An algorithm for a hexagon tilegram map of Australia

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Abstract

Introduction

Representing the globe in 2D space has presented issues for many years. Methods have been established to visualise geographical space. We present a solution for alternate visualisations when the intention is to represent the spatial distribution.

Background

- Choropleth methods are accurate geographically.
- Cartogram alternative map has been used historically.
- Spatial relationships are preserved.

Problem

- Spatial distributions are not well presented when areas differ in size.
- We want to understand the distribution among population
- We can benefit from making the focus the distribution, not the geography

- Presenting spatial distributions
- Extremely small areas are lost not easily compared at a high level
- Choropleths; unequal space on the display, difficult to represent Australia
- Cartograms; strong distortions misrepresent Australia

- Unusual population settlement and dispersion over the geographical space: Australia Dense south east, sparse central and west

- Applying alternative maps that allow for dense population areas when cities that are population dense are close together

Solution

Like Dorling, same shape will be used. Like tilegram, tesselation using equally sized shapes.

Allocate each geographic area to a map space of consistent tesselated shape

which is different from existing algorithms: contiguous, keeps exact neightbours, no recognisable shape non contiguous, keeps shape, can lose neighbours

Clear to see spatial distribution, geographic neighbours will have similar values Should keep neighbours relationships intact

Easier to read distribution at a distance, see a much larger area, general relationship at a glance

Works well for America, states are almost homogeneous Works well for England, London is the biggest issue, pushing out rural areas does not disturb population dense areas.

Our solution considers multiple population dense areas.

Allows dispersion to be increased when needed, and distance from origin to be considered

Relevant Literature

all known results relevant to the problem stated,
whether or not they are used in proposed contributions

Discuss advantages and drawbacks of known solutions that are relevant to your problem, discuss the relevance of each reviewed item to your topic and your solutions.

For every discussed reference, it is very important to relate them to your problem and contribution in one of several ways:
it does not exactly solve the same problem, it solves the same problem but makes different assumptions about the system, it has some limitations that you do not have, it makes the same assumptions but does not work well under certain
conditions and scenarios for which you have better solutions, or, if none of these is true, you are considering it as valid competitor, and will try to defeat it in your analytical or
experimental comparisons.

Algorithm

Design of algorithm

The Dorling maps in [@TVSSS] give examples of displacing central geographically small but population dense areas. This inspired the concept of this algorithm.

First the collection of polygons is considered. There are several ways of providing the set of polygons.

The projected centroids of all polygons are derived.

A rectangle is established bounding all of the polygon's centroids, with an additional buffer zone.

Some values will be automatically derived if not provided. buffer distance: size of the hexagons: filter_dist:

The buffer is created to allow expansion beyond the range of the centroids. It is a complex method, and becomes more detailed for finer hexagons. It relies on the rows and columns of the hexagons.

- derive a group number
- takes a rolling minimum and maximum for both longitudes and latitudes
- takes a rolling average of these values
- creates a smoother bufferzone expanding where there are hexagons along the coastline. Will not be smaller than the area containing the set of centroids

A hexagon point grid is created that contains possible points for a polygon to be allocated.

For each polygon centroid in the set. Consider the distance to each of the focal points provided. The closest focal point name, the distance to the polygon centroid, and the angle from focal point to polygon centroid will be returned and added to the polygon data set.

The distance between the polygon centroid and it's closest focal point data set is used to arrange the data set for allocation. The closest point is allocated first, extending to the furthest.

Allocation of all centroids then occurs. For each polygon, only unallocated hexagon points will be considered. The filter distance is then used to subset possible points to only those surrounding the the polygon centroid. Of these possible points, only those within a range of the angle are kept. This angle begins at 30 degrees.

If no available hexagon grid point is found within the original filter distance and angle, the distance is expanded, only when a maximum distance is reached will the angle expand to accomodate more possible grid points.

The allocation is returned and combined with the data relating to each polygon.

First give the intuitive solution.

Proof of algorithm

Examples of Melbourne, Victoria, Australia At different levels, distance from original centroids, change in area

Evaluation

Conclusion

Reference List