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Enabling Web-Based Customization of Contiguous Cartograms

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Abstract:

We present recently developed customization features for contiguous cartograms in the go-cart.io online application, including user-defined boundaries, inset handling, and interactive sharing. Cartograms are maps where region areas are proportional to the magnitude of a specific attribute, such as population or income. A cartogram is termed contiguous if adjacent regions are correctly displayed as neighbors. Contiguous cartograms are effective for communicating statistical data because they enhance the visibility of geospatial patterns and trends (Nusrat and Kobourov, 2016).

Despite the communication value of contiguous cartograms, their widespread adoption is hindered by the technical complexity of existing generation tools. Altough standalone software, such as ScapeToad (Andrieu et al., 2008) and GIS extensions (e.g., Souza, 2015), offer basic functionality for cartogram generation, free online applications are more user-friendly because of their ease of access, cross-platform compatibility, and support for content sharing. However, there are still limited choices for web-based cartogram creation available to users who work with unique datasets and require quick, intuitive solutions, such as journalists, students, and educators. Furthermore, available online cartogram generators typically lack advanced customization options to improve communication effectiveness and visual appeal for their intended users, as summarized in Table 1. To address these gaps, we have introduced various customization features in go-cart.io.

Feature	go-cart.io	Magrit	fBlog	MAPresso
Map upload	Yes*	Yes	No	No (for online version)
Region labels	Auto-position*, editable text*	Auto-position, editable text	No	No
Insets for distant regions	Yes*	No	No	No
Region colors	Automatic*, custom	Choropleth	Custom	Unknown
Side-by-side cartogram comparison	Yes	No	No	No
Sharing and embedding via unique link	Yes	No	No	No
Modern browser support	Yes	Yes	Yes	No
License	MIT	GPL-3.0	Closed source	Closed source

Table 1. Free web-based graphical user interface tools for contiguous cartogram generation: go-cart.io (Shi et al., 2019), Magrit (Viry et al., 2018), fBlog (van den Broek, 2012), and MAPresso (Herzog, 2003). Browser support tested with Chrome (131), Safari (18), and Firefox (132). The asterisk (*) refers to new features of go-cart.io v3.0.0.

We have integrated a web-based user interface into go-cart.io, enabling users to create their own cartograms by following the steps displayed on the website (Figure 1a). Users can define input boundaries by either selecting a pre-defined map or uploading custom data in GeoJSON or Shapefile format. The interface also allows users to specify cartogram target areas, customize region labels, and optionally display selected regions in inset maps, either by uploading a CSV file or through an interactive online spreadsheet editor (Figure 1b). Once configured, the application renders an equal-area map of the input boundaries alongside cartograms corresponding to the data specified by the user, as illustrated in Figure 1c.

Additional features of go-cart.io include a customizable color palette with topology-aware coloring to ensure that adjacent regions are filled with distinct colors, the ability to display multiple cartograms side by side for comparison, and support

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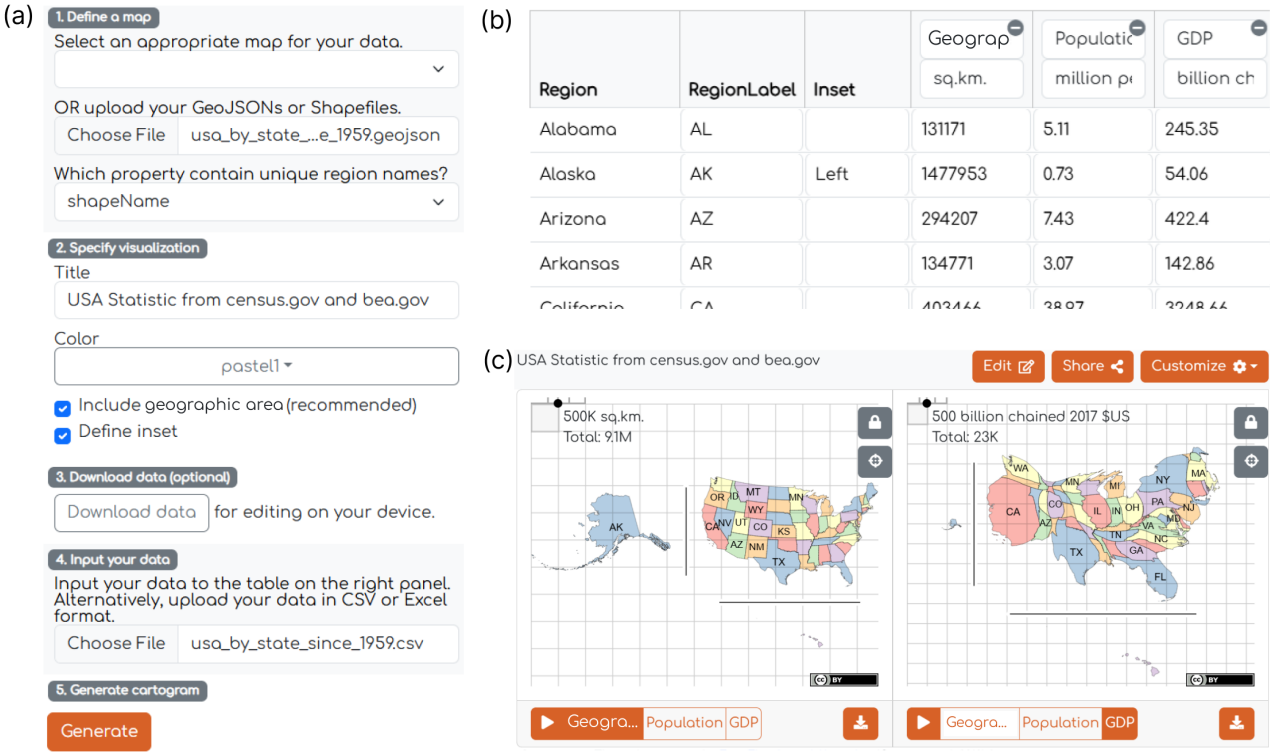

Figure 1. Elements of the go-cart.io user interface. (a) Sidebar for customization. (b) Spreadsheet for specifying region labels, insets (e.g., placing Alaska to the left of the conterminous United States), and cartogram target areas. (c) Cartogram viewer.

for online sharing and iframe embedding. Once shared, the cartogram remains accessible online for viewing and integration into external websites. Users can copy and customize shared cartograms, which inherit interactive features such as animations and infotips from the original go-cart.io interface.

For future work, we aim to further enhance go-cart.io's ability to tailor cartograms according to user needs. Planned improvements include ad-hoc editing features, such as directly modifying colors and target areas within the graphic, repositioning and resizing labels interactively, and enabling users to draw and annotate on cartograms. Moreover, we intend to support other types of thematic map visualizations, such as choropleth and proportional-symbol maps, to broaden go-cart.io's versatility as a comprehensive data visualization tool.

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