International Cartographic Association
Association Cartographique Internationale

Mountain faces

Stephan Wondrak [a]

[a] *Swiss Federal Statistical Office, stephan@wondrak.ch*

Keywords: Mountains, Comparisons, Application, Animation

Abstract:

A mountain may have very different faces, depending on the location of the observation point. Ridges and walls often appear flatter or steeper than they actually are. Each summit offers its own view of the mountains around it.

The different faces (or views) of a mountain result from the variation of certain imaging parameters such as the geographical position and sea level of the observation point, as well as the viewing direction (horizontal and vertical). The only constant may be the focal length of the human eye, or of a binocular or camera lens.

Figure 1. Obergabelhorn and Matterhorn (Switzerland). Observation point : Le Besso (3669 m), © S. Wondrak

When looking to mountains in a landscape relief (virtual or true 3D), the spontaneous movements of the observer in space result in ever new observation points and continually changing perspectives. In a true 3D relief, the distances between the observation points and the observed mountains are very short, and, in contrast to the long distances of fixed[1] summit views in nature, the focal length of the human eye is constantly adapted[2]. The constantly changing mountain views do not have uniform imaging parameters. Therefore, the direct comparability of such mountain views is limited.

Figure 2. Obergabelhorn and Matterhorn in the relief «Walliser Alpen» of Toni Mair. Coordinates of the observation point unknown.

[1] Regarding the position of the summit
[2] In a photograph we see this as depth of field (see Figure 2).

The aim of the presented work is the development of an application for the generation of directly comparable mountain views. By the standardisation of the following imaging (or mapping) parameters, mountain views become directly and objectively comparable:

- Altitude of the observation point
- Distance to the summit
- Viewing direction (horizontal and vertical)
- Focal length of the (virtual) lens

For a direct comparison of two mountains, all possible observation points are located on circles around the summits, with a constant altitude and distance to the observed mountains. The horizontal viewing direction alters synchronously, depending on the point of the compass.

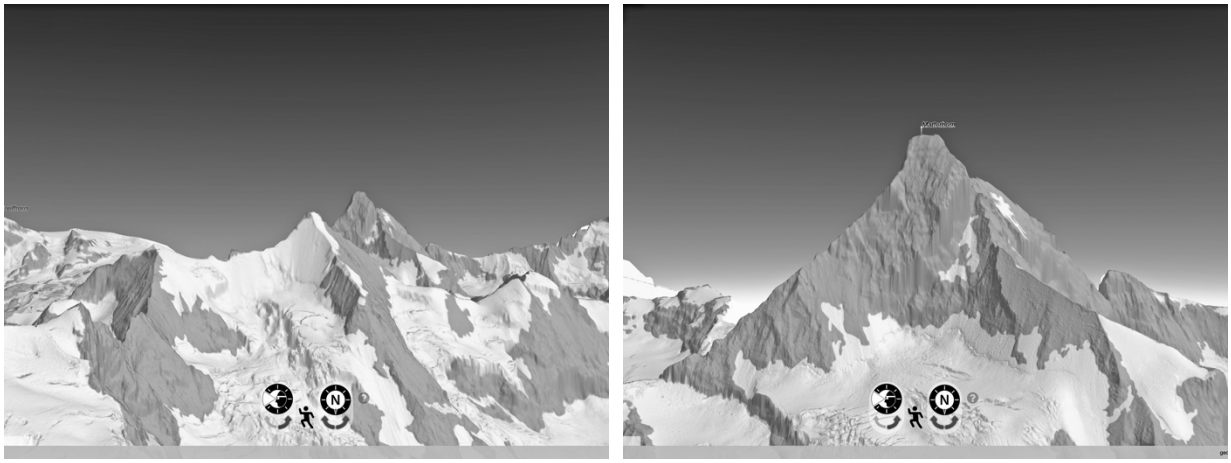

Figure 3. North faces of Obergabelhorn and Matterhorn in a direct comparison (Source: www.map.geo.admin.ch).

The photographic view of a mountain always contains a profile (or contour) line. This contour line can be emphasized, extracted and shown separately as a silhouette. For a quick comparison of two or more mountains, such silhouettes can also be generated with vector graphics. Both forms of presentation (photo and vector graphic) can be animated in the application. With vector graphics, even a dynamic transition between two silhouettes is possible (so-called morphing).

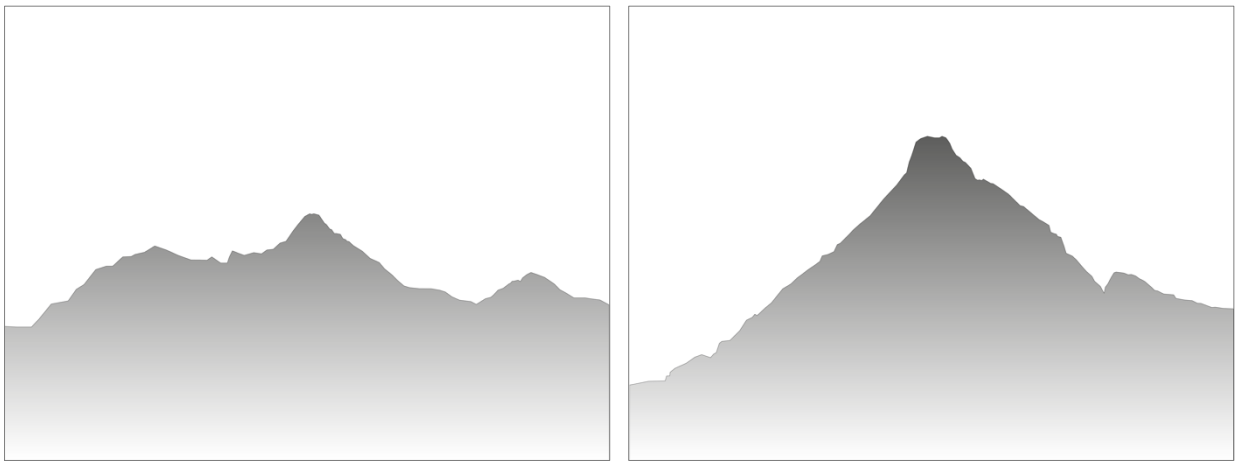

Figure 4. Silhouettes of Obergabelhorn and Matterhorn. Altitude and distance of the observation points: 4000m.

Thesis: The different characteristics of mountains (e. g. altitude, size, shape) become more apparent with direct comparisons, and due to the standardisation of the mapping parameters described above.