PACKAGE ID - 001069SPARC00 DEMP

KWIC TITLE - Density Equalizing Map Projections

AUTHORS - Merrill, D.
Lawrence Berkeley National Lab, CA (United States)

LIMITATION CODE -COPY **AUDIENCE CODE -** LIM

COMPLETION DATE - 12/01/1994 **PUBLICATION DATE -** 07/01/1995

DESCRIPTION - A geographic map is mathematically transformed so that the subareas of the map are proportional to a given quantity such as population. In other words, population density is equalized over the entire map. The transformed map can be used as a display tool, or it can be statistically analyzed. For example, cases of disease plotted on the transformed map should be uniformly distributed at random, if disease rates are everywhere equal. Geographic clusters of disease can be readily identified, and their statistical significance determined, on a density equalized map.

PACKAGE CONTENTS - Media Directory; Software Abstract; LBL-35738; Source Code;

SOURCE CODE INCLUDED? - Yes

MEDIA QUANTITY - 1 3.5 Diskette

METHOD OF SOLUTION - Required program inputs are (1) subregion popluations (2) geographic coordinates of points defining subregion boundaries (3) geographic coordinates of (optional) case locations or other map features. For each boundary point (2) and each non-boundary point (3) a 'push' is calculated by summing contributions from a closed-form line integral around the boundaries of all subregions. The push is applied to the points (2) and (3) and the new boundary configuration is used to calculate the push on the next iteration. Iterations continue until the area of all subregions are proportional to the populations (within a pre-defined tolerance).

COMPUTER - SUN SPARC

OPERATING SYSTEMS - SunOS Release 4.1.3 U1B or SunOS 5.5 (Solaris)

PROGRAMMING LANGUAGES - Fortran (Unix f77)

SOFTWARE LIMITATIONS - The compiled version can handle a maximum of 9600 boundary points, 17,000 non-boundary points, and 1380 subregions. Approximately 36MB of memory are required. Source code is provided so that array dimensions can be adjusted to fit the particular problem and available memory. The number of users is limited only by the operating system.

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SOURCE CODE AVAILABLE (Y/N) - Y

UNIQUE FEATURES - There is no known program that has been successfully used for problems of comparable complexity. Other programs are either much slower, or produce illegal map transformations in which the boundaries of subregions overlap.

RELATED SOFTWARE - The DEMP line integral algorithm is independent of other DEMP algorithms written by Deane Merrill between 1985 and 1993. The LBNL implementation of the Russian line integral algorithm (RLInt) was written by Elon Close in 1993-94, independent of code produced by Tikunov and Gusein-Zade. Modifications and enchanements were added by Deane Merrill in December 1994. Associated software (not included)for providing input data and plotting output data was written by Deane Merrill and Michael Mohr between 1985 and 1995.

OTHER PROG/OPER SYS INFO - The binary executable RLInt.exe was linked with the -Bstatic option so that no dynamic link library is required. The only other requirements are the input files RLInt.dta and RLInt.par which are described (with examples) in the documentation. The names RLInt.dta and RLInt.par are case sensitive. No proprietary software is required.

HARDWARE REQS - Array dimensions are limited by available memory. See SOFTWARE LIMITATIONS.

TIME REQUIREMENTS - An example with about 1200 regions, 2500 boundary points, and 8000 non-boundary points required ten iterations, which took a total of about 24 hours on a Sparc 10 workstation. The time per iteration is approximately proportional to the square number of boundary points (2500 * 2500). The number of iterations depends on the non-uniformity of population density in the initial map.

REFERENCES - Close, E.R., Merrill, D.W., Holmes, H.H., Implementation of a New Algorithm for Density Equalizing Map Projections (DEMP), LBL-35738, (July 1995)

ABSTRACT STATUS - Release AS-IS 02/12/96.

SUBJECT CLASS CODE - PY

KEYWORDS -
COMPUTER PROGRAM DOCUMENTATION
ALGORITHMS
D CODES
MAPPING
COORDINATES
ITERATIVE METHODS
PUBLIC HEALTH

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POPULATION DENSITY
EPIDEMIOLOGY

EDB SUBJECT CATEGORIES -
990200 552000

SPONSOR - DOE/EH

PACKAGE TYPE - AS - IS