Laser-Scan Ltd.

Software Product Specification

DTMCREATE package

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DTMCREATE Package Software Product Specification

1 ***DESCRIPTION***

DTMCREATE is a semi-interactive Digital Terrain Model (DTM) production system.

The DTMCREATE package is one of 3 Laser-Scan DTM production and manipulation packages:

- DTMPREPARE - prepares IFF format vector data for DTM construction using package DTMCREATE,
- DTMCREATE - the DTM creation package,
- TVES - **T**errain **V**isualisation and **E**xploitation **S**oftware - an advanced DTM manipulation, validation and editing package

All three packages are supplied with a background package "MATRIX". Package MATRIX contains Laser-Scan DTI (**D**igital **T**errain **I**mage) format DTM management programs, a basic DTM viewing program and a DTI manipulation subroutine library for applications programmers. (See separate SPS for MATRIX package)

1.1 ***DTMCREATE - Input.***

Data input to the DTMCREATE package is from Laser-Scan IFF (**I**nternal **F**eature **F**ormat) files on magnetic disk. Data may consist of contour strings and/or spot heights, clifflines and three dimensional river and ridgeline strings. Whole IFF layers or individual feature codes may be nominated as indicating slope breaklines, clifflines, ridgelines and rivers at run time.

1.2 ***DTMCREATE - Output.***

The DTMCREATE package provides DTM output to a Laser-Scan internal type DTI (Digital Terrain Image) file. Format converters are available to produce alternative DTM formats. Examples of such format conversions are UHL1 or TED4 type Defense Mapping Agency file format, or simple ASCII text listings.

2 ***FACILITIES***

DTMCREATE offers the following features:

- use of standard VAX and popular displays,
- triangulation method, all source data points are honoured,
- powerful DTM edge matching techniques,

- o efficient use of computer time,
- o interactive editing of terrain structure files,
- o user friendly: all routines contain interactive help facility and diagnostic printout facility.

3 ***PREREQUISITES***

3.1 ***Computer Hardware Prerequisites***

The following computer hardware requirements are needed to run DTMCREATE.

- o Any DEC VAX, MicroVAX, VAXstation or Alphastation computer supported by the current version of OpenVMS.
- o At least 10MB available disc space for software, plus sufficient for data files.
- o At least a 4096 pages working set per process is needed for efficient operation of the larger utilities.
- o LSL-supported graphics device, currently one of:
  - Sigmex 6000 series colour display (not supported on Alpha).
  - Sigmex ARGS 7000 series colour display (not supported on Alpha).
  - Tektronix 4010 or 4014 DVST with enhanced graphics and optional Laser-Scan TMU controller (not supported on Alpha).
  - any Tektronix 4100 series colour graphics terminal (not supported on Alpha).
  - DEC VAXstation workstation under UIS or Motif
  - DEC Alphastation workstation under Motif
- o Any DEC-compatible alphanumeric terminal (optional if graphics device has alphanumeric terminal capabilites).
- o Optionally, any Laser-Scan supported digitising table with minimum 4 button cursor, for use with TRIEDIT interactive editor (table not supported on Alpha).

3.2 ***Software Prerequisites***

DTMCREATE modules run under OpenVMS VAX Version 5.5-2 (or higher version, assuming continued upwards compatability by DEC), or OpenVMS Alpha Version 6.2 (or higher), concurrently with other interactive and batch processes.

For the use of Motif on a VAXstation, the "DECwindows Motif" layered product from DEC is required. The "VMS DECwindows Developers Kit for Motif" is not adequate.

For the use of UIS on a VAXstation, VAX VMS Workstation Software (VWS) version 4.3 or later is required.

Laser-Scan's **I**FF **M**ap **P**rocessing package (IMP) is a prerequisite. Laser-Scan's LITES2 interactive digitising and editing software is recommended for digitising and editing vector input data. LASERTRAK automated digitising is recommended for large numbers of input documents.

3.3 ***Growth Considerations***

The minimum hardware and software requirements for any future version of this product may be different from the minimum hardware and software requirements for the current version.

4 ***SUPPORT LEVEL***

DTMCREATE is a fully supported Laser-Scan standard software product.

5 ***COMPONENT MODULES***

DTMCREATE consists of the following component modules:

MODULE TRIANG (triangulation)

TRIANG is the spatial structure generation program that defines source data inter-node relationships based on a Delaunay triangulation. It produces two binary files which serve as input to other DTMCREATE package programs.

TRIANG features are:

- accepts Laser-Scan's Internal Feature Format (IFF) data as input from disk.
- offers the choice between an idealised Delaunay triangulation (more suited for large scale geological surface estimation) or constrained Delaunay triangulation for complex geomorphological applications.
- enables the user to select IFF layers and/or feature codes for breakline allocation.
- enables the user to select IFF layers and/or feature codes for cliffline allocation.
- has feature coding facility for rivers and ridgelines, enabling geomorpholical constraints to be applied to automatic interpolations of DTM points in river valleys and on hill tops.
- enables the user to select specific IFF layers and/or feature codes for triangulation from a large multi-layer IFF file.
- enables the user to select input from DTI (Digital Terrain Image) format DTM files for edge matching purposes.
- creates "imaginary points" around the edge of supplied data area to automatically overcome "edge of the world effects", leading to high quality inter-DTM edge matching.
- provides "most often required" default settings for all options.
- offers change of measurement system on data input, eg metric to imperial or vice-versa, (or to any user defined system).
- enables the user to ignore selected IFF layers and/or feature codes.
- enables multi-file input to the same triangulation run, enabling the user to change input parameters between files.
- offers the user the option of graphical output showing the growth of the triangulation.
- enables the user to specify a rectangular window defining the area required for triangulation; input data lying outside of these limits will be ignored.
- defaults to use of the IFF file range to determine the extent of the triangulation.

- is command driven.
- offers command file operation to reduce operator error rate and use of "guidance files" for training, demonstrations, and semi/fully-automated operation.

MODULE TRIDER (slope derivative estimation)

TRIDER takes as input the binary files which define the triangulation structure created by TRIANG (or output by TRIEDIT) and estimates the first derivatives of slopes at each node within the triangulation. Output is to a binary file which is used as input to TRIGRID.

TRIDER offers the following features:

- four options for estimation of Z values for "imaginary points" outside the area for which source data is available. This greatly enhances edge matching between DTMs.
- produces a disk file containing the slope derivatives for each node in the triangulation. This may be rapidly read into the DTM generating module (TRIGRID) each time a grid of differing resolution is required.
- provides "most often required" default settings for all options.
- offers user option of graphical output showing progress of derivative estimation.
- is command driven.
- offers command file operation to reduce operator error rate and use of "guidance files" for training, demonstrations, and semi/fully-automated operation.

MODULE TRIGRID (DTM grid generation)

TRIGRID is a grid (DTM) generation program operating on the data structure created by TRIANG or TRIEDIT and TRIDER,

TRIGRID offers the following features:

- production of DTMs with differing cell sidelengths in X and Y.
- enables the user to specify repeatedly the extent of the desired DTM, associated DTM size and sidelength until the desired combination is presented.
- offers the choice between linear facet estimation of DTM post values (fast but rather angular DTM surface) or a smooth surface patch option which fits local quintic surfaces for DTM post estimation (slower but very smooth DTM surface).
- offers options to restrain the smooth surface patch interpolation, both within individual triangles and over the whole data range, to suit the source contour interval and terrain character.
- enables the user to select automatic limits for the smooth patch interpolation based upon the geomorphological context of the triangle and the feature code attributes of the triangle vertices.
- outputs the Laser-Scan internal DTI (Digital Terrain Image) format DTM files which are the common file medium for the TVES (Terrain Visualisation and Exploitation Software) package.
- offers graphical output showing growth of the DTM grid.
- provides "most often required" default settings for all options.
- is command driven.
- offers command file operation to reduce operator error rate and use of "guidance files" for training, demonstrations, and semi/fully-automated operation.

MODULE TRIEDIT (triangulation graphical editor)

TRIEDIT is a triangulation graphical editor, including structure display and contouring, to adjust the automatically derived inter-node relationships to suit special purposes, and to allow insertion of additional special purpose strings.

- enables the user to apply cartographic skill to modify the process of DTM generation without having to return to source vector data files.
- provides triangulation structure display.
- provides node flagging, display and edit for rivers and ridgelines.
- offers the option of re-contouring using a simple linear estimation based on triangle facets (either to screen or to IFF file), for data validation.
- enables interactive adjustment of the automatically derived inter-node relationships to suit special purposes, and to allow insertion of additional special purpose strings.
- enables registration of map graphics on a digitising table, to allow accurate input of new features (not supported on Alpha).
- enables the user to zoom the graphics screen onto sections of the map for clarity or accuracy. Editing can continue on the magnified section and further zooms may be made upon this section itself (up to a limit).
- enables the user to create new features interactively. Both 2 and 3 dimensional strings may be inserted.
- offers input of new features contained in an IFF (Internal Feature Format) file. Both 2 and 3 dimensional strings may be inserted.
- provides a mid session "SAVE" option to protect completed edits from computer failure, etc.
- provides the facility to dump the triangulated data back to an IFF disk file for plotting or analysis.
- provides the facility to generate an IFF disk file containing the triangle facets as discrete IFF features.
- provides the facility to dump the triangulation linkage to an IFF disk file for plotting or analysis.
- enables the user to examine and change basic attributes of individual nodes, or whole strings of nodes, namely height, feature type (i.e. derivative status) and geomorphological flag.
- provides a delete facility for single points and whole strings of points within the triangulation.
- has flexible hardware configuration requirements; supported hardware availability being set via simple text lookup files.