

Water Catchment Analysis

Objective:

Learn how to calculate the direction water will flow and find water catchment areas from LiDAR data in VRMesh. The program also allows you to obtain the boundary of a catchment; measure the area of a catchment; calculate the length and average slope of a water flow path. The following instructions will take you step-by-step through the process of water catchment analysis.

Step 1: Extract ground points

1. Classify Point Clouds



Open up the **Survey Wizard** in the Classification menu. Select three commands: *Detect Vegetation*, *Detect Building Roofs* and *Clean Ground Points*. These commands allow you to get well classified ground points.

2. Split Ground Points



Click the **Split Classified Points** command in the Feature Extraction menu to split the ground points.

Step 2: Convert ground points to accurate meshes

1. Point Cloud to Mesh



Open up the **Point Cloud to Mesh Wizard** in the Point Clouds menu. Select the commands you want to execute. Usually, you need to decimate and denoise point clouds before generating meshes, which speed up the process of converting point clouds to meshes and will not affect the accuracy of meshes.

2. Mesh Repair



First use the **Seam Gaps** command in the Mesh Repair menu to seam gaps



among regions. Then use the **Fill Holes** command to fill all holes. Please note


that you need to select the *Open Object* checkbox to make sure the maximum boundary will be kept intact. And finally use the **Remove Floating Parts** command



to delete small sub-objects according to the connection of meshes.


3. Mesh Editing

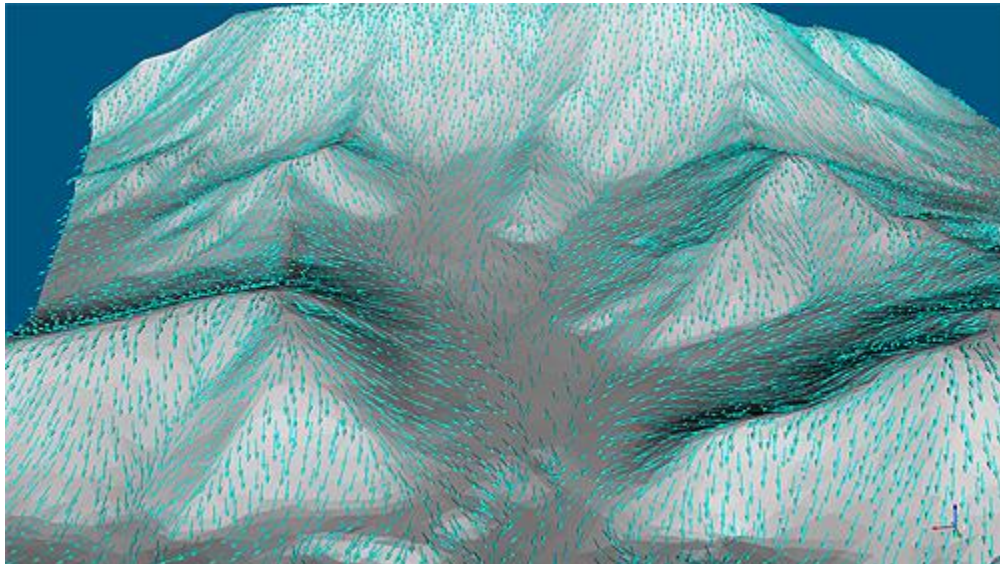
Use the **Smoothing** command  to remove noises from the surface.

Use the **Decimation** command  in the Mesh Editing menu to reduce the number of triangles. This command will maintain a good approximation to the original geometry.

Step 3: Analyze water catchment

1. Calculate the direction water will flow


Click the **Water Catchment** command  in the Analyze menu and press the **[Calculate]** button in the parameter window. The flow direction arrows will appear on the surface. You may change the size and color of the glyphs.




2. Find water catchment area

Press the [**Pick Catchment**] button in the parameter window and click a preferred location on the surface. The program will find a catchment area based on the defined search radius. The catchment area will be marked in a chosen color.




3. Trace water flow path

Click the **Water Flow Path** command  in the Analyze menu and click a preferred location on the surface. The program automatically traces a water flow path. Please note that a catchment area will constrain water flow tracing.


4. Extract catchment boundary


Click the **Pick Marked Boundary** command  in the Mark menu and click a catchment area. The boundary curve of the preferred catchment will be created.

5. Measure the length and slope of a flow path

Click the **Measure Length/Area/Slope** command  in the Analyze menu. In the parameter window, click the [**Catenary Length**] button  and click a preferred flow path on the surface to measure the catenary length; click the [**Catenary Slope**] button  and click a flow path to measure the catenary average (equal area) slope.

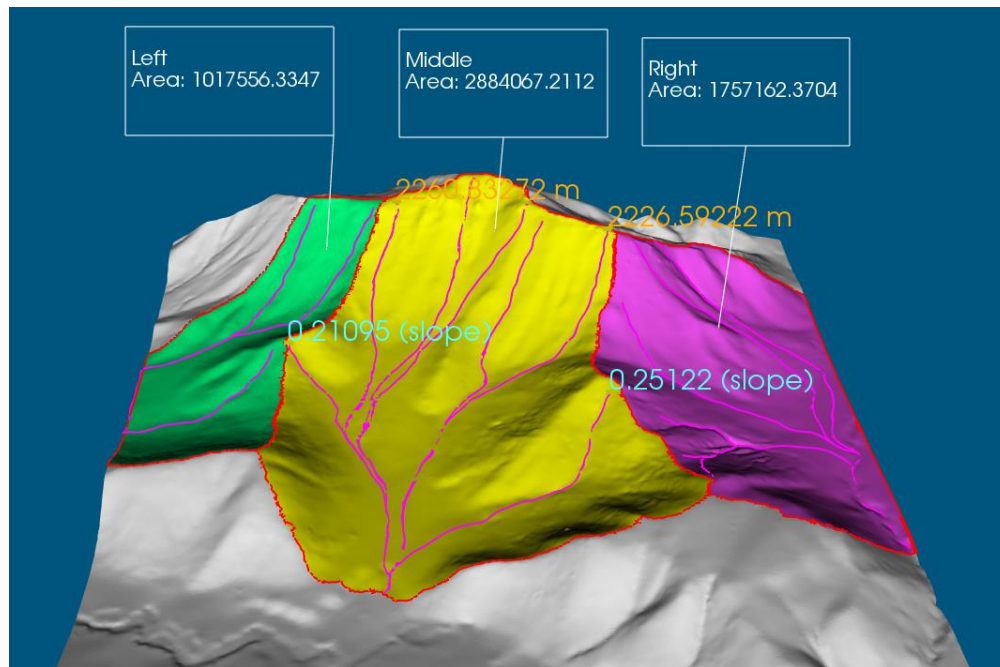
6. Measure the area of a catchment

Extract a water catchment from the object first using the **Split Marked Region** command  in the Mark menu. Remember, you should select the *Extract* option in the parameter window.

After the catchment has been extracted, use the **Measure Volume/Area** command  in the Analyze menu to measure the area of a catchment.

Summary

VRMesh provides a complete workflow for water catchment analysis. The program can automatically classify ground points from noisy point clouds and generate an accurate surface mesh. Based on a high-quality terrain surface, analyzing water catchment becomes easy. You can quickly calculate the flow direction, find catchment areas, trace water flow paths, extract catchment boundaries, as well as do some measurements, such as the length/slope of a flow path and the area of a catchment. The final result is shown below:



YouTube Video: <https://youtu.be/pbfA3JnaqKs>