SurfMate

Digital Terrain Modelling Software for Civil Engineers

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Civil Engineering Software

Description

SurfMate is a very fast, powerful general-purpose surface modelling system running inside of AutoCAD software.
Thousands of people use SurfMate daily for generation and annotation of contour maps, profiles, sections and volumetric computation. SurfMate converts surface mapping data such as point or break line data into contours, grids, triangulated irregular networks (TIN), and triangulated grids.

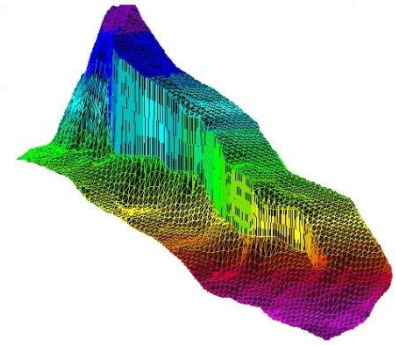


Figure 1 - Accurate surface modelling

A suite of sophisticated tools allows you to manipulate modelled surfaces into high quality finished maps and perform a variety of engineering computations. SurfMate meets the needs of a broad range of professional disciplines such as civil, environmental, petroleum and mining engineering, geologic mapping and exploration, surveying, photogrammetry and topographic mapping, landscape architecture, oceanography and surface visualization.

Application Examples

SurfMate can be used in a variety of applications including:

- Topography
- Slope analysis
- 3D flowlines
- Thickness maps
- Bathymetry
- Contaminant modelling
- Cross sections and profiles
- Visibility analysis
- Lighting analysis
- Building terrace design
- Preliminary road route planning (use RoadMate for full road design)
- Faulted geology
- Mine planning
- Mining engineering
- Mining geology
- Golf course design
- Site visualization

Topography

SurfMate generates contours or surface meshes for topography starting from x, y, z files, digital elevation models or extracted drawing entities, such as spot elevations or contour polylines. 3D breaklines defining elements such as building pad perimeters, roads or geologic faults may optionally be used. Contours may be based on a TIN, grid or triangulated grid.

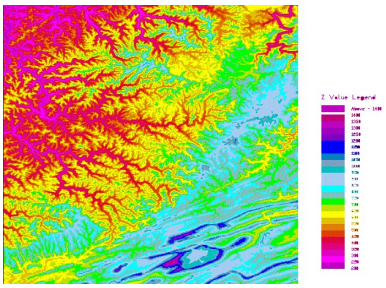


Figure 2 - Using colour mapping to show elevation ranges

Contouring directly on the TIN (Triangulated Irregular Network) is common in civil site design. Contouring on the grid allows for smooth curved surfaces between your data points. Contouring on the triangulated grid (unique to SurfMate) allows both smooth curving surfaces and exact honouring of breaklines. Optional contour line indexing, annotation, hachuring, and colour options are available.

Slope Analysis

SurfMate can display your surface coloured by surface slope in percent or degrees complete with coloured legend showing the slope breakdown. Iso-slope contours may be created and draped onto the surface in 3D. Creating slope analysis maps is quick, easy and flexible.

3D-Flowlines

3D flowlines represent the 3D path a drop of water would take if placed on the surface. A flowline runs perpendicular to a contour line. Flowlines are a great way to check drainage designs or delineate watersheds.

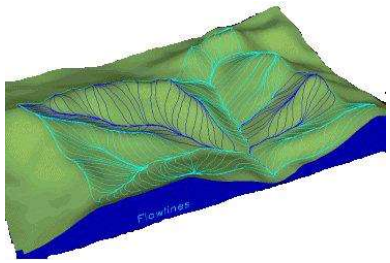


Figure 3 - Flowlines

Creating Thickness Maps

Thickness (isopach) maps represent the thickness between two surfaces. For example, an isopach between the top and base of a coal seam would be used for mapping the distribution of the coal seam. A thickness map between existing and design topography is the basis for cut and fill volumes. Thickness maps are created by subtracting two elevation surfaces, such as an existing and a design topography, or the top and base of a geologic unit. SurfMate includes much more than just subtraction: over 30 surface-to-surface mathematical operations are included, including trend analysis and slope analysis.

Contouring Bathymetry

Many private firms and government agencies who need to map coastal and navigable waterways, reservoirs and rivers use SurfMate. Profiles, cross-sections, water and sediment volumes are generated quickly and easily.

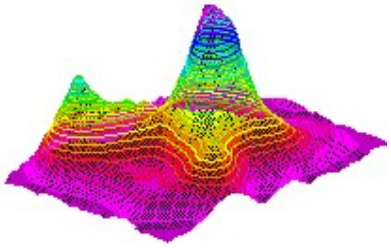


Figure 4 - Contouring Bathymetry

Modelling Contaminants

Modelling contaminant distribution with SurfMate uses the Kriging capability of the program. Interactive variogram design allows you to create custom semi-variograms to match the transport characteristics of the contaminant - stratigraphy combination.
Logarithmic contours may be used or irregular contours based on specific

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contaminant thresholds may be generated. Several maps may be combined to show the relationship between the contaminant and bedrock topography, stratigraphy or ground water surfaces.

Creating Sections

Longitudinal sections and cross-sections may be created along any arbitrary line or polyline paths. Use the centreline of a road or stream to create a 2D graph of elevation versus distance.
Create a profile of existing topography along your proposed centreline, then draw your design vertical alignment right on the 2D profile and reapply it to the design centreline to create a 3D
centreline polyline to your exact design. Great for preliminary road design or open channel hydraulics design.

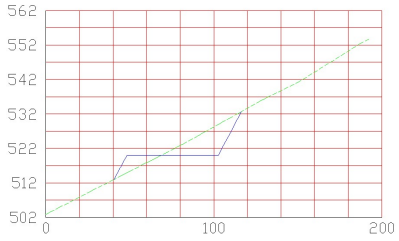


Figure 5 - Cross Sections

Computing Volumes

Rapid, accurate volumetric computation is a strength of SurfMate. All volumes are prismoidal volumes of a TIN, grid or triangulated grid representing your surface. The Area Volume command lets you calculate the volumes within any number of closed area polylines.
Supply one surface representing thickness or two surfaces representing the top and base of a unit (or existing and design topography) and volumes are calculated and reported with cut, fill and net volumes for each area, plus the grand total.
Surface mining engineers use area volumes to calculate overburden and product volumes under hundreds of removal polygons in one pass. Site designers use area volumes for cut/fill calculations for different parts of the design area. The resulting thickness map is always preserved so you may contour the cut/fill or isopach map.

Visibility Analysis

Sight lines are important in site planning, environmental remediation and transmission tower placement. Choose a viewpoint location and SurfMate will display a visibility analysis by colouring the topographic surface by angle of incidence where it is visible and indicating areas, which are not visible from that viewpoint.

Lighting Analysis

Surface lighting may be analysed by supplying a light location, and then the displaying the surface coloured based on the angle of incidence of light striking the surface.

Designing Platforms/Terraces

Creating building terraces set into the existing terrain is painless. If the terrace is slightly sloping, draw your outline with a polyline and then use "grade polyline to a plane" and simply show SurfMate your required direction of fall and input the value of the grade. Your polyline is instantly updated in 3D! Supply the cut slope and fill slope angles and SurfMate's intersect slope command will project the slopes from your pad perimeter and calculate the head of the cut and the toe of the fill and draw the resulting daylight line in 3D.

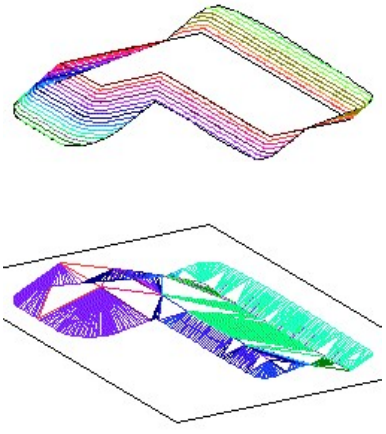


Figure 6-Automated Platform/Terrace design

Create a new design surface by selecting the daylight and perimeter lines as break lines and you're done. Use SurfMate's optimise terrace routine to have your design with balanced cut/fill or even with a designated amount of excess cut/fill material. Takes into account material bulking factors. Complex earthworks designs can be accommodated where you require varying earthworks side-slopes. Slopes can be transitioned using linear or spline methodology.

Conceptual Road Route Planning

Tools are included for basic preliminary road design (use in conjunction with RoadMate for detailed road design). Starting with the proposed 2D-road centreline in plan view, drape it on existing topography and make a quick 2D longitudinal section/profile of the existing ground along the road. Draw your approximate design vertical alignment right on the longitudinal profile.

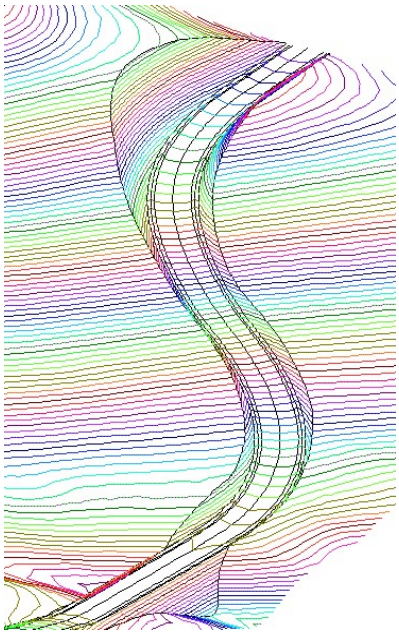


Figure 7 - Conceptual road design

Use vertical align to apply your preliminary vertical alignment back to your 3D-road centreline, resulting in a 3D centreline of your road. Use "apply section" to use a preliminary cross-section template of your roadway to create the breaklines for the road, including the cut and fill daylight lines.

Faulted Geology

Complex faulting may be accurately modelled using SurfMate. Faults may be drawn in as 2D polylines and placed in 3D using the extrapolate command which extrapolates the local gradients from the wells within the fault block. Vertical position and throw may be analysed and

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adjusted using the drape, flatten and vertical align commands. Faulted surfaces may be used with cross-sections and volumetrics. Surfaces may be created representing the fault itself and then intersected with a stratigraphic surface to solve for the 3D-fault trace.

Mine Planning

SurfMate can model surface topography, subsurface geology and changing surface mine configuration to calculate reserves, overburden and product volumes and map quality data. Structure and thickness maps can be quickly calculated and used together with the area volumes command to compute product and overburden volumes for hundreds of irregular uncover and removal polygons in one pass. The "intersect slope" command allows rapid design of highwall intersections or lift configuration for a tailings pile. Stockpile volumes may be reported in any volume units you require.

Mining Engineering

Reservoir modelling including structure, isopach, porosity, permeability and saturation maps may be created from well bore data or from the technical committee's contour polylines. SurfMate's surface operations lets you model each parameter independently and then calculate the hydrocarbon pore volume using surface-to-surface math. Need each parameter by lease tract? No problem, use the area volume command, supply closed polylines for the lease outlines and SurfMate will calculate hydrocarbon pore volume, net pay, or any other parameter, tract by tract. Put your planimeter in the museum. Supply your conversion factors and you can report your volumes in stock tank barrels. Need to fill your reservoir simulation software and view the results? SurfMate's open architecture allows you to sample your reservoir on any spacing (or an irregular spacing) and export the parameter values to your simulation model. Import and view your simulation results graphically.

Mining Geology

SurfMate handles large geological data sets with ease. Whether you are mapping a prospect with 20 boreholes or a basin with 40,000 boreholes, SurfMate can build your map in seconds.

Structure maps, faulted structure maps and isopach maps with complex zero lines may all be created and modified quickly. Any geological interpretation starts with the raw data and builds upon it using the power of the mapping algorithms together with the guidance from the experienced explorationist to converge on the best answer.

SurfMate is designed for rapid iteration as you build and modify your maps. Powerful surface-to-surface math allows you to quickly compute resulting structure maps from an isopach and underlying structure maps. Balanced isopach maps, analogous to balanced cross section keep you honest.

Curvature analysis allows for mapping fractured reservoirs. Trend surface and residual methods are built in.

Golf Course Design

SurfMate is widely used in golf course design and visualization. Smooth curvature together with breaklines and boundaries of arbitrary complexity allows the designer to construct, analyse and visualize the most demanding courses. SurfMate can output directly to rendering packages, such as Autodesk 3DS Max, for fly over visualization. Bunkers, greens and fairways may be exported individually for ease of materials application.

Site Visualisation

Once your design nears completion, SurfMate allows you to "stand" anywhere on the surface and look around in perspective view. The surface view command lets you specify camera height and camera lens for perspective views



Figure 8 - Visualisation

from close-up to aerial perspectives. Complex surfaces may be partitioned based upon surface material for rendering and re-sampled at an optimum face count for the rendering package. You will never find a flipped or missing face in a SurfMate mesh.

Civil Engineering Tools

SurfMate is packed with useful features – here are just a few:

- Draw Co-ordinate Grid using grid lines or crosses
- Import ASCII survey data with descriptions – includes easy input selection, filters for descriptions and high speed reading
- Create 3D breaklines from 2D lines by automatically snapping onto survey points – this alone can save you hours when all you have is in 2D!
- Auto-connect points with a 3D polyline for joining breakline points automatically in 3D.
- Co-ordinate table of inserted blocks where Y, X and Z values are updated or removed when the points are moved or erased with user input of colours etc. Automatically update values in the co-ordinate table when points are moved (also in the Z direction!) or erased. Tables can even be updated to reflect the elevations from a different surface. Co-ordinate tables can be exported to text files to facilitate easy interface with survey equipment
- Draw batter slope lines for earthworks automatically
- Label lines and polylines with distance and bearing automatically – useful for cadastral work.
- Convert Splines to polylines (2D or 3D) for use as breaklines
- Draw 3D flow arrows showing steepest direction of flow
- Grade any plane in one direction or give slope in 2 directions and SurfMate will calculate the resultant slope.
- For terracing/platform design, automatically achieve a balanced cut/fill design or have excess cut or excess fill.
- Create sections through multiple surfaces with full control over datum, Labelling increments etc.
- And many more....

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Seamless Integration

SurfMate is used with RoadMate, PipeMate and WaterMate software from Technocad providing complete, instant, seamless integration for the extraction of all ground level information. No more wasted hours typing-in your ground elevations!

On-line help

SurfMate has full-featured Windows on-line help with indexing and search features. Tutorials included for easy reference.

Technical Support

Professional technical support is available with your subscription.

Purchase Options

You can purchase a short-term or long-term subscription. The choice is yours – whatever suits your budget and project requirements!

- Network licensing (LAN) is also available

Hardware Requirements

As per Autodesk recommendation for AutoCAD or AutoCAD Map

Software Requirements

- AutoCAD Release 2027, 2026, 2025 & 2024 supported. Also, Autodesk Map 2027, 2026, 2025 & 2024, or any AutoCAD derived Autodesk product. AutoCAD LT not supported.
- Operating systems: Windows 10 64-bit and Windows 11 64-bit

Ordering Details

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