

Quadpatch Grid Exporter

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Introduction

Quadpatch Grid Exporter is a utility application for generating MODFLOW-USG unstructured discretization files (DISU), MODPATH supplemental discretization files (GRIDMETA), and MODFLOW-6 vertex-based unstructured discretization files (DISV). The quadpatch grids are defined by specifying a traditional structured MODFLOW base grid and an associated array of grid cell refinement values. Quadpatch Grid Exporter combines the base grid and the grid cell refinement data to produce a smoothed quadpatch grid. An option also is provided to export the unstructured grid cell polygons as ESRI shapefiles for use in graphics display applications. Base grid and refinement data are provided by a simple text-based grid definition file. Examples of the grid definition file are provided with the software distribution. A brief description of the input is provided below. The example grid definition provides a model that can be modified by users to generate their own unstructured quadpatch grids.

Example Grid Definition File

The grid definition file used to produce the unstructured grid for the MODPATH-7 example ex02 is shown below. The data is arranged in a block format. The modflow grid block defines the basegrid. The quadpatch block defines the refinement data that will be applied to the cells in the basegrid to produce the quadpatch grid.

```
begin modflow_grid
  length_unit = foot
  rotation_angle = 0
  x_origin = 0
  y_origin = 0
  nlay = 3
  nrow = 21
  ncol = 20
  delr = constant 500
  delc = constant 500
  top = constant 400
  bottom layer 1 = constant 220
  bottom layer 2 = constant 200
  bottom layer 3 = constant 0
end modflow_grid

begin quadpatch
  refinement layer 1 = array_file ex02_refinement.csv
  refinement layer 2 = array_file ex02_refinement.csv
  refinement layer 3 = array_file ex02_refinement.csv
end quadpatch
```

modflow_grid block input

The *modflow_grid* block contains the following data items:

length_unit – length unit used by MODFLOW specified either as foot or meter.

nlay, nrow, and ncol – layer, row, and column dimensions of the basegrid.

delr and **delc** – one-dimensional arrays specifying grid cell spacing along rows (delr) and along columns (delc) in the basegrid.

top – two-dimensional layer array specifying top elevation of layer 1.

bottom – three-dimensional, layer-based array specifying the bottom elevation of layers 1 through nlay.

rotation_angle, x_origin, and y_origin – transform data that allow the grid to be transformed to specific real world coordinates, if desired. The rotation angle is measured in the positive counterclockwise direction relative to the positive x-axis. The *x_origin* and *y_origin* values specify the offset location of the x-y origin for the transformed grid. For an untransformed grid, the rotation angle and the x and y origins are all equal to 0. The origin of the untransformed grid is located at the lower-left corner of the basegrid. These transform variables are not used by MODFLOW-USG, MODFLOW-6, or MODPATH. They are provided simply to allow output from those models to be transformed and plotted in specific real world coordinates. For MODFLOW-USG datasets, QuadpatchGridExporter writes the grid origin offset and rotation values to the GRIDMETA file. For MODFLOW-6 datasets, QuadpatchGridExporter writes the grid transformation values to the DISV file. MODFLOW-6 then writes those values to the MODFLOW binary grid file as part of its simulation output. Grid transformation data in the GRIDMETA and binary grid files is available to post-processing programs to transform output from MODFLOW and MODPATH from model coordinates to real world coordinates.

The individual data items can appear in any order within the block.

quadpatch block input

The *quadpatch* block contains the following data item:

refinement – three-dimensional, layer-based array specifying grid cell refinement level data.

Input format

Scalar and other single-value data items are specified as:

variable_name = variable_value

If the `variable_value` is a text item, it does not need to be enclosed by quotation marks unless it contains spaces.

One-dimensional and two-dimensional layer arrays can be specified as a single constant value or an array of values using the following syntax:

To assign a single constant value to all elements of the array:

```
variable_name = constant variable_value
```

To assign an array of values, the values must be read from a separate file that is specified by the syntax:

```
variable_name = array_file filename
```

The file containing the array values must reside in the same directory as the grid definition file. All one- and two-dimensional array data is read as a one-dimensional series of comma- or space-separated values. As many lines as necessary can be used to specify the array data.

Three-dimensional layer-based arrays are specified as a series of layer data items.

To assign a single constant value to all the elements of a specific layer, the following syntax is used:

```
variable_name layer layer_number = constant variable_value
```

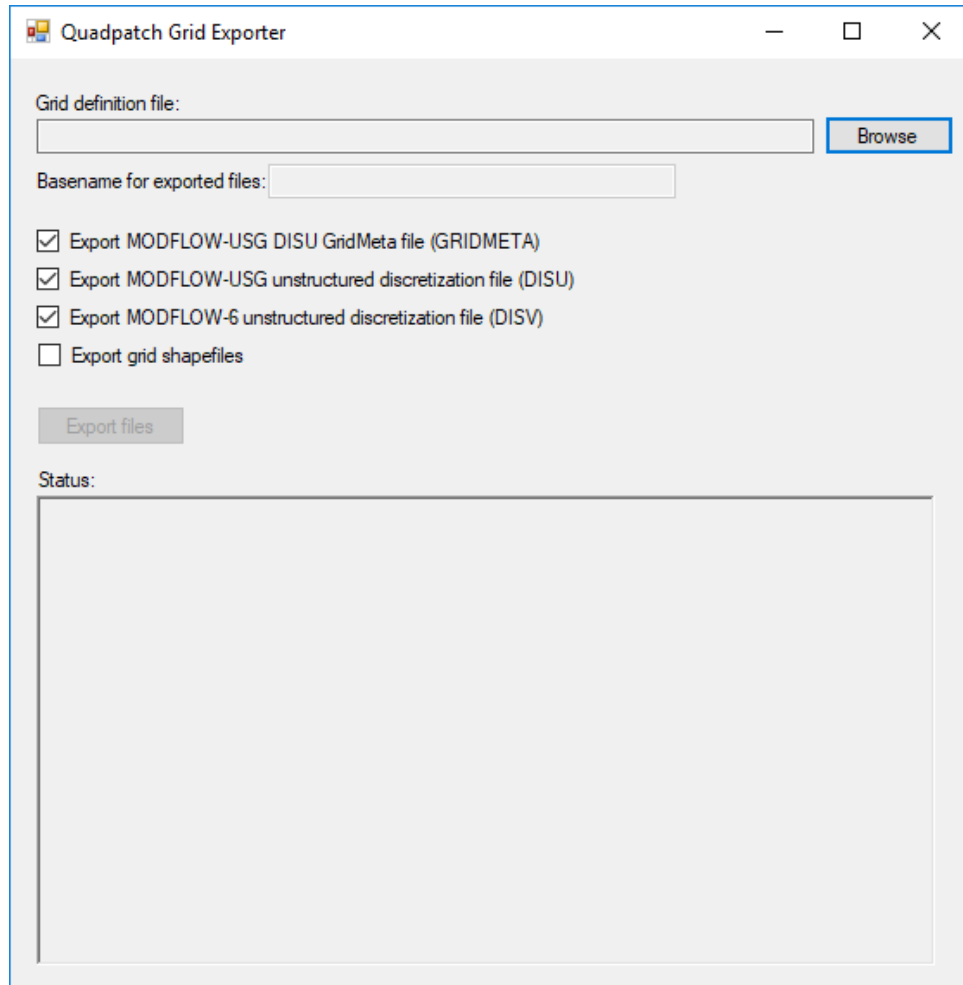
To assign an array of values for the elements of a specific layer, the following syntax is used:

```
Variable_name layer layer_number = array_file filename
```

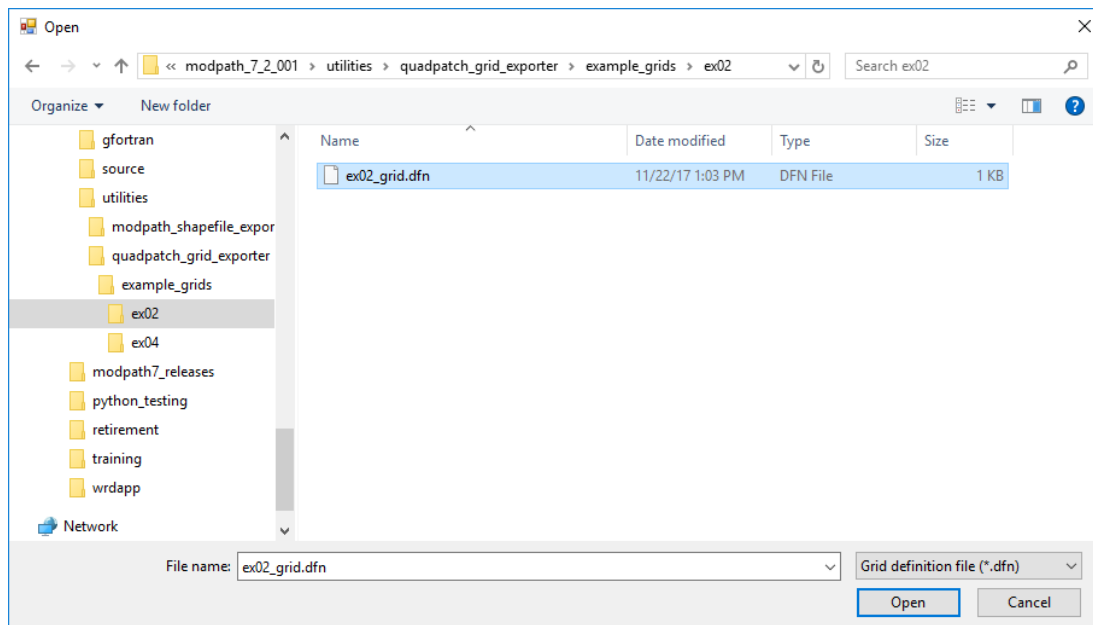
Running Quadpatch Grid Exporter

Quadpatch Grid Exporter is a Microsoft Windows application. It consists of an executable file (`quadpatch_grid_exporter.exe`) and several dynamically-linked library (DLL) files. No special installation is required. The application should run on any computer running Microsoft Windows 7 SP1 or newer. The files can be placed anywhere provided that the executable file and all the DLL files are located in the same directory.

To run Quadpatch Grid Exporter, double click on the executable file in Windows explorer and the application window will appear.



Click the Browse button to find and select a grid definition file.



Select the output options you want and click the Export files button.

The screenshot shows the 'Quadpatch Grid Exporter' application window. It has a title bar with standard Windows window controls. The main area contains a 'Grid definition file:' label, a text box with the path 'Z:\work\modpath_7_2_001\utilities\quadpatch_grid_exporter\example_grids\ex02\ex02_grid.', and a 'Browse' button. Below this is a 'Basename for exported files:' label and a text box containing 'ex02_grid'. There are four checkboxes: 'Export MODFLOW-USG DISU GridMeta file (GRIDMETA)' (checked), 'Export MODFLOW-USG unstructured discretization file (DISU)' (checked), 'Export MODFLOW-6 unstructured discretization file (DISV)' (checked), and 'Export grid shapefiles' (unchecked). An 'Export files' button is located below the checkboxes. At the bottom, there is a 'Status:' label and a large text box displaying the following text:

```
begin modflow_grid
length_unit = foot
rotation_angle = 0
x_origin = 0
y_origin = 0
nlay = 3
nrow = 21
ncol = 20
delr = constant 500
delc = constant 500
top = constant 400
bottom layer 1 = constant 220
bottom layer 2 = constant 200
bottom layer 3 = constant 0
end modflow_grid

begin quadpatch
refinement layer 1 = array_file ex02_refinement.csv
refinement layer 2 = array_file ex02_refinement.csv
refinement layer 3 = array_file ex02_refinement.csv
end quadpatch

Quadpatch grid was successfully created.
```

The status of the export operations is displayed in the text box at the bottom of the application window. The grid shapefiles and the DISU, GRIDMETA, and DISV files generated by the application will be created in the same directory as the grid definition files.

