Plan Oblique Relief for Web Maps

Bernhard Jenny[a], Jonas Buddeberg[b], Charlotte Hoarau[c], Johannes Liem[a]

[a]College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, Corvallis, Oregon, USA
[b]University of Potsdam, Germany
[c]IGN, COGIT, France; Université Paris-Est

Plan oblique maps show the third dimension of terrain with a side view on an otherwise conventional planimetric map (*Jenny, B., & Patterson, T., 2007. Introducing Plan Oblique Relief. Cartographic Perspectives, 57).* The third dimension is easier to perceive on plan oblique maps than on conventional maps. Plan oblique relief has been used for static maps for print, but not for interactive web maps. This paper reports on two new developments that make plan oblique relief available in web maps. The first is a server-side renderer for adding a plan oblique dimension to two-dimensional web maps. The renderer loads a tiled terrain model, then creates a plan oblique view from the terrain, and finally drapes 2D map tiles onto the terrain. The result is a new set of map tiles with plan oblique geometry and optional shaded relief that can be viewed with standard web mapping libraries. We will discuss the OpenGL-based renderer, and present sample maps. An example is the *Crinkled Watercolor Map* at http://cartography.oregonstate.edu/CrinkledWatercolor.html.

The second development enables the map reader to adjust the plan oblique geometry in the web browser. The terrain inclination angle, the illumination angles for shading, as well as the hypsometric tinting can be adjusted on the fly at interactive frame rates. These features have been added to an alpha version of the OpenLayers 3 web mapping library (Figure 1). Resulting web maps differ from regular web maps by the fact that the web browser loads a tiled terrain model instead of a tiled map image. The terrain tiles are rendered using WebGL on the client browser, and combined with a texture tile set. We will discuss the architecture of this system, including the details of the WebGL rendering component. Example maps will be presented, for example, the *Interactive Plan Oblique Europe* map at http://cartography.oregonstate.edu/tiles/PlanObliqueEurope/ (Figure 1).
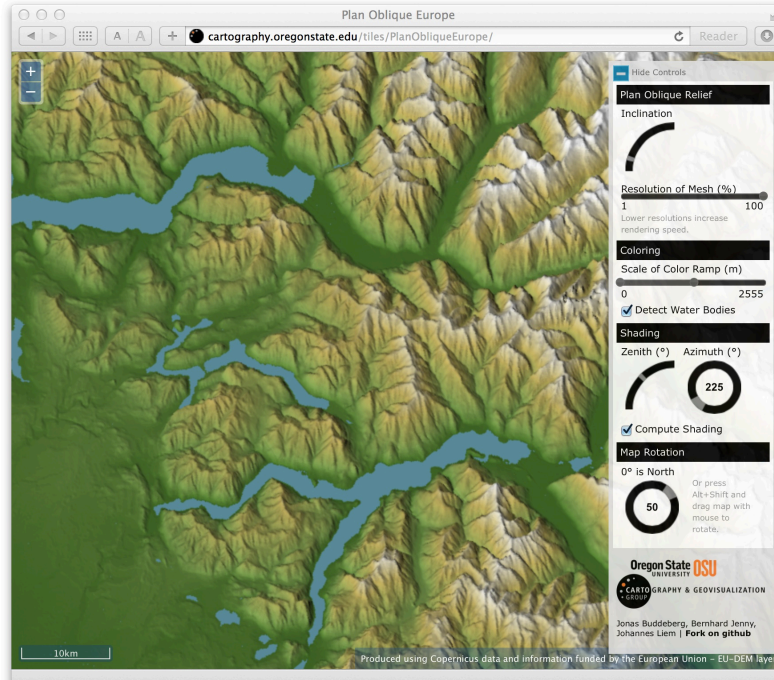
Figure 1: Interactive plan oblique web map based on OpenLayers 3 and WebGL

Keywords: 3D map, relief map, terrain map, WebGL, OpenLayers 3, terrain renderer