

The development and application of a cognitively-intuitive dynamic map based on a diffusion-based density equalizing algorithm

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ABSTRACT

A Dynamic map is implemented and tested using a cartogram algorithm to distort space to enlarge any areas of user interest. The map organises space into a hierarchy of shapes, island at the country level, provinces at the regional level, districts, cities and suburbs, which along with the distortion, is proposed to be more cognitively intuitive than traditional methods of multi-scale representation.

The advantage of using this system is that local view is expanded, whilst still allowing the global view to be maintained. This new method was tested to see if it was more cognitively intuitive than other traditional methods such as zoom in/out or the use of an inset map using time as a measure. Other aspects that were tested within the experiment were the importance of shape in the recognition of countries when their shape had been distorted, and whether participants were able to better orient themselves when trying to decide which direction locations are in using the different multi-scale representation methods.

The results showed that participants were able to recognise most of the distorted countries, the countries that were most difficult to identify were those whose shape had shrunk. It would seem that these were harder to identify than those whose shape had been expanded. The dynamic map was found to elicit faster times to navigate to specific locations than other methods, suggesting it is a more cognitively intuitive way to navigate through space. The results of the orientation test found that there was no significant difference in orientation results between the different methods. This could be attributed to the test using New Zealand locations and participants relying on their own geographical knowledge, rather than using the visual cues given to them.

Keywords and phrases: cartogram, multi-scale representation, distortion, orientation, cognition