

MEDIAN CUT ALGORITHM

Synonyms: *Optimized palette generation.*

Definition: *Adaptive algorithm for color quantization to select the best representative subset of colors; it is used, for example, in the palette generation process.*

The median cut algorithm is a popular solution for optimized palette generation [1]. The idea behind the median cut algorithm is to use each of the colors in the synthesized look-up table to represent the equal number of pixels in the original image. The algorithm subdivides the color space interactively into smaller and smaller boxes. In contrast to uniform subdivision, optimized palette generation algorithms divide the color space based on the distribution of the original colors. The algorithm starts with a box that encloses all the different color values from the original image. The dimensions of the box are given by the minimum and maximum of each of the color coordinates that encloses the box under consideration. The box is split just choosing the side to be further subdivided. Therefore, the points are sorted along the longest dimension of the box. The partitioning into two halves is made at the median point. Approximately equal numbers of points will fall at each side of the cutting plane.

This step is applied until K boxes are generated where K is the maximum number of color entries in the available color map. The representative colors are found by averaging the colors in each box, and the appropriate color map index is assigned to each color in that box (Figure 1). Variations of the algorithm can be obtained by changing the way the box is divided. For example, one possible way is to minimize the sum of variances for the two new boxes. Advanced techniques for color reduction can be found in [2], [3].

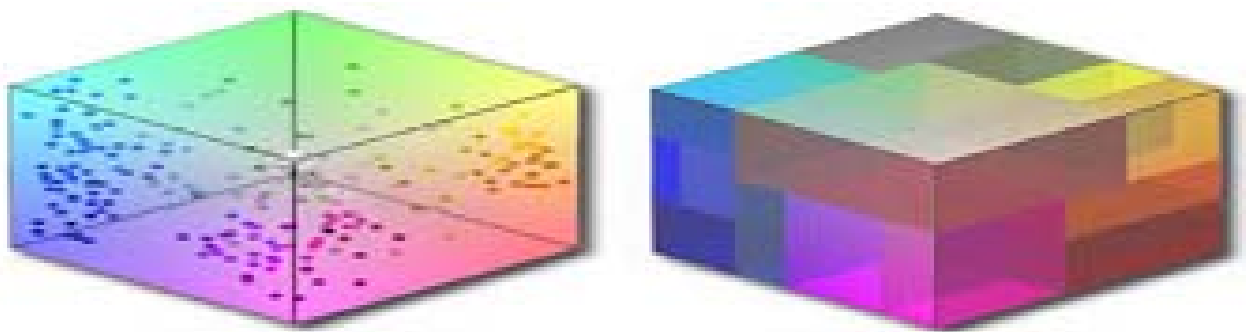


Figure 1 – Example of color reduction using the median cut algorithm:
(left) color samples of the image, and (b) sixteen-color palette.

See: Color-Mapped Imaging, Adaptive color quantization/reduction, Dithering, GIF/PNG format.

References

1. P. Heckbert, "Color Image Quantization for Frame Buffer Display", ACM Comp. Graphics, SIGGRAPH, vol. 16, no. 4, pp. 297-307, July 1982.
2. J. Puzicha, M. Held, J. Ketterer, J.M. Buhmann, D.W. Fellner, "On Spatial Quantization of Color Images", IEEE Transactions on Image Processing, vol. 9, no. 4, pp. 666-682, April 2000.
3. N. Papamarkos, A.E. Atsalakis, C.P. Strouthopoulos, "Adaptive Color Reduction", IEEE Transactions on Systems, Man and Cybernetics, Part B, vol. 32, no. 1, pp. 44-56, February 2002.