

MVE2 Module Documentation

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1. skal_DisplaceMap

Title: *MVE2 - DisplaceMap*

Description: *Provides modules involved in displace mapping. There's a module for generating displace map from an image. The next module creates 3D triangle mesh from planar triangle mesh or regular 2D grid according to the displace map. Another module paints 3D triangle mesh points according to their elevation in specified direction. A simple triangle mesh renderer is also available for viewing results.*

Company: *University of West Bohemia in Pilsen, Czech Republic*

Copyright: *Jiří Skála 2005*

Version: *1.0.1974.25928*

Runtime version: *1.1.4322*

1.1. Modules

1.1.1. RegGrid2DSource

Source of regular 2D grid. Supports cell color attributes and point scalar attributes. This is internal module for testing purposes only.

Ports:

- *Output* - Regular 2D grid.

Details:

Author: *Jiří Skála*

Type of module: *unspecified*

Version: *28.5.2005*

Settings

RegGrid2DSource module setup dialog.

1.1.2. RegGrid2DWatch

Prints regular 2D grid including all cell and point attributes. This is internal module for testing purposes only.

Ports:

- *Input* - Regular 2D grid to print.

Details:

Author: *Jiří Skála*

Type of module: *unspecified*

Version: *28.5.2005*

1.1.3. TriMeshAttrAdder

Adds point color and point scalar attributes to triangle mesh. This is internal module for testing purposes only.

Ports:

- *Output* - Output triangle mesh with attributes added.
- *Input* - Input triangle mesh.

Details:

Author: *Jiří Skála*

Type of module: *unspecified*

Version: *28.5.2005*

Settings

TriMeshAttrAdder module setup dialog.

1.1.4. TriMeshRenderer

Simple triangle mesh renderer that supports vertex colors. If there are no point color attributes gray color is used for each vertex. Intended mainly for testing purposes.



Press *W* key to toggle wireframe display. Press *Escape* to close renderer window. You can also use mouse to change view interactively. Moving the mouse with left button pressed rotates the view. Moving the mouse up and down with right button pressed to controls zoom.

How it works:

Input MVE2 triangle mesh is converted into Direct3D style. An array of colored D3D vertices is created from original mesh points and triangle vertex indices are copied into an index array. Result is rendered in a separate thread to a special window.

Ports:

- *InputMesh* - Triangle mesh to render.

Details:

Author: *Jiří Skála*

Type of module: *Renderer*

Version: *18.5.2005*

1.1.5. TriMeshWatch

Prints triangle mesh including all point attributes. This is internal module for testing purposes only.

Ports:

- *Input* - Triangle mesh to print.

Details:

Author: *Jiří Skála*

Type of module: *unspecified*

Version: *28.5.2005*

1.1.6. CalculateDisplace

Assigns scalar attributes to regular 2D grid points according to color attributes of adjacent cells. Scalar attributes will be in [0; 1] range. Supports alpha channel and allows RGB color channels masking.

How it works:

Point colors are computed as a bilinear interpolation of adjacent cell colors. Module can process cell color intensity or one of RGB color components.

Ports:

- *InputGrid* - Regular 2D grid with cell color attributes. Typically a bitmap image.
- *OutputGrid* - Regular 2D grid with point color attributes.

Details:

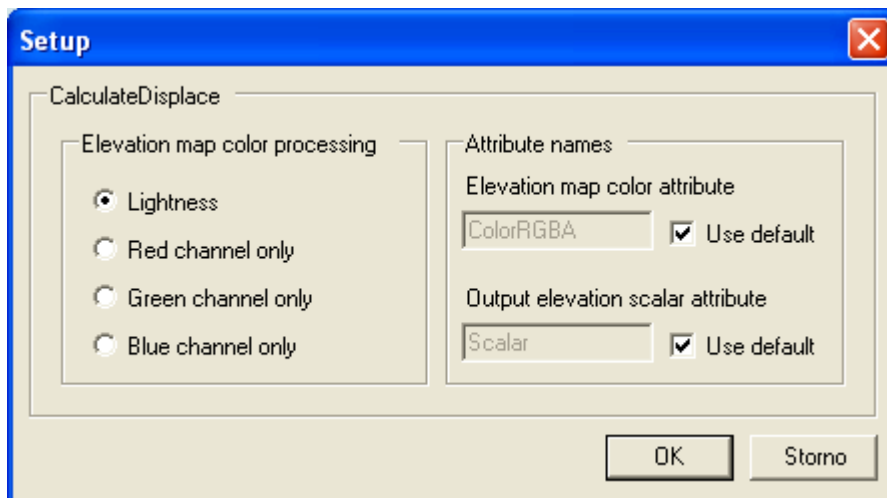
Author: *Jiří Skála*

Type of module: *Color Filter*

Version: *12.5.2005*

Settings

CalculateDisplace module setup dialog.



Elevation map color processing determines how cell colors will be processed. You can select color lightness (also called intensity or value) or make the module use only one of RGB color components.

In the *Attribute names* panel you can specify names for input cell color attributes and for output point elevation attributes. It is recommended to use default values unless you really need different attribute names.

1.1.7. DisplaceMap

Creates a 3D triangle mesh from planar triangle mesh or regular 2D grid. Elevation (Z coordinate) is computed from XY plane according to scalar point attributes. Module provides advanced control over regular 2D grid sizing and positioning. If there is a triangle mesh at module input the resulting 3D

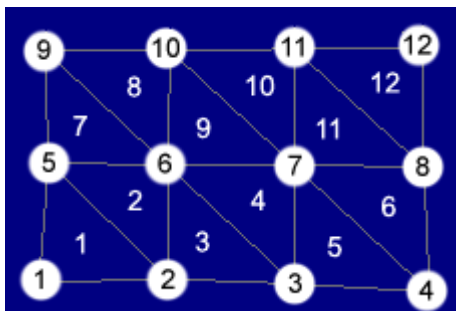
triangle mesh won't have any point or cell attributes even if input mesh has had some. This is because the third dimension of created mesh may give attributes different meaning or make them a nonsense. For example point distance from origin or triangle normal vector would become incorrect.

How it works:

In case of planar triangle mesh input things are quite simple. Points of newly created 3D mesh have the same X and Y coordinates as those from original planar mesh. Z coordinate is computed as point elevation (point scalar attribute) multiplied by elevation factor which may be set in module configuration.

If there is a regular 2D grid at module input some additional computing is necessary. Z point coordinates are calculated the same way as in previous case. Except this we have to determine coordinates X and Y . The input grid is regular so we can compute them quite easily according to grid size and position. See module setup description for further details about possible grid size and position settings.

Triangle mesh vertices are created in rows from left to right. Rows are created from bottom to top. Triangles are then made in strips (not real *triangle strips*, they are still just isolated triangles) in the same direction as vertices. Example of point and triangle creation order is shown in picture below. All triangles have counterclockwise vertex order.



Ports:

- *InputMesh* - Regular 2D grid or planar triangle mesh with scalar point attributes.
- *OutputMesh* - Elevated 3D triangle mesh.

Details:

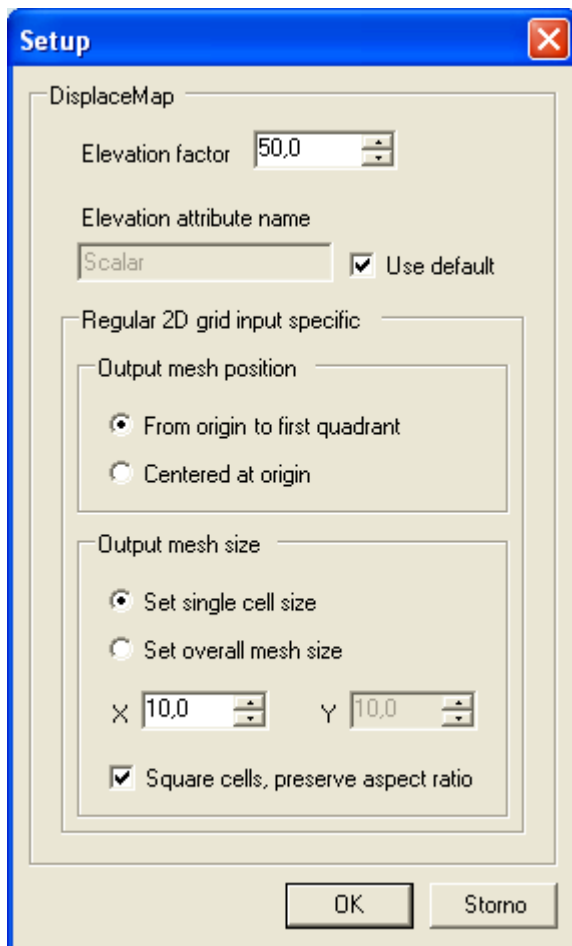
Author: *Jiří Skála*

Type of module: *Elevation filter*

Version: *15.5.2005*

Settings

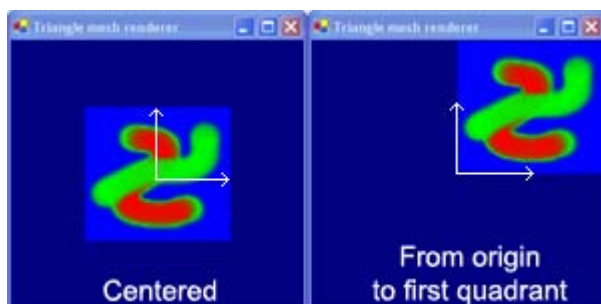
DisplaceMap module setup dialog.



Elevation factor sets the multiplier of point elevation attributes. It's in fact point elevation scale.

Elevation attribute name is the name for scalar point elevation attributes. It is recommended to use the default value unless you really need different attribute name.

The panel below provides settings for regular 2D grid input. *Output mesh position* determines where in the *XY* plane will be the output triangle mesh placed. It may be centered in the origin or start in the origin and continue to the first quadrant. See example in the image below.



The grid size may be set in two ways. First is to enter dimensions of a single grid cell. If you want cells to be square just check appropriate check box and enter *X* edge size only. Another way is to specify overall grid dimensions. Again you may only enter *X* edge size and check the check box to maintain original grid aspect ratio.

1.1.8. Elevation

Paints triangle mesh points according to their elevation. Direction of elevation may be specified arbitrary in module setup dialog or by Vector3D connected to module input.

Several color mappings are available. If input triangle mesh is planar and perpendicular to the direction of elevation then all points are painted in the same color that corresponds to the lowest elevation level.

How it works:

Algorithm proceeds it two passes. In the first pass an elevation level for each point is computed. The direction of elevation yields a normal vector that designates parallel planes. Each point then lies within one of these planes and it determines it's elevation level.

In the second pass color attributes are assigned to points according to their elevation. Point colors are determined by selected color mapping scheme which is adapted to fit point elevation range.

Ports:

- *ElevationVector* - Optional. Direction in which the elevation will be computed.
- *OutputMesh* - Triangle mesh with point color attributes.
- *InputMesh* - Triangle mesh to paint.

Details:

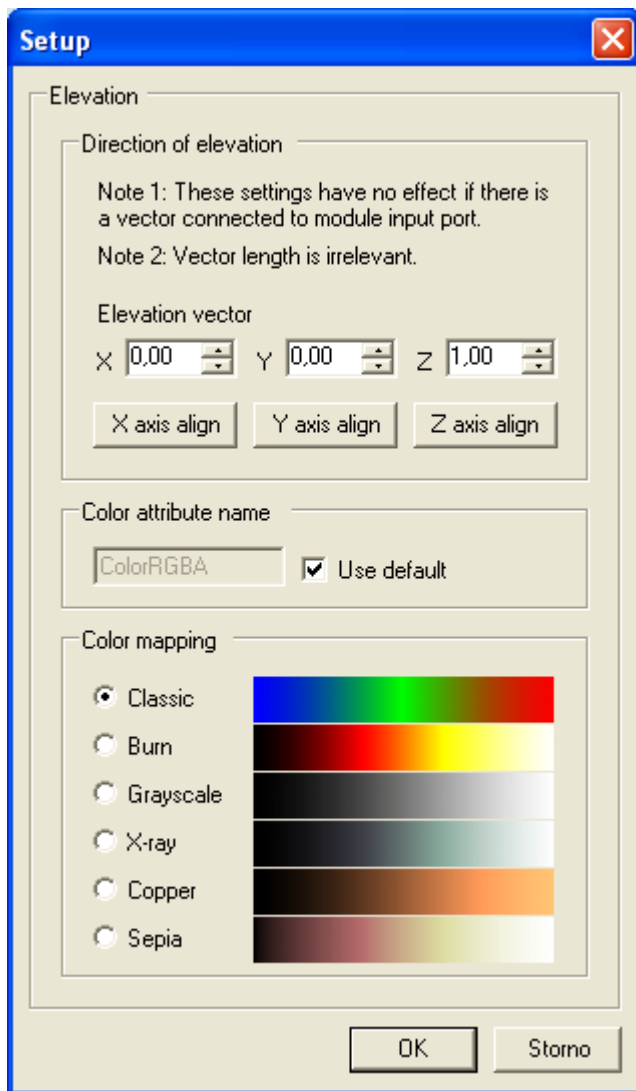
Author: *Jiří Skála*

Type of module: *Color Filter*

Version: *16.5.2005*

Settings

Elevation module setup dialog.



Elevation vector specifies direction in which point elevation will be computed. The three buttons below helps quickly align vectors with one of coordinate system axes. Elevation vector setting is ignored if there is a vector connected to module input port.

Color attribute name is the name for color attributes that will be assigned to points. It is recommended to use the default value unless you really need different attribute name.

In the *Color mapping* panel you can choose which color mapping scheme will be applied to triangle mesh points. If you want inverse mapping just reverse the elevation vector.