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MapColPal - a color palette generation and testing tool for thematic maps

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Abstract:

Color is a crucial part of cartographic visualization while simultaneously posing many challenges to the cartographer working on it. Creating and testing a self-made color palette for a map instead of relying on a standard palette requires manual effort, time, and expertise. It is possible to do this prototyping within a geographic information system, but they offer little help in this demanding process. Tools to aid in the cartographic design process with a limited scope and high depth became known as 'cartographic brewers', as defined by Brewer (2003), with ColorBrewer, as described by Harrower and Brewer (2003), as one of the most influential examples among them. ColorBrewer helps work with and understanding properties of color palettes more easily. And yet, based on its design choices and the state of research and technology during its conception, it has limitations in multiple areas: It features only a selection of pre-created color palettes for a single data layer and presents these palettes only as a choropleth map.

What could a tool look like which improves on ColorBrewer to assist cartographers in choosing color palettes for thematic maps? The proposed answer to this question is an online tool with the ability to generate new color palettes and then present them in multiple contexts apart from only as a choropleth map, as depicted in figures 1 and 2. In further detail, the key features of the proposed tool are:

1. The tool generates new color palettes algorithmically depending on cartographic, perception-based principles as well as user inputs.
2. Thematic maps are often displayed using a topographic map as a basemap for context. Therefore, basemaps should be considered in choosing or generating the color palette of the thematic map. The application includes common basemaps (e.g., the OpenStreetMap WMTS) so that the figure-background relationship between the information layers of the thematic map and the basemap can be evaluated visually, but also to generate color palettes automatically to contrast from that basemap (i.e., the basemap is sampled for dominant colors and new palettes are generated for optimal contrast).
3. The tool creates color palettes for a polygon layer (e.g., for a choropleth map) or a point layer (e.g., for a graduated symbol map) or for both at the same time while optimizing them for simultaneous display. So, in the most advanced use case, the tool can generate suitable colors for graduated point symbols presented on top of polygons which in turn could be viewed above a chosen basemap.
4. The tool can also generate a fitting color each for text elements, generic border lines and a monochrome background to offer more support in designing a color scheme for the map in its entirety.
5. The visualization of the output palettes features multiple considerations to visually evaluate the created palette: An option to view either an example map at city level or at country level; a transparency slider to test the palette in different opacities; an option to select different kinds of color vision deficiency to filter the visualization and mimic the perception of a color-blind person; and the sample data for the output will be arranged to feature different symbol sizes and combinations of color classes next to each other to allow for assessment of simultaneous contrast.

The focus of the proposed application is on thematic maps, primarily deployed on the web, therefore the tool will be programmed as a responsive web app using HTML, CSS, and JavaScript as well as libraries like svelte, D3.js, Leaflet.js and chroma.js. This also leads to the tool being easily executed on many different machines with differing screen sizes and an accessible code repository. Also, a pure front-end approach means there is no need to communicate back to the server once the page is loaded, so the tool can then be executed offline. For export and further use of the generated palette, the tool offers formatting options common in the field of web design, such as an array of hexadecimal color codes, as depicted in figure 2, or the RGB notation used within CSS.

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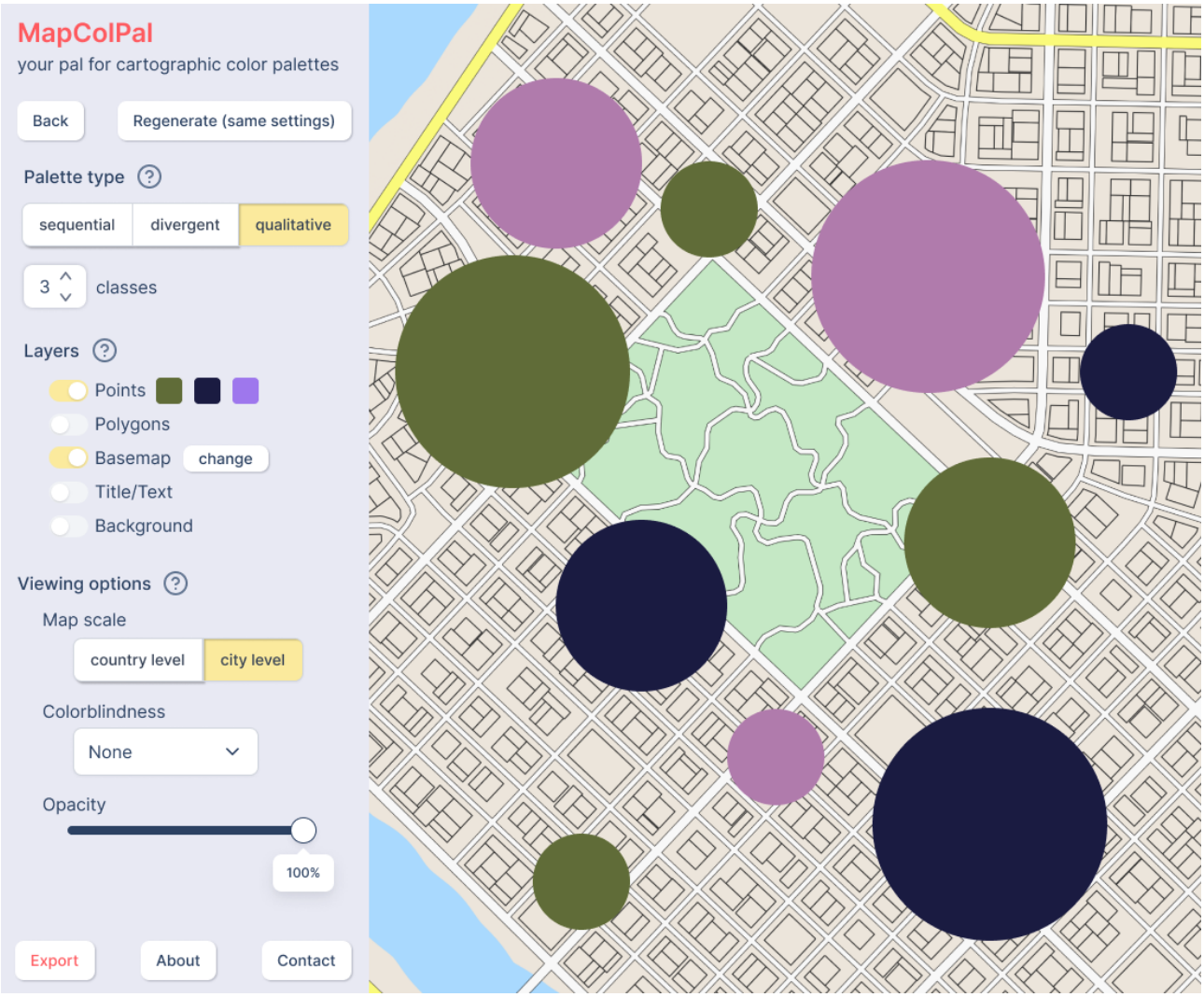

Figure 1. Mock-up of the main screen of the proposed application.

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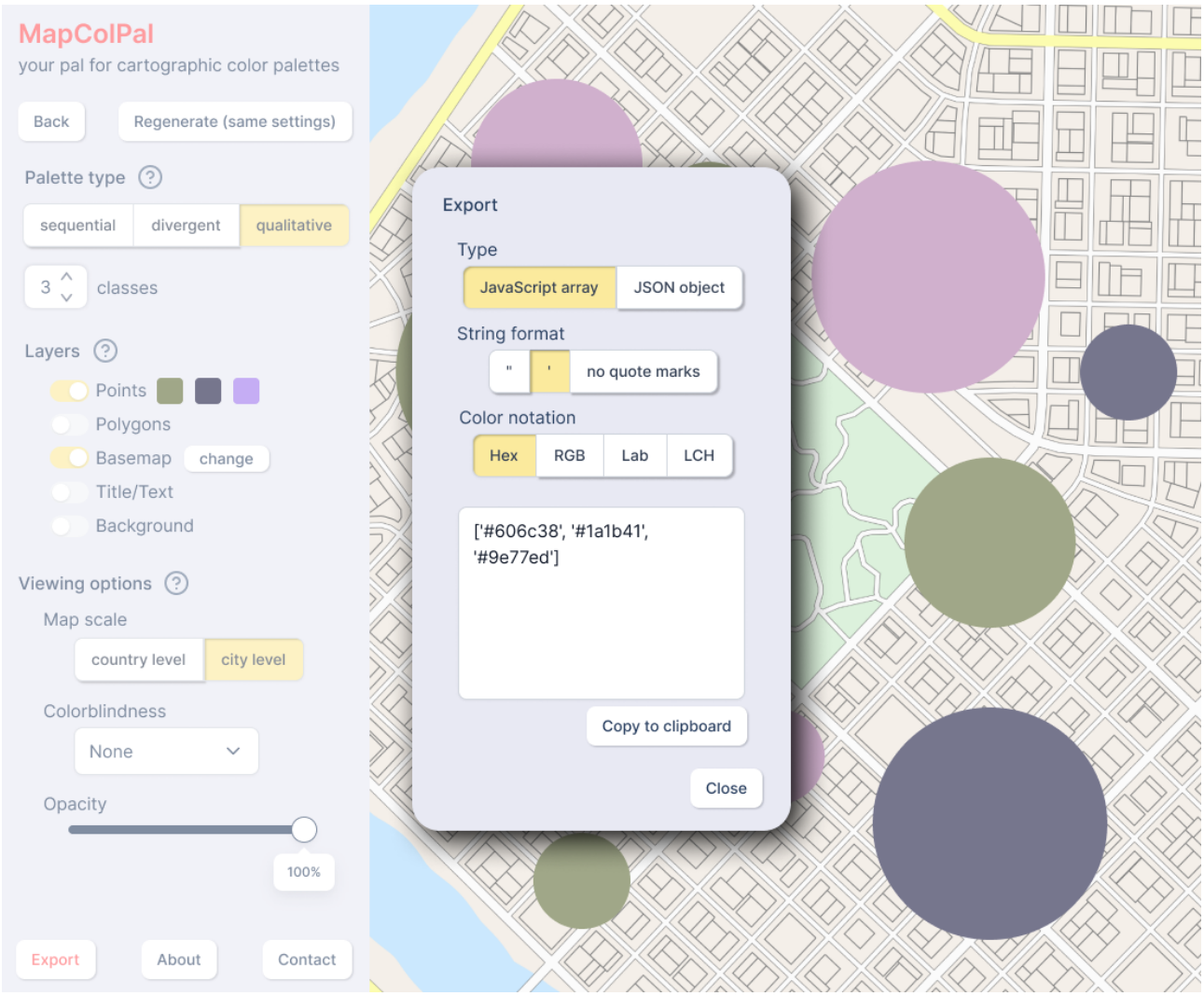

Figure 2. Mock-up of the export screen of the proposed application.

References

Brewer, C. A., 2003. A transition in improving maps: The colorbrewer example. *Cartography and Geographic Information Science* 30(2), pp. 159–162.

Harrower, M. and Brewer, C. A., 2003. Colorbrewer.org: An online tool for selecting colour schemes for maps. *The Cartographic Journal* 40(1), pp. 27–37.

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