Lab 4: Scale, Resolution, and Generalization

In this laboratory session, we will delve further into the art and science of cartography by exploring key techniques in manipulating spatial data for effective map-making. Our focus will be on crafting maps that are not only informative but also suitably tailored to our audience's needs, ensuring clarity and relevance without overwhelming the viewer. To achieve this, we will examine various methods for rescaling maps, adjusting their resolution, and applying a range of generalization techniques. These processes are essential in reducing map complexity, thereby enhancing the overall readability and usefulness of our cartographic creations. Through this exploration, we aim to equip you with the skills necessary to balance detail and simplicity in your maps, making them both accessible and meaningful to your intended audience.

Your tasks involve executing and comprehending the provided R code, followed by addressing the questions listed below.

Deliverables:

1. An R script of the code that you wrote, which showcases your findings from the ‘Your turn to code’ section below.
2. The answer to the below questions need to be submitted in a Word Document or some other word-based program.
3. A jpeg of the shapefile of Germany.

Questions

1. When would you want to change the scale of your data?

Altering the scale of data is a fundamental process to better match the needs of the intended audience. It allows for the presentation of complex information clearly and understandably. Scaling down large-scale data, for example, enables the representation of vast geographic areas on smaller maps, making them easier to read and interpret. Conversely, scaling up small-scale data allows for a more detailed examination of a smaller region, enhancing precision and detail. Adjusting the scale of data is a crucial part of creating maps that effectively communicate information to different audiences with varying levels of detail requirements.

1. What are some pros and cons of changing your raster resolution to have less resolution?

Advantageously, reducing raster resolution can reduce the file size and computational demands, allowing for faster processing and easier sharing of data. This can be particularly advantageous when working with large datasets or limited computational resources. Furthermore, lower resolution can sometimes improve the visual appearance of the data, smoothing out small variations and making the overall patterns more apparent. However, reducing resolution can also lead to loss of information, resulting in a less accurate representation of the underlying data. This can be problematic, particularly in scientific or engineering applications where precision is crucial. It can also limit the range of analyses that can be performed, as certain types of analysis require high-resolution data to provide accurate results.

1. When would you want to generalize your polygon data (think countries, states, counties, etc)

Generalizing polygon data, such as countries, states, or counties, is typically necessary to simplify complex shapes and reduce the level of detail for specific mapping purposes. This simplification is essential for creating visually clear and uncluttered maps, particularly when representing large geographic areas or when aiming for a more generalized overview. Generalization helps in emphasizing broader patterns and relationships within the data while minimizing visual distractions caused by excessive detail. It also aids in optimizing map performance and readability, making it easier for users to interpret and comprehend the information presented on the map.

1. How is simplifying line data different from smoothing the line data?

Simplifying line data involves reducing the number of points that make up a line, without significantly altering its overall shape, while smoothing line data involves removing sharp corners or jagged edges by applying mathematical algorithms that smooth the line's curvature. Simplification maintains the essential shape of the line but reduces its complexity, whereas smoothing focuses on altering the line's appearance to make it appear smoother or more continuous. Simplification is more focused on data reduction and optimization for rendering, while smoothing is more concerned with improving visual aesthetics.

1. When we are aggregating point to polygons in what situation do you want to use a concave approach? A convex approach?

When aggregating points to polygons, a concave approach might be preferred when the points being aggregated are scattered throughout the polygon and the goal is to create smaller, more distinct aggregations within the polygon boundaries. Additionally, a concave approach can be advantageous when trying to create polygons that follow natural boundaries, such as rivers or coastlines.

Conversely, a convex approach might be more suitable when dealing with points that are more uniformly distributed within the polygon, or when the goal is to create larger, more inclusive aggregations. This could be the case in land-use planning where the goal is to create generalized areas for different types of development or zoning. A convex approach may also be preferred in cases where the resulting polygon needs to be easily interpreted and compared to other polygons, as convex polygons are more regular and predictable in shape.

Otherwise, neither method is universally superior and the best choice will depend on the specific objectives and characteristics of the dataset.

Your turn to code

1. Take the world map object and subset to Germany and produce a jpeg image. Submit your code and the Germany jpeg image.
2. Change the resolution of the volcano dataset to a factor of 30 and find the ‘max’ cell stat.
3. We did some smoothing operations. Please smooth the North Carolina dataset using the ‘ksmooth’ and ‘spline’ approaches and plot them to the screen on a 2x2 grid.
4. c (you might have to browse the internet for a set of spatial points data).

Once complete with the ‘Your turn to code’ please push your code to your Git Repository and provide the link to your lab instructor.