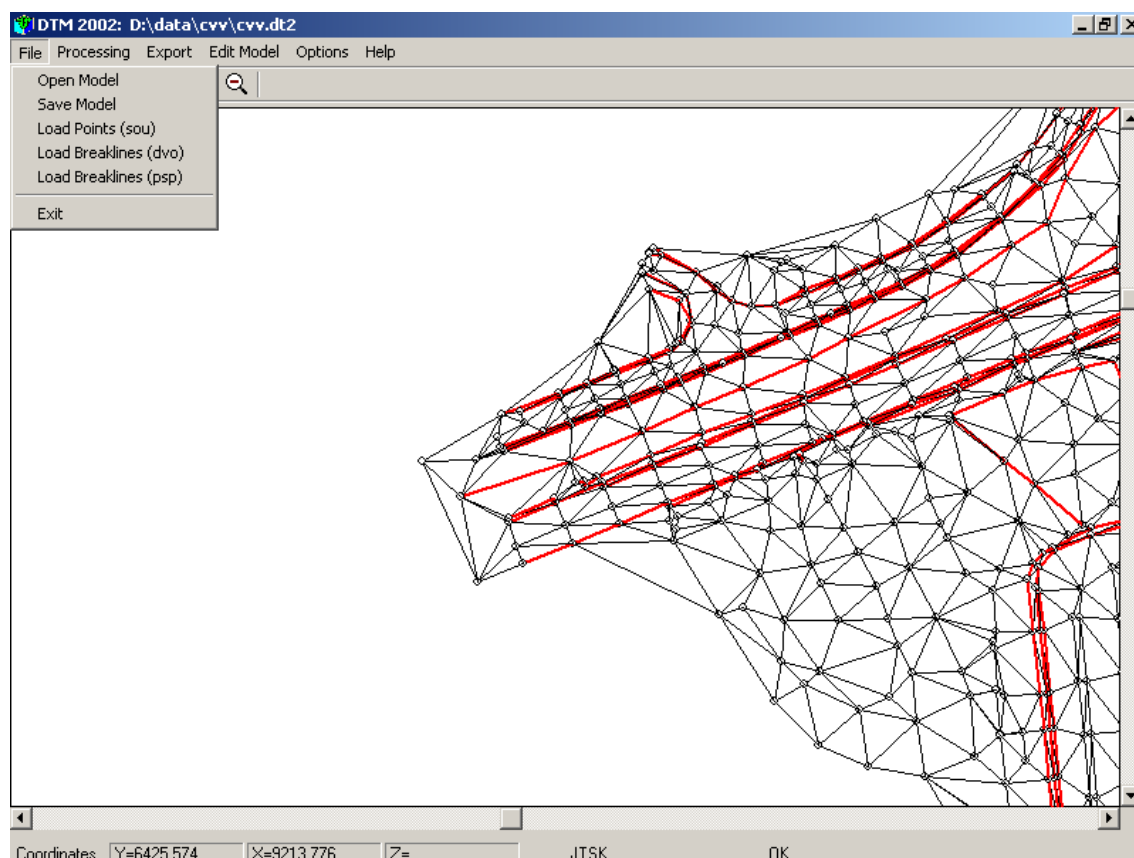
```

.p
844
845
851
853
.p
855
858

```

Exit - end of application, files are conditionally saved and program is terminated.

Picture 4



3.2 Menu PROCESSING

Triangulation setting - sets maximum length of breaklines

Triangulation - starts model triangulation

Contour line - calculates contour lines with user defined interval

Longitudinal section - scans longitudinal section through terrain along given centreline of road. Files .VPP, .SPP of longitudinal section through terrain are created

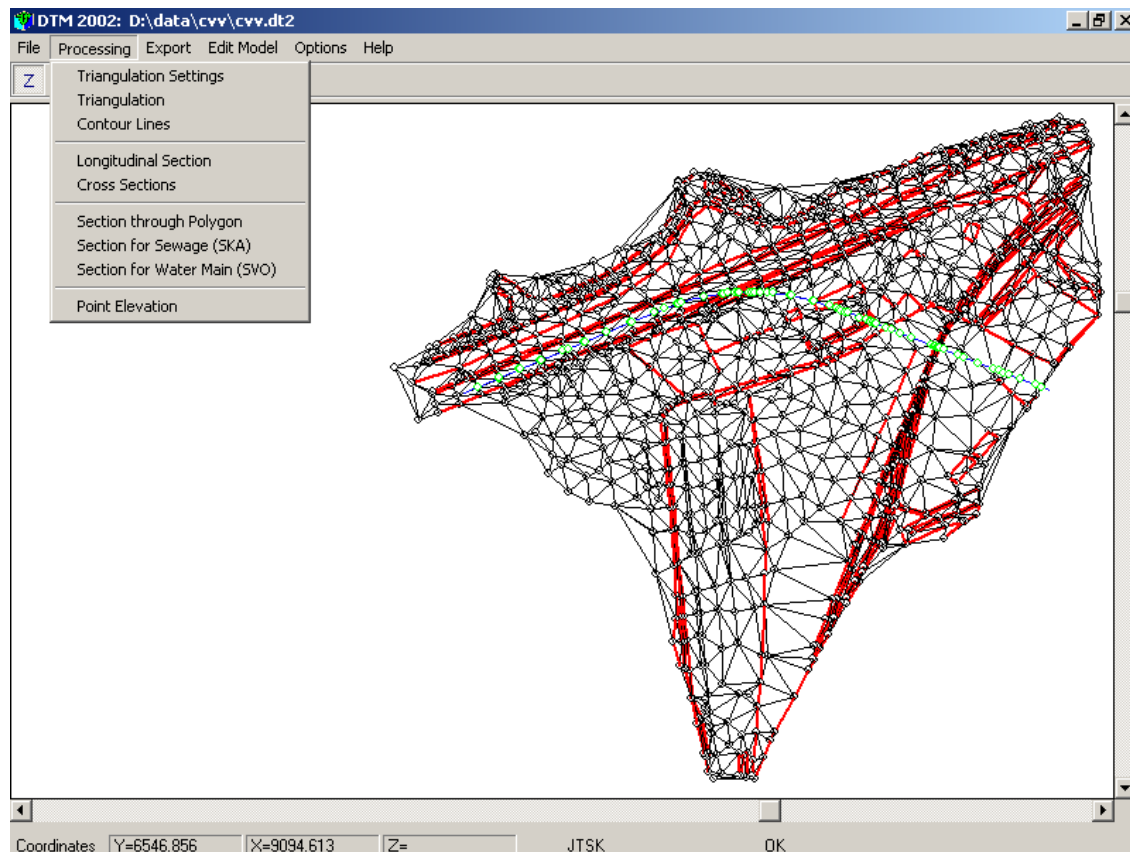
Cross sections - scans cross sections through terrain according to data given in dialog window (picture 6). Files .VPR, .V27, .STR of cross sections of terrain are created.

The syntactic data check is performed by program SI27 after scanning cross sections.

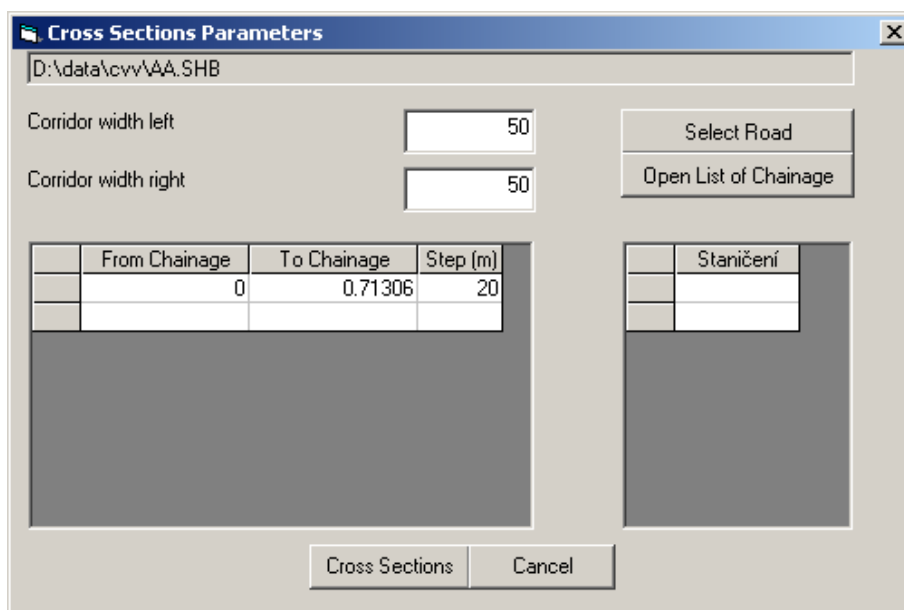
Polygon section

- scans section through terrain model along any polygon given by coordinates (Y, X) of vertexes. Section is saved into file .TER.

Picture 5



Picture 6



- Section for Sewage** - scans section through terrain for Sewage mains for use in program KanVod (obsolete).
- Section for Water mains** - scans section through terrain the for Water mains for use in program KanVod (obsolete).
- Point Elevation** - function calculates elevation of points given by its coordinates Y, X at model surface.

*Note: dialogue table for editing of IP (as other tables in RoadPAC 2004) allows communication with MS Excel (**Load from Excel, Save to Excel**). Click right button of mouse at any place of header of table to access those functions. Data will be loaded /saved from/to current selection of active sheet of MS Excel.*

3.3 Menu EXPORT

Export Points and Breaklines -saves file of points .SOU and file of breaklines .DVO

Export with Renumbering- points of DTM are renumbered so numbers of points are shifted by given constant. Breaklines are renumbered in the same way.

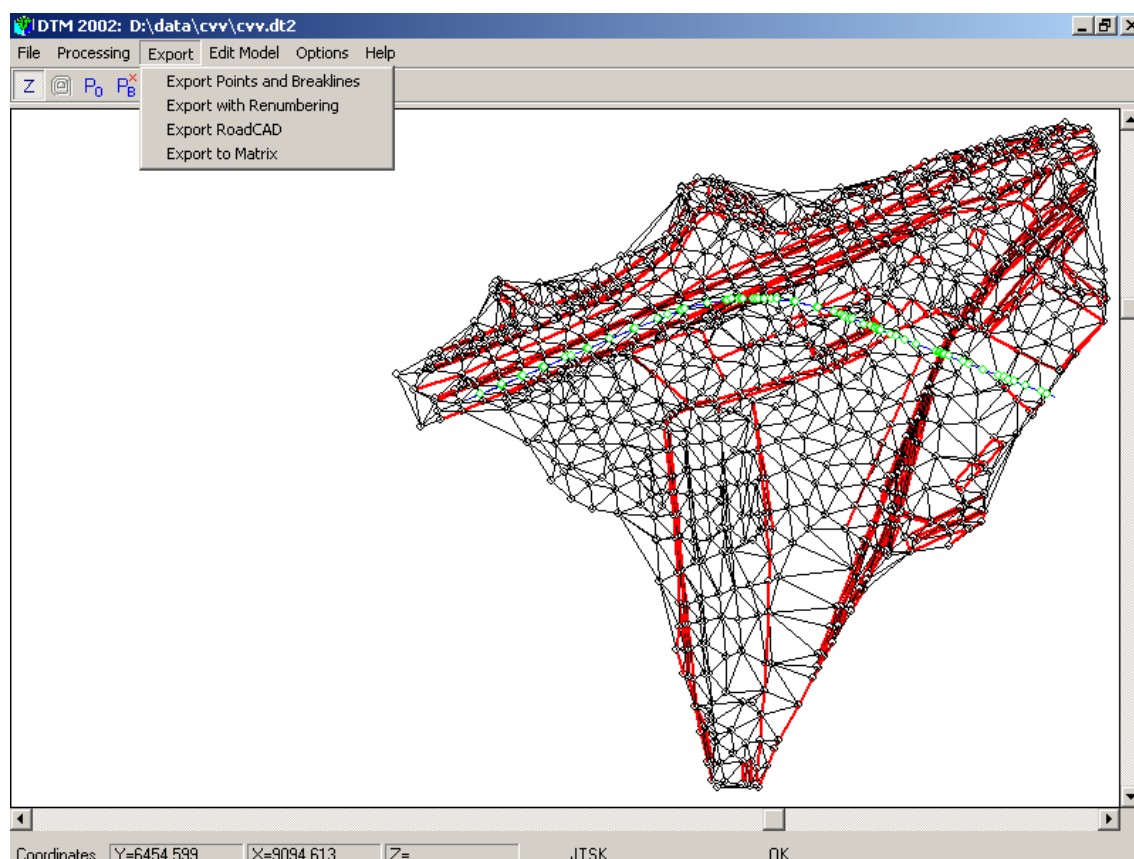
Notes:

In menu Model Edit is other possibility to renumber points of DTM with continuous numbering of points.

Export RoadCAD saves files for processing DTM in program RoadCAD. Three files are always saved at the same time:

- file of coordinates of points (.AC1),
- file of breaklines (.AC2),
- file of generated triangles of DTM surface (.AC3)

Export to Matrix saves points at surface of DTM in regular orthogonal raster with given spacing. This file is used by special program for evaluation of Noise Effects of Transport.

Picture 7

3.4 Menu MODEL EDIT

Points Renumbering rennumbers points of model. New numbers of points will start with given number and will create continuous sequence of numbers. Breaklines will be renumbered in the same way.

Model Edit opens dialog window Model edit (picture 9).

Function **Model edit** allows to edit coordinates and numbers of points, to insert and delete points, to insert and delete breaklines.

Point edit - point can be identified by keying in number of point into position “point number” and than click on button with a star or choose small windows around that point. Actual coordinates Y, X, Z of chosen point key are displayed. Coordinates and elevation of points can be edited and all changes saved by clicking on button **Save**.

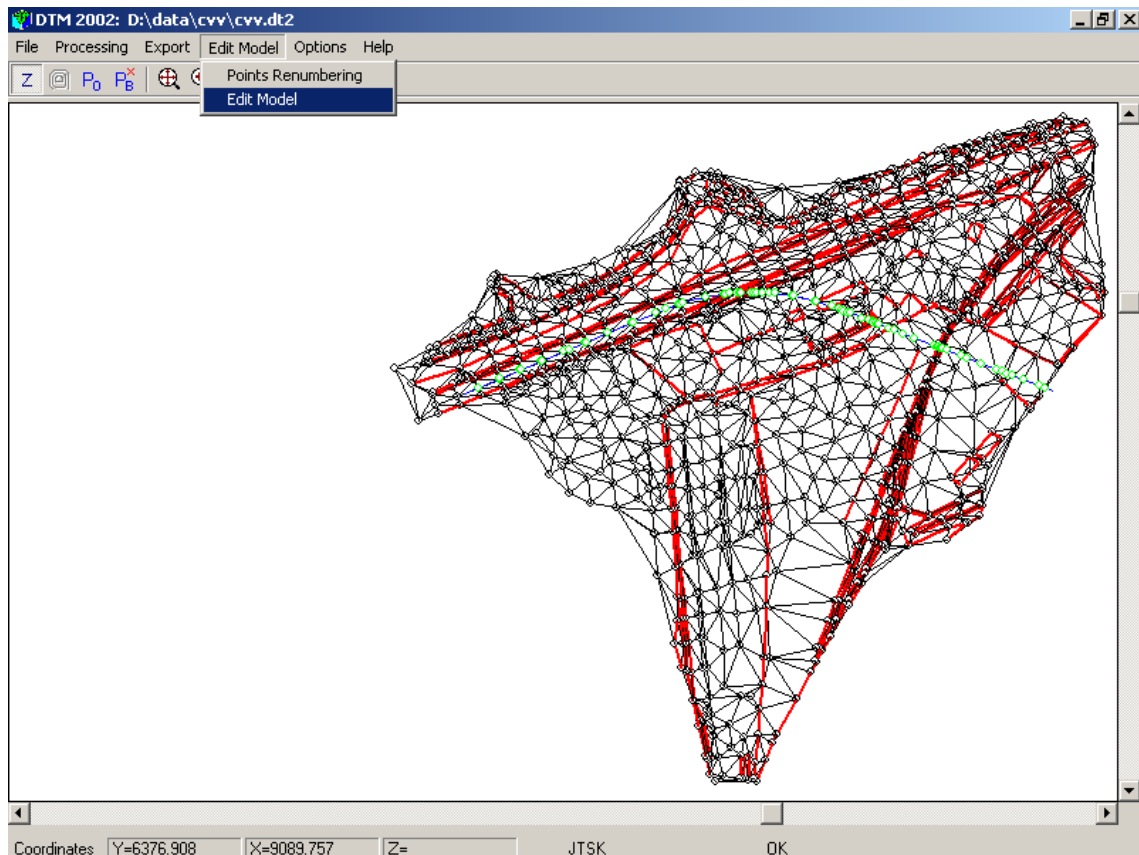
Delete point - chose point and click on button **Delete**.

New point - click on button **New Point**

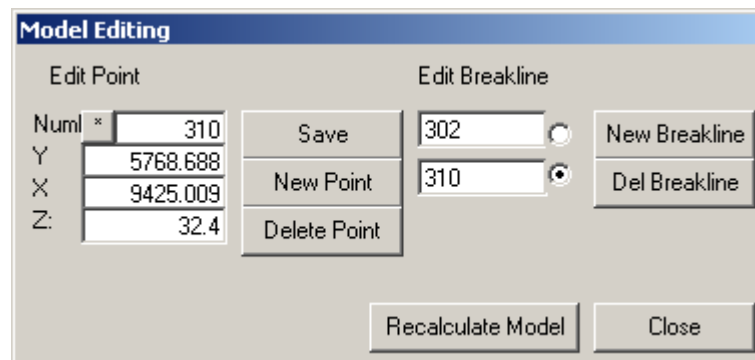
Both end points of breakline must be given at edit form for breaklines. Selection of point can be again done either straight on display by "small window" or by entering the number of point. Between both ends of breakline you can switch by radio buttons before number of points. New breakline can be added to model by command **New Breakline** or deleted by command **Delete Breakline**.

Function **Recalculate Model** starts recalculation of model - files of points .SOU and of breaklines .DVO are saved A model triangulation must be always done when dialog is switched on.

Picture 8

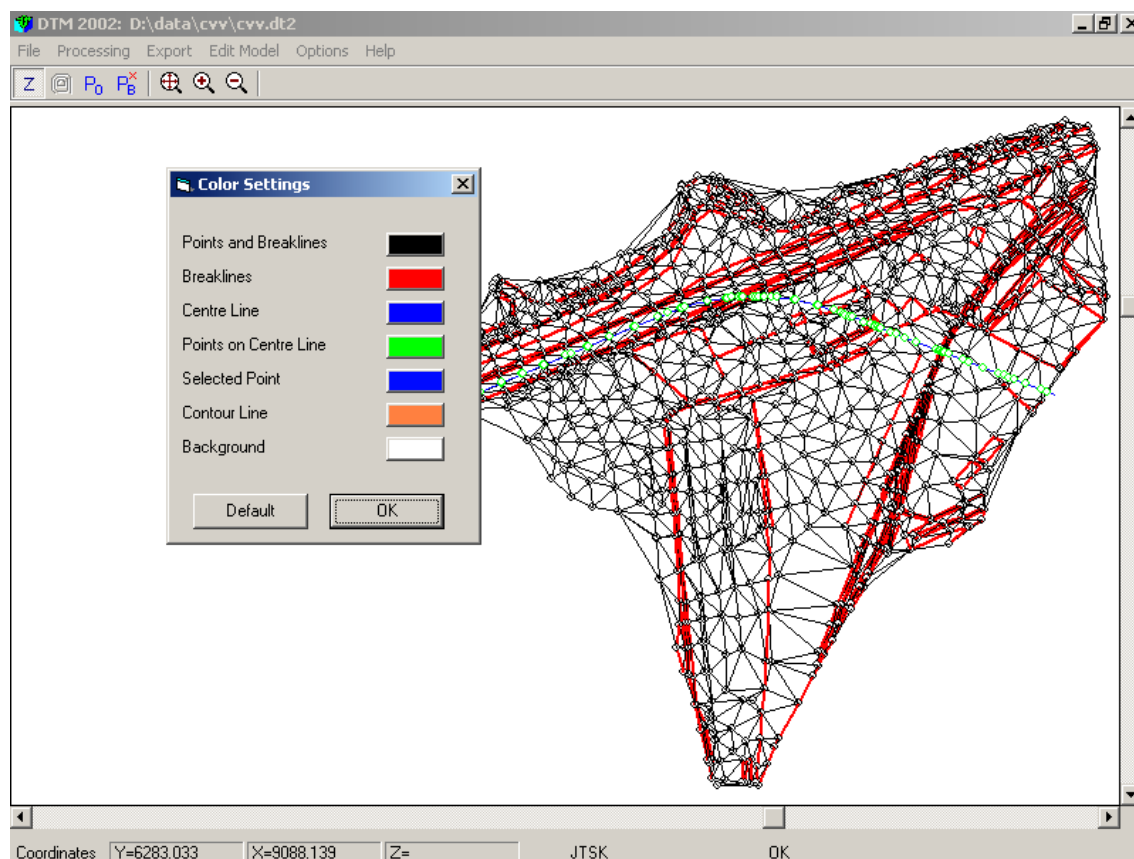


Picture 9



3.5 Menu *OPTIONS*

Command **Colour Setting** in this menu allows set colour of particular items of the model. Click on **Default** to set default colours of program DTM.



Picture 10

3.6 Menu *HELP*

Menu help displays information on program version.

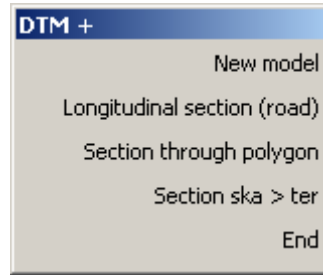
4. *DTM+* multilayer digital terrain model

Program DTM+ can work with multilayer model, the program can scan sections simultaneously through several opened models.

Create shortcut to switch on program DTM+, modify command for starting the program by adding /+ „C:\RoadPAC\DTMW32.exe /+“.

When program is switched on as above described, the standard DTM window appears as well as control window of program **DTM +** (picture 11).

Picture 11



New Model

opens new window for DTM. By this command several windows for models can be opened. All models operate individually in the same way as standard model. The only exception is function **Load 3DFace from DXF** in menu **File**.

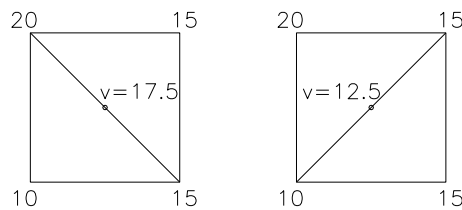
Load 3DFace from DXF

loads model defined by 3D faces saved in DXF format. The model can be processed in different way.

Standard model - triangulation must be performed prior to operation with DTM (elevations, scanning of sections).

Wire model - model without triangulation. This option does not allow function Elevation of Point, because in space between the wires of model the elevation is not defined.

Note: 3D face with four nodes is not generally plain. Therefore it is difficult to calculate exact elevation of any point within the model. Model must be triangulated for scanning elevations. It is necessary to be aware of possible mistake in process of calculation - elevations at points depend on fact, how are the triangles really defined (picture 12).



Picture 12

Scanning of sections in multilayer model

When commands from control menu of DTM+ are used (see picture 11), they are performed on all models, which are currently opened, simultaneously. (If any function from standard window of single model is used, only section for this model will be scanned).

Longitudinal Section (Road) - scans longitudinal section along road centreline through all opened models. Filename is created for each section as follows:

section name_model name.TER.

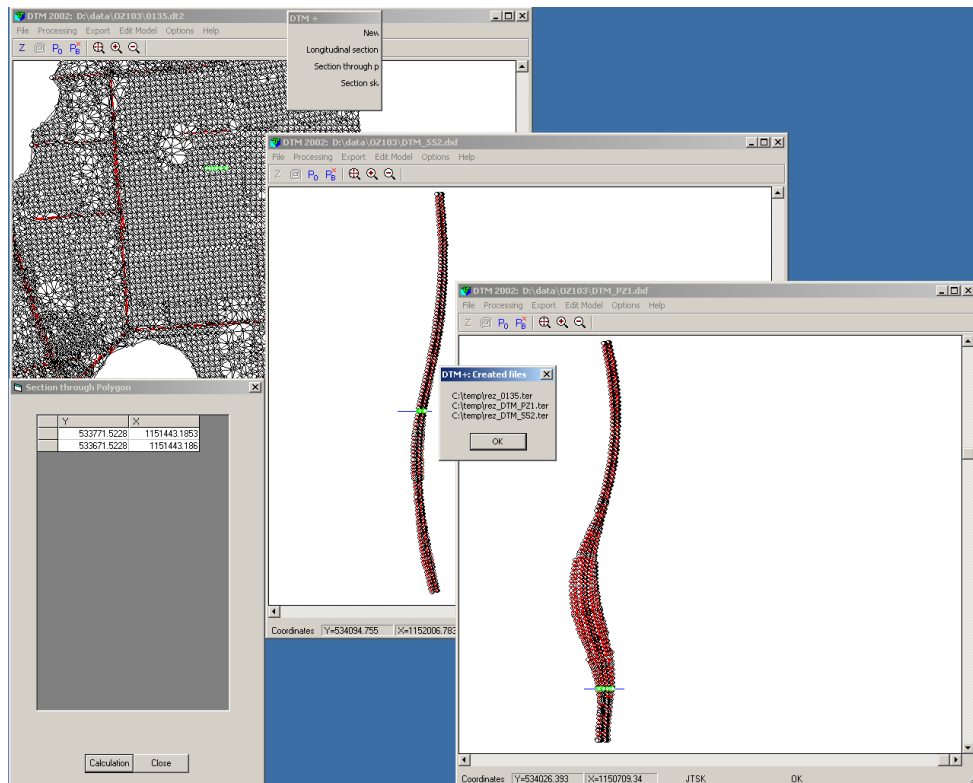
Section through Polygon- scans terrain section through any polygon given by vertexes (coordinates Y, X). Filenames are created as follows:

section name_model name.TER (see picture 13).

Section ska > ter - scans longitudinal section along of Sewage and Water Mains through all models. This function is now not used, because program KANVOD can scan the sections itself.

End - close all windows and finishes application.

Picture 13



Scanned sections through different models can be drawn in AutoCAD by the program RoadCAD part 7. Standard form of cross section is used (see Picture 14)

Picture 14

