Horizontal Hachures

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Outline

Definition
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Definition

From Cartographic Relief Presentation (Imhof, 1982)

- Horizontal hachures are more compactly and evenly arranged than contours.
- In contrast to contours, no exact elevation value is assigned to the individual hachure line.
- The thickness of horizontal hachure lines is not constant, usually following the principle of oblique lighting.
Horizontal Hachures

From Imhof (1982), figure 154, page 231
Custom Relief Contours

Comparison with Horizontal Hachures
Horizontal Hachures vs. Custom Relief Contours

- **Horizontal hachures**
  - Compact and evenly arranged
  - No exact elevation values assigned
  - Thickness varies with oblique lighting effect

- **Custom relief contours**
  - Spacing based on contour interval
  - Contours drawn at round numbers (e.g. 10, 100 etc.)
  - Thickness and/or color vary with oblique lighting effect
Horizontal Hachures vs. Custom Relief Contours

Horizontal hachures

Illuminated contours

Tanaka (1950) The Relief Contour Method of Representing Topography on Maps.
Horizontal Hachures vs. Custom Relief Contours

Horizontal hachures

Illuminated contours

Pauliny map - Courtesy ETH Zürich (historic slide collection)
Horizontal Hachures vs. Custom Relief Contours

Horizontal hachures

Illuminated contours
southwest illumination

Pauliny (1892), Karte von Schneeberg, Raxalpe, und Semmering.
Horizontal Hachures vs. Custom Relief Contours

Horizontal hachures  Shadow contours

Horizontal Hachures vs. Custom Relief Contours

Horizontal hachures

Shadow contours

Landkarte des Kantons Thurgau (188?)
Horizontal Hachures vs. Custom Relief Contours

Horizontal hachures

Shadow contours

Köpcke (1885) Ueber Reliefs und Relief-Photogramme
Other Custom Relief Contours

Slope shading effect

Oblique lighting effect?

Bulletin of the American Geographic Society (1907)

New Zealand Mapping Series #58 Arthur’s Pass map (1931)
Other Custom Relief Contours

Localized contour removal - steep areas

Loose rocks

Swisstopo (in Jenny et al. (2014) Design Principles for Swiss-style Rock Drawing)

Mackaness and Steven (2006) An Algorithm for Localised Contour Removal over Steep Terrain
Methodology
Methodology - Overview

- Use contours to create shading effect

- Create shading effect by varying number and spacing of contour segments as opposed to varying thickness or color of contours

- Avoid sharp edges to the contour segments that could be associated with using polygonal outlines to define the ends of contour lines
Methodology -
Technique

- Begin with digital elevation model (DEM) grid
- Hillshade the DEM
- Convert grid cells of the DEM to points
- Contour the points at a small contour interval
- Buffer points using values smaller than the grid cell size and clip the contours
- Assign hillshade value to the clipped contours
- Iteratively buffer and clip the contour segments to create longer, more continuous horizontal hachures that are more closely spaced in more darkly shaded areas
Methodology – Site Example
Methodology

DEM of Mt. Hood, Oregon, USA
26.3 meter grid cells
Grid extent = 92 x 111
Contour interval = 1 meter
Methodology

Buffered points

Buffered points with all contours
Methodology

Buffered points with all contours

Contours clipped and those on point selected
Methodology

Buffered contour segments base on hillshading value

Contours clipped and those on points selected
Methodology

Buffered contour segments based on hillshading value

Contours clipped and those on points selected
Methodology

Buffered contour segments based on hillshading value

Contours clipped and those on points selected
Results
Results

Horizontal hachures
Results

Horizontal hachures

Horizontal hachures with short segments eliminated
Results

Horizontal hachures

Horizontal hachures with hypsometric tinting
Results

Horizontal hachures

Horizontal hachures with short segments extended
Results

Horizontal hachures

Horizontal hachures with contours
Summary

- Horizontal hachures are one method of modulating contour lines to achieve relief shading.

- This method of horizontal hachuring produces fine lines that provide both shading and texture.

- The resulting contour segments benefit from traditional contours or hypsometric tinting that highlight the form of the terrain feature.
Special Thanks

- Lorenz Hurni – ETH Zürich
- Bernhard Jenny – Oregon State University
- Geoff Aitken – NewTopo (NZ) Ltd.