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Bivariate geospatial data visualization and perceptual colour models

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As part of the GeoViQua FP7 EU project, existing and novel approaches to geospatial quality visualisation are being studied. We found there are various approaches for visualising location-dependent geospatial data quality, and many exploit colour as a means to transport information (as a so-called "retinal variable"). For machines to treat colour, it has to be described in some (ideally well-defined) colour space, but the qualities of colour spaces themselves are often being overlooked – even though their inner structure substantially affects the results of colour-based visualizations. This not only creates problems for the reproducibility and validation of such approaches, it also may reduce the quality of the resulting visualisations.

It is often held that one color space is as good as any other, but the advent of perceptually proportional color spaces such as CIECAM02 introduces a class of color spaces which are ultimately superior for tasks such as visualization of information. This is because in such models, the components of color (such as lightness, hue, saturation) are separated very close to how human perception separates them. Thus, unlike traditional colour spaces, these spaces allow changing one component (e.g. hue) without altering the perception of the others (i.e. lightness or saturation). Such components are called colour appearance correlates. In effect, they can be varied and perceived independently, enabling colour-coding without visual crosstalk.

In this presentation we will show how CIECAM02 can be used to express bi-variate values in color appearance correlates and how this improves a geospatial visualization which includes quality. Preliminary results indicate that for example intercomparability between color patches is improved, especially if they are not adjacent.

Just as traditional color coding, the technique applies to a range of information. It is, however, especially suitable for conveying bi-variate data as occurs when combining data and corresponding quality information. While CIECAM02 appearance correlates require three correlates to wholly define a colour appearance, the correlates are not completely independent, making the combined use of three or more correlates impractical.

In the presentation, this and other issues arising in application of the model to geospatial data are discussed. An open-source implementation is shown and the conceptual relation to exiting symbology standards will be discussed.