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SMALL AREA REPLACEMENT IN DIGITAL THEMATIC MAPS

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An algorithm is described for identifying small isolated areas in digital thematic maps and selectively replacing them with their (weighted) most frequently occurring neighbors. The identification process successively scans the thematic map in alternating directions (downward, upward, downward, etc.) until each pixel has been completely defined by the size of the area to which it belongs. The final output is an area size map which can be overlaid on the original thematic map. After the first (downward) scan only pixels at the bottom of individual areas are fully defined; after the second (upward) scan, all pixels which are connected in a continuously upward direction to the bottom of individual areas are fully defined; and so on. Spiral shaped areas require 1 scan for each semi-rotation or part of a semi-rotation. The replacement of selected areas is performed in a single simultaneous scan of the thematic map and the area size map. Pixels which lie in areas less than the specified minimum size for their corresponding themes are assumed to be unclassified, and the resulting unclassified areas are then replaced in successive steps. In each step the interior border pixels of the remaining unclassified area are replaced on an individual pixel basis by the most frequently occurring neighboring themes. Determination of the most frequently occurring neighbor can optionally include variable weighting for each theme and the algorithm also allows diagonally adjacent pixels to be connected or unconnected on a per scene basis.

This algorithm has been implemented in the ARIES image analysis system which was developed for the Canadian National Forest Institute. The limiting factor is the number of pixels per line and this implementation can cater for images with over 4000 pixels per line. The time taken to identify all areas less than 128 pixels and to replace those of less than 4 pixels in a 16 class thematic map of 1000 lines by 1000 pixels was less than 15 minutes, including operator interaction.