

## Cartograms

Tse-Chuan Yang

### Introduction

A cartogram is a thematic map (see GIS\_RD\_05-70) that distorts the areas of spatial features in proportion to the value of an attribute, such as population. Unlike traditional maps which give prominence to state more geographic information, a cartogram contains deliberate exaggerations of a map that communicate the analyzed data about regions through their spatial dimensions (e.g. see Figure 1).

The area cartogram is a useful tool for visualizing the geographic distribution of routine data in a variety of disciplines. Through the spatial transformation of map regions relative to the data, the cartogram emphasizes data distribution instead of territorial size.

**Figure1. 2004 Presidential Election Result\***



*Data resource: Michael Gastner, Cosma Shalizi, and Mark Newman, University of Michigan*

### Classification

Generally, there are three kinds of cartograms: contiguous cartogram, perimeter-preserving cartogram and conformal cartogram.

1. Contiguous cartogram: in a contiguous cartogram, the geographic objects have to maintain connectivity with their adjacent objects. The cartographer must make the objects the appropriate size to represent the attribute values but has to maintain the shape of objects as interpretable as possible.
2. Perimeter-preserving cartogram: a perimeter-preserving cartogram is one in which the map outline is left unaltered while the map interior is transformed.
3. Conformal cartogram: conformal mapping refers to the local preservation the angles during the transformation of a region. In a conformal cartogram, the detailed boundaries are preserved and drawn similar to those on the original map.

### Application

Cartograms can be appealing due to their captivating design and creativeness in presenting routine information. They are innovative, interesting and stylish. Cartograms have been used in social, political, epidemiological, and commercial applications.

### Further Readings

1. Dent, Borden D. *Cartography Thematic Map Design*. 4th ed. Dubuque, IA: C. Brown Publishers, 1996 pp. 202-215
2. Dorling, D. *Area Cartograms: Their Use and Creation*, 1st ed. Department of Geography, University of Bristol, England, 1996.
3. Foley, J.D., A. Van Dam, S.K. Feiner, and J.F. Hughes. *Computer Graphics: Principles and Practice*. Addison-Westley Publishing Company, Reading, Massachusetts, 1990.
4. Tikunov, V.T. and S. Gusein-Zade. "Map Transformations", *Geography Review*, Vol. 9, No. 1, 1995, pp. 19-24.
5. Tobler, W.R. "A Continuous Transformation Useful for Districting", *Annual of the New York Academy of Sciences*, Vol. 219, No. 9, 1973, pp. 215-220.
6. Tobler, W.R. "Pseudo-Cartograms", *The American Cartographer*, Vol. 13, No. 1, 1986, pp. 43-50.