IMAGESTATION DTMQUE - MERGING LIDAR AND BREAKLINE DATA

TUTORIAL

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MERGING LAS AND BREAKLINE TUTORIAL

TUTORIAL INTRODUCTION

ImageStation DTMQue (ISDQ) is a collection of command line utilities used primarily for converting surface data to the ImageStation DTM format and for making changes to DTM format surface data. The DTM format is the preferred surface format for use in the ImageStation photogrammetry applications for accuracy and efficiency and is used by products such as ImageStation OrthoPro. Wrapped around ISDQ’s various command line utilities is a powerful interface that you can use to create, edit, and save workflows that can either process a single input source file or an entire directory of input source files. In addition, ISDQ delivers basic utilities for making changes to DTM surfaces such as clip, tile, triangulate, transform, thin, merge, and several more.

TOPICS

This tutorial presents a workflow using ISDQ for combining LIDAR point cloud data with breakline data from a MicroStation design file. The resulting merged DTM files can be used as input DTM data to OrthoPro.

Topics covered in this tutorial include:

- Creating a new ISDQ workflow file
- Scanning folders for input files
- Converting ASCII and DGN format files to DTM format
- Merging surface files
- Clipping surface files to a smaller area
- Triangulating surface files
- Displaying surface files

TUTORIAL TEXT CONVENTIONS

There are several conventions used throughout the tutorial:

- Ribbon bar items are shown as: On the Aaa tab, in the Bbb panel, click Ccc > Ddd.
Dialog box names, field names, and button names are depicted using **bolded text**.

Information to be entered, either by selecting from a list or by typing, is depicted using *italicized text*.

**TUTORIAL DATA SET**

The tutorial data set consists of three LIDAR point cloud files in ASCII format (*.ASC*), a MicroStation design file (*.DGN*) containing breakline features, a coordinate system file that describes the map projection being used (*project.csf*), and an ASCII file containing polygon coordinates for clipping the surface area (*clip.txt*). Create a folder named `C:\Training\ImageStation` and unzip the data set to this folder. (The resulting full path to the data set should be `C:\Training\ImageStation\ISDQ-Merging Data`.)

**TUTORIAL PREREQUISITES**

You should have ImageStation DTMQue installed.
DEFINING THE ISDQ WORKFLOW

CREATING A NEW WORKFLOW FILE

Let's get started...

1. Launch ImageStation DTMQue from the Windows Start menu.
   
   *The ImageStation DTMQue main dialog opens with an "unsaved workflow."

2. Click File > Save As and enter a name for your new workflow file. Save the workflow file in the same folder where the tutorial data reside:
   
   C:\Training\ImageStation\ISDQ-Merging Data.

   *At this point you should see something like the screenshot below.*

![Workflow Screenshot]

   *Add your processing steps using the Edit/Insert menu or the toolbar here.*

   ![Workflow Screenshot]

SCANNING FOR MULTIPLE SURFACE FILES

1. Click Input > From Folder.

   *A DtmScanner process module is added to the Workflow process tree in the left pane and its associated parameters are displayed in the right pane.*

2. Use the directory file browser to locate the folder where the tutorial project data are located: C:\Training\ImageStation\ISDQ-Merging Data.
3. Note that the **input-mask** is already set to "*.asc." For other workflows this can be changed to scan for any other input files you may have, such as *.las, *.xyz, *.txt, etc.

4. Uncheck the **recursive** checkbox. This is used for scanning subfolders for similarly named input files.

![ImageStation DTMQue - Merging LIDAR and Breakline Data](image)

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**CONVERTING ASCII TO DTM FORMAT**

1. Click on the **DtmScanner** process in the left pane to give it focus, then click **Format > Ascii.**

   *An Asc2Dtm process module is added to the Workflow process tree under DtmScanner in the left pane and its parameters are displayed in the right pane.*

2. Leave the **input-field** set to `$\{input\}` to indicate that this module will take the files located by DtmScanner as input for processing.

3. Use the **input-csf** file browser to select ```project.csf``` from the project folder which defines the coordinate system for the surface data and click **Open.**

4. Leave the **output-field** set to ```[file rootname $\{input\}] .dtm``` to indicate that the newly created surface files will be named the same as the input files but will have a .dtm file extension.

5. Leave the **point-format** field set to ```E N Hgt``` to indicate the format of the ASCII input files. Feel free to click the down arrow to see which other formats are supported.
6. Leave the **skip-lines** field set to 0 lines to indicate that there are no header lines in the input files that need to be skipped.

CONVERTING DGN TO DTM FORMAT

1. Click **Format > DGN**.

   A **Dgn2Dtm** process module is added to the Workflow process tree in the left pane below **Asc2Dtm** and its parameters are displayed in the right pane.
2. Right-click on Dgn2Dtm and click **Uplevel** to move the process to the main Workflow process tree (i.e. move it out from under the DtmScanner sub-tree).

3. Use the **input** file browser to select breaklines.dgn from the project folder and click **Open**.

4. Leave **output** set to \[file rootname ${input}].dtm\] to indicate that the output surface file will be named the same as the input file but will have a .dtm file extension.

5. Leave **output-csf** set to \[file rootname ${input}].csf\] to indicate that the input-csf file from the previous process step will be copied to the same name as the output surface file with a .csf file extension.

6. Click the **filter** browse button, then click **Edit Filter**.

   **Tip** For your own workflows, if you have a DTM Symbology .INI file that you use for ISDC and/or ISAE work you can use the file browser to locate that file and use it to define the geomorphic features of the input DGN file.

7. On the DGN Definition dialog box, click **New**.

8. Under **Class**, click on REG and change it to BRK.

9. Under **Level Name**, click in the empty field and key in 705, which is the name of the level in the design file that contains the geomorphic features.
10. Click **OK** to return to the main dialog.

![ImageStation DTMQue - Merging LIDAR and Breakline Data](image.png)

**MERGING THE DTM FILES**

1. Click on **Operate > Merge**.

   *A DtmMerge operation module is added to the Workflow process tree in the left pane and its parameters are displayed in the right pane.*

2. Use the **input** file browser to specify the project folder you are working in:  
   C:\Training\ImageStation\ISDQ-Merging Data.

3. Change the **input-mask** to *.*dtm.

4. Uncheck the **recursive** checkbox option.

5. Leave **input-csf** set to ${input-csf} to indicate that the process will use the CSF from the previous process step.

6. Leave **output** set to ${input}/merged.dtm to indicate that the results will be stored in *merged.dtm* file in the working directory.
7. Make sure **points** and **breaklines** options are checked and all others are unchecked.
DISPLAYING THE RESULTS

1. Click **Display > Show**.

   A **DtmShow** process module is added to the Workflow process tree and its parameters are displayed on the right pane.

2. No changes are necessary in this step. This process step will cause ISDQ to display the results of the merged surface files from the previous step. Having the **async** option enabled allows the rest of the processes that get added to the Workflow process tree to continue while the surface remains displayed in the **3D DTM Viewer**.
CLIPPING THE MERGED DTM

1. Click **Operate > Clip**.

   A **DtmClip** process module is added to the Workflow process tree in the left pane and its parameters are displayed in the right pane.

2. Leave **input** and **input-csf** set to their default values to indicate that it will use the output files from the previous step.

3. Edit the **output** file by adding "\_clipped" to the file name as shown below.

4. In the **clip-polygon** field key in the file name, **clip.txt**, that contains the coordinates of the polygon used for clipping. Note that if this file is located somewhere other than the folder where the workflow file (*.wf) resides then the full path to the file would also have to be included.

5. Leave **inside checked** to specify that all points inside the polygon are written to the new file.
TRIANGULATING THE MERGED DTM

1. Click **Operate > Triangulate**.

   A **DtmTriangulate** process module is added to the Workflow process tree in the left pane and its parameters are displayed in the right pane.

2. No changes to the fields are necessary for this step. The process will read in the clipped DTM and its associated CSF from the previous step, triangulate it, and write the results back to the same file.
DISPLAYING THE NEW RESULTS

1. Click **Display > Show**.

   Another **DtmShow** process module is added to the Workflow process tree in the left pane and its parameters are displayed in the right pane.

2. No changes are needed here. This will cause ISDQ to display the results of the triangulated clipped surface in the **3D DTM Viewer**.

PROCESSING AND ANALYSIS

SAVE THE WORKFLOW

At this point we are just about ready to submit the workflow for processing, but before doing so, click **File > Save** to save your work.
EXECUTING THE WORKFLOW

1. Click on the **Output** tab to display a blank window. Results from the workflow processes will be displayed here as the workflow progresses.

2. Click **Execute > Run** to process the entire workflow. The whole workflow should take less than a minute to complete. The processing is complete when you see this line at the bottom of the **Output** tab:

   Command-line : C:\Program Files\Hexagon\ImageStation DTMQue 2016\Program\DtmShow.exe ...

   The blue progress bar at the bottom right corner of the ISDQ main dialog box will continue to scroll until you close the 3D DTM Viewers.

   **Note:** You can use **Tools > Max. Parallel Commands** to process multiple jobs concurrently. The default is 1 and while increasing this number will allow more jobs to run concurrently, processing large surface files can cause the system to become disk I/O bound or memory bound, so you will likely want to experiment with different settings depending on your system capacity and the job at hand. Each job attempts to check out a license. Do not set **Max. Parallel Commands** to a number higher than the number of ISDQ licenses currently available to you or the jobs will error off due to insufficient licenses.

COMPARING THE RESULTS

After the workflow completes there will be two instances of the **3D DTM Viewer** displayed on top of each other. Use your cursor to drag one off the other and then use your mouse to zoom in and rotate the 3D view.
Use your mouse to dynamically rotate, pan, and zoom the display:

- Hold the left mouse button down in the view and drag it to apply Roll, Pitch and Yaw.
- Hold the right mouse button down in the view and drag it to pan the display.
- Scroll the mouse wheel to zoom in and out.
Zoom into the LIDAR data in the upper left area of the merged.dtm file. Notice the difference in the display between this and that of the merged_clipped.dtm surface file which has been triangulated. The former represents the raw point cloud and breakline data whereas the latter has been triangulated and provides a shaded relief look to it. You should also notice that the merged.dtm surface does not yield a Z coordinate readout as you move your cursor across the surface whereas the merged_clipped.dtm surface does. This is because surfaces cannot be probed for elevations until they have been triangulated.
To summarize what we have just done, we have created and executed a new ISDQ workflow file which scanned the input folder for input files, converted ASCII and DGN format files to DTM format, merged the DTM files, clipped the merged DTM file to a smaller area, triangulated the clipped DTM file, and displayed the intermediate and final DTM files.