Laser-Scan Ltd.

TVES - Acceptance Tests

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"TVES Acceptance" Category: Acceptance Tests

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1 INTRODUCTION

This document describes the acceptance test procedure for the Laser-Scan Package TVES.

TVES is a package of routines which are designed to exploit and validate grid based data, and in particular DTMs produced via the package DTMCREATE. The package includes the modules COVER, DTICONTOUR, DTICHECK, I2GRID, PROFILE, ROVER, SLOPES and VECTORISE. In addition, the extended vector overlay facilities of DTIVIEW (DTIVIEWEXTRA) form part of the TVES package.

Data input to the TVES package is from grid data stored in a DTI format, and for a number of the modules vector data from an IFF file.

2 OVERVIEW

For the purpose of acceptance, a DTM generated by the package DTMCREATE will be utilised. The heighted vector data from which the DTM was generated will also be used for the purposes of overlay, along with data on woods, roads and rivers digitised from a map covering the area of the acceptance DTM.

Acceptance will be performed using a supplied DCL command procedure to invoke the TVES modules, and issue module commands. In parts of the acceptance test, involving the module ROVER, it will be necessary to interactively type commands. In these cases, the required commands are given in this document.

The acceptance procedure is invoked by typing **@LSL$COM:TVES_ACCEPT**

A LSL supported graphics device with 8 bit-planes is required for the demonstration of the TVES package. You will be asked if graphical output is to a VAX workstation, before being asked to confirm that you wish to carry out the acceptance tests.

3 DESCRIPTION OF ACCEPTANCE PROCEDURE

The acceptance procedure first demonstrates the module ROVER. ROVER is used to display a DTM as a colour coded layered image, and to overlay vector data in registration on to this image. As part of the acceptance, contour data and data on rivers, roads and woodland will be overlaid.

The facilities available in ROVER to control the graphical representation of both the raster and vector data (eg. height interval, height range, colour definition options) will be demonstrated. User control over feature and picture selection, will be shown. Full and quartered screen mode will be shown. A series of images will be produced:

The first image shows the use of the default window and default height step interval - no overlay is shown. The second image shows a user defined window; a height step interval of 50 metres, and a height range of 0 to 500 metres (parts of the terrain above 500 metres appear in black). The third image shows the whole of the terrain in the DTI file, and uses a height step interval of 50 metres, and a height range of 0 to 850 metres. Not all steps are shown in the displayed legend. Vector data consisting of woods, contours, roads and rivers will be overlaid in registration on to this image. The colour of the overlay features is derived in this example from the FRT.

Deselection and selection of the raster and vector pictures will be demonstrated. The vector overlay will be cleared and selection of overlay will be shown by drawing just the rivers and roads. Control over the colour of overlay will be shown by drawing the contours in white on to this image.

The quartered screen option is demonstrated next. The image in quadrant 1 (top left) is generated with a height step interval of 50 metres. The image in quadrant 2 (top right) uses a height step interval of 200 metres. Quadrant 3 (bottom right) will be used to show the same terrain image with contour overlay. Selection and clearing of a quadrant will be shown by clearing quadrant 2 - a new image that has been rotated by 180 degrees will be drawn into this quadrant. The final image in quadrant 4 (bottom left) will use the option to disable the legend and border annotation.

Pass [ ]/Fail [ ]

The module SLOPES will be invoked to demonstrate how new information on slope and aspect may be derived from the DTM.

Four slope maps will be generated from the elevation data. The first map will utilise the default slope class interval and gradient range values. The second map will demonstrate user control over the slope interval values. The third map will demonstrate user control over the gradient and height range: slopes above 30 degrees will be shown in black, while areas of terrain above 500 metres will be shown in white. All these maps were generated using slope algorithm 1; the fourth slope map will use slope algorithm 2 (average of 2 surface facet normals).

Pass [ ]/Fail [ ]

Three aspect maps will be generated from the elevation data. The first map will utilise the default aspect parameter settings (ie an angular interval of 30 degrees). The second map will use an angular interval of 45 degrees.

Pass [ ]/Fail [ ]

Three shaded overlays will be generated from the elevation data. The first will be generated using the default settings for the light source. This uses a light source in the North West, and with an angular elevation of 45 degrees. The second image will show the result of changing the position of the light source to the North East. The third image will be generated with a light source at an angular elevation of 30 degrees.

Output of a shaded overlay to a grid file as well as to the graphics screen will be demonstrated.

To confirm the correct output of the shaded overlay, ROVER is again invoked. The ability to overlay vector information on the shaded image, and to display the shaded image alongside the original elevation data will be shown.

Pass [ ]/Fail [ ]

Acceptance of the module PROFILE is performed next. PROFILE is used to construct a series of path profiles lines through a DTM. Typically, the origin of the profiles will be a base station, and the profile data will be used for radio frequency propagation analysis. Profiles are constructed either radially around the base station, or between each DTM node and the base station. Options are provided to restrict profile generation to a rectangular area of interest or to a sector of interest, and to define a fixed sample interval, or a sample interval that is dependent on the distance of the sample point from the origin.

Each profile is written to an IFF file as a separate feature. The bearing and length of the profile is stored in the IFF file, along with the x y and z coordinates of the profile sample points.

The acceptance procedure will first demonstrate the construction of profiles between the profile origin and every DTM node in a rectangular area. A constant sample interval will be used. Secondly, the construction of profiles radially around the base station at a fixed angular interval of 5 degrees will be shown. A 360 degrees area of interest will be defined, along with three band distances - the rate of sampling will be different in each band.

The paths of the profiles will be shown using ROVER by overlaying the generated IFF data on to a plan view of the acceptance DTM. The first plot shows the profiles that were generated between the profile origin and all DTM nodes in the rectangular area of interest. The second plot shows the profiles that were generated radially around the base station at an angular interval of 5 degrees. Note that the profiles are clipped to a rectangular area of interest and to a circular area of interest. A variable sample interval was used when generating these profiles, with the sample rate being higher towards the edge of the area of interest. This is shown by redrawing the profile lines as symbol strings.

Pass [ ]/Fail [ ]

The acceptance test proceeds to demonstrate the use of the module COVER to derive visibility information from the DTM. A visibility map will be generated and displayed following the positioning of an observer, and definition of the viewing parameters associated with the observer.

A prepared visibility map generated using a number of observers will be utilised to demonstrate the form of the display when dealing with multiple observers, and to show how the user may select the visibility masks associated with each observer.

Pass [ ]/Fail [ ]

The visibility map generated for a single observer will be used as input into the module VECTORISE to demonstrate raster to vector conversion. The resulting link-node structured IFF file will be displayed in ROVER, superimposed on the cover, as an accuracy test.

Pass [ ]/Fail [ ]

Vector to raster conversion is performed by the module I2GRID. For acceptance an IFF file containing area woodland features, and vector line data on rivers and roads will be selected for conversion. The options in the program to determine the coding of features in the IFF file, and control of the selection of features to be scan converted will be demonstrated.

Pass [ ]/Fail [ ]

The use of the DTM contouring utility DTICONTOUR will be shown on a DTM generated by package DTMCREATE. DTICONTOUR will first be used to contour the DTM. Intermediary and index contours will be generated. The option to annotate the index contours with their height will be selected. Output will be to an IFF file which will be inspected relative to the DTM using ROVER. You will be asked if you want to display the contour map in ROVER.

Pass [ ]/Fail [ ]

The use of the DTM checking utility DTICHECK will be shown. DTICHECK will be used to check the DTM for adjacent nodes that exceed a threshold height difference of 50 metres. Depending on the nature of the terrain surface, such a height difference may indicate errors in the DTM. The option to generate a ROVER command file should be selected. You will be asked if you want to display the suspect points in ROVER, to which you should answer yes.

ROVER will be used to view the suspect points and utilise the command file produced by DTICHECK. The command file will automatically move the screen cursor to the suspect points. Once the matrix has been drawn on the screen and the prompt **Edit>** is displayed, type

@TVES_ACCEPT_DTICHECK

The cursor will move to the first suspect point. It is now possible to examine the surrounding points to verify that DTICHECK has correctly identified a point that exceeds the height difference threshold. Use the commands **UP, DOWN, LEFT** and **RIGHT** to move the cursor by one pixel in the specified direction. To move to the next suspect point type **CONTINUE**. This sequence of operations may be repeated until the end of the command file is encountered and to exit from ROVER type **EXIT**. The command file can be abandoned before completion by typing **EXIT** which also exits from ROVER.

Pass [ ]/Fail [ ]

The facilities available in the matrix 3-D viewing module DTIVIEW for the overlay of vector map data on a terrain view are accessed via the TVES package module DTIVIEWEXTRA. Acceptance of these facilities will involve generating an isometric view (note the option to draw the land surface in just one colour is selected), and overlaying the woodland, roads and rivers vector data on to this terrain base. The facility to deselect and reselect the overlay picture will be shown.

Pass [ ]/Fail [ ]

The ability to interactively edit the DTM will be demonstrated using ROVER.

As ROVER alters the input DTI file in situ, a copy of the acceptance DTM will be used. Interaction with the grid data via movement of the screen cursor and the various modes of editing (ie. single point, line, area and smooth) will be shown. A number of edits will be performed on the file. The screen flooding facility will be demonstrated as a powerful, user controlled DTM validation tool. The use of the zoom command will be shown.

The commands required for acceptance should be typed interactively at the terminal following the display of the matrix as a colour image, and the output of the prompt **Edit>**.

To interact with the matrix, move the workstation mouse. As the mouse is moved, a small black cursor will appear and move across the screen. The position and the height of the point at the current cursor position is shown on the bottom of the screen.

Pass [ ]/Fail [ ]

To edit a single data value, first position the cursor over the point to be edited; press the lefthand button on the mouse, and then the centre button. You will be prompted for a new data value on the terminal. Enter a value at the DECterm window such as 100 (any height within the range 0 - 850 is valid) in response to the prompt **DTI value>**. If you now move the cursor you will see the pixel has changed colour, and if you revisit the pixel it will now have the height you entered.

Pass [ ]/Fail [ ]

To edit a line of data values, position the cursor over the start of the line, and press the lefthand button on the mouse. To define subsequent points on the line, move the cursor over each point in turn, and press the lefthand button. Note that a line connecting the points is drawn on the screen. Press the centre button on the mouse to end the line, and in response to the prompt **DTI value>** on the terminal, enter the new height value. All the data points along the defined line will be changed to this value.

Pass [ ]/Fail [ ]

To edit an area of data values, first type **AREA** in response to the prompt **Edit>**. Define the boundary points of the area to be edited using the lefthand button of the mouse (as for the line edit). To end, press the centre button on the puck. Note that it is not necessary for the last point of the area to be the same as the first point, the area will be automatically closed by ROVER. In response to the prompt **DTI value>** on the terminal, enter the new height value. All the boundary and interior data points of the area will be changed to this value.

Pass [ ]/Fail [ ]

A smooth edit involves defining two lines (with two different heights), and calculating the heights of intervening data points using linear interpolation. Type **SMOOTH** in response to the prompt **Edit>**, and using the lefthand button on the mouse define the points of the first line. Use the centre button to end the line, and in response to the prompt **DTI value>** on the terminal, enter a new height value. Repeat this operation for the second line, ensuring that the points of the second line are defined in the same direction as the points of the first line. Following the entry of a height value for the second line, ROVER will interpolate the heights of the intervening points.

Pass [ ]/Fail [ ]

To demonstrate the interactive flooding of the screen image, type **ENABLE FLOOD** in response to the prompt **Edit>**. Make sure that the graphics window is in focus by pressing the menu banner entitled "Graphics Window". If the screen cursor is now moved up the screen, the area of blue will increase as the land area is progressively flooded. When the cursor is at the top of the screen, the land area is flooded to the maximum height. The height value is displayed at the bottom of the screen. When the cursor is at the bottom of the screen, only the sea area is shown in blue. Note that no overlay is unaffected by the flooding, and that moving the cursor horizontally across the screen has no effect on the flooding level. Go back to the DECterm (find it by pressing Alt+F3 or by clicking on the small bar in the top left-hand corner of the window and selecting option "Lower"). Type **DISABLE FLOOD** to return to the edit prompt, and redisplay the matrix without any flooding by typing **PLANES 5**.

Pass [ ]/Fail [ ]

It is possible to zoom the image around the current cursor position. Move the cursor to the point around which you wish to zoom, and type the command **ZOOM**. The matrix will be redisplayed at twice the magnification. If this command is now repeated, a further magnification factor is applied. To return to the previous magnification level type the command **ZOOM 0.5**

To exit from ROVER type **EXIT**.

Pass [ ]/Fail [ ]

Overall Pass [ ]/Fail [ ]

Comments:

Customer Representative: **Date:**

Laser-Scan Representative: **Date:**