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(54) Title: METHOD AND APPARATUS FOR PRODUCING THRESHOLD ARRAYS USING VARIANCE MINIMIZATION AND PIXEL ANGLE CALCULATIONS

(57) Abstract

A method and apparatus for creating threshold arrays having a minimized gray scale variance without geometric artifacts. The invention comprises the steps of processing each candidate pixel in the threshold array using a variance minimization technique and applying a sparse image calculation on the same pixel. The preferred embodiment of the invention comprises the application of a variance minimization technique on a threshold array. The threshold array is analyzed on a pixel–by–pixel basis. Each candidate pixel that is to be turned on is examined in relation to the previous pixels that already exist. The candidate pixel is examined to determine its effect on the variance of the smoothed gray level determined by the convolution of the pixel pattern with a smoothing kernel. The candidate pixel is also examined in relation to the distribution of the angles it forms with the previously selected pixels. The preferred embodiment uses a variant of the combinatorial Hough transform. In the preferred embodiment, there is an accumulator array for each not yet selected pixel that has a location for each of a quantified set of angles. A sum is stored in this location based on those previously selected pixels which make an angle with the not yet selected pixel which is discretized to the angle corresponding to that location. The effect of the true angle may be distributed over more than one location of the accumulator array and may depend on distance and angle. It is desired that a pixel is selected which combines a low variance of the smoothed gray level with a favorable distribution of values in its angle accumulator array. This process is repeated until all the pixels in the threshold array have been selected.

