Web-based Decision Support System for Choosing the Appropriate Map Projection

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Web-based Decision Support System for Choosing the Appropriate Map Projection

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Online demonstration: **http://mercator.elte.hu/~kerkovits/projections/**

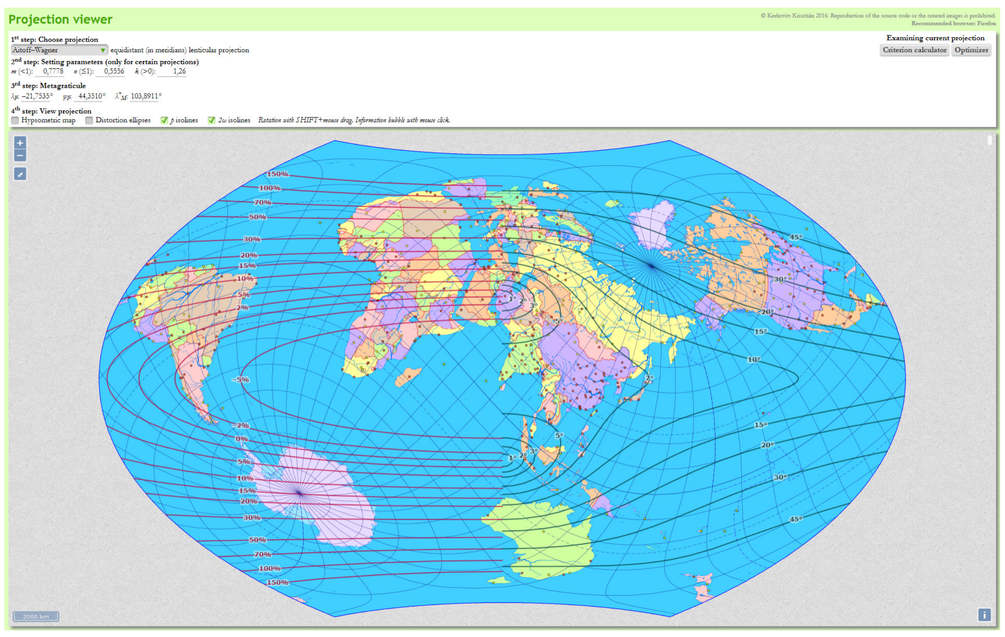
The goal of the application

The best projection for a map depends on many different factors: the extent, the shape and the location of the mapped area, the theme of the map, the knowledge of the expected reader etc. Finding the most suitable projection is a tedious process, and needs high experience. Therefore, several kinds of decision support systems had been created for less educated cartographers. The web app called Projection Wizard [1] is a simple tool which asks only the extent of the mapped area and recommends using one of the 30 built-in projections. Only simple constraints (e. g. conformality or equivalency) are supported. The mapped area cannot be irregular in the software, it must be a geographic quadrangle. This software neither optimizes all parameters of the recommended projection nor reports the quantity of its distortion.

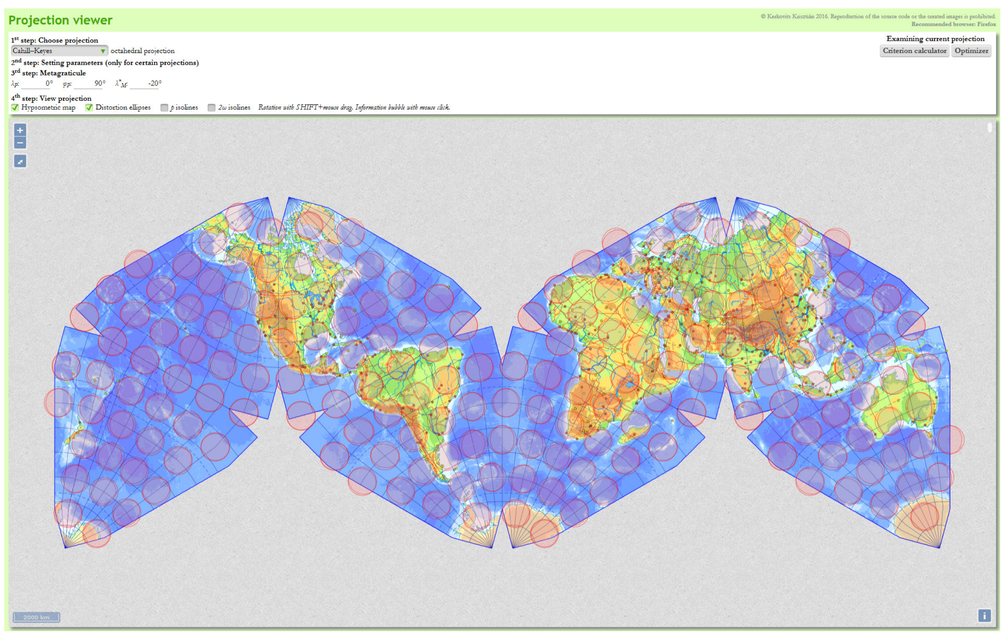
More experienced cartographers may want to spend a little more effort to find the best-looking projection. Therefore, the authors created a more sophisticated web app based on the OpenLayers library. In this web app, projections can be compared, adjusted or even optimized for the region of interest.

Viewing the projection

The first module of the program displays a digital map of the world in any of the listed nearly 100 projections. Parameters can be adjusted manually. The aspect of the projection can be rotated. The user gets immediate feedback. Distortion characteristics can be visualized by distortion isolines.



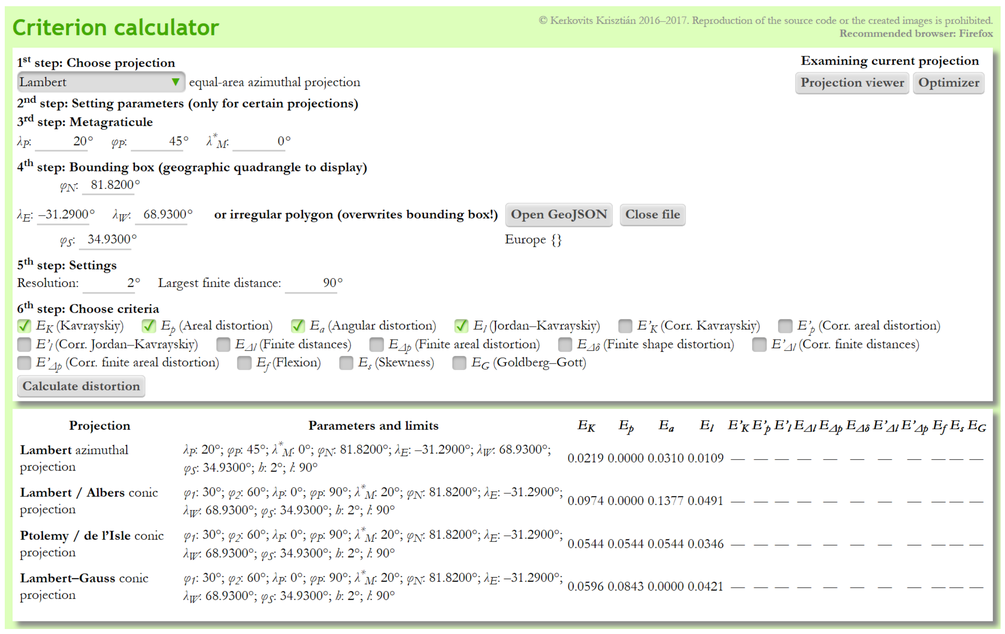
Tissot indicatrices can also be drawn onto the map. Even some uncommon projections (e. g. butterfly) are supported.



This module is also used for teaching the characteristics of map projections to Cartography students at Eötvös Loránd University.

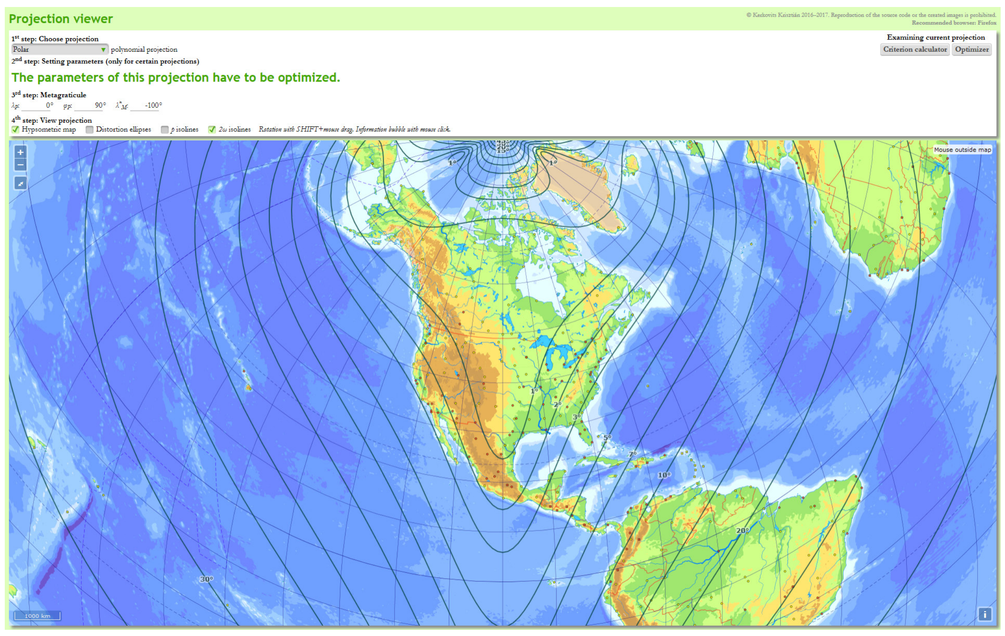
The distortion calculator

The created map does not only need to be good-looking, it should also be appropriate for making estimation of distances, areas, etc. Different kinds of distortion values have been developed to express the overall distortion of a projection. This calculator can estimate these different criteria for geographic quadrangles and even for irregular areas. The user can compare results in a table. Whenever possible, an effective generalization of the Simpson's rule is used for fast calculation of numeric integrals [2]. Irregular areas can be described as a GeoJSON file.



Optimization of parameters

The third module of the software optimizes the projection aspect and parameters to gain as low distortion as possible. Calculations are done using the Nelder–Mead (simplex) method. Polynomial projection formulas make it possible to approximate the ideal projection even for irregular areas. The user gets visual feedback during the long calculation and can interrupt the process.



Further plans

Current GIS applications do not support transforming digital maps to these less common projections. Therefore, a transformation toolkit for raster and vector features is planned in the future.

References

[1] B. Šavrič, B. Jenny & H. Jenny: Projection Wizard – An Online Map Projection Selection Tool. In: The Cartographic Journal 53/2 pp. 177-185. 2016.

[2] Kerkovits K: Vorteilhafteste Flächentreue Kegelentwürfe für unregelmäßig begrenzte Gebiete. Kartographische Nachrichten 67/3 pp. 122-128. 2017.