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COMPUTER LOCATION OF DRAINAGE NETWORKS BY AN INTERACTIVE LINE FOLLOWING ALGORITHM

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An algorithm is described designed to locate and connect linear features with identical characteristics on multiespectral images. The input is a map of magnitudes (PM(i,j)) and line orientations (PR(i,j)) produced by an edge and curve detection algorithm which uses a window of 5x5 pixels centered at every pixel belonging to an edge and looks for a preferred line in that pixel along 0°, 45°, 90° or 135° (PR=1,2,3,4,. PR=5 means indetermined orientation). Noisy results coming from the local line detection operation are avoided using a radiometric corrected input image on a combination of bands together with an appropriate threshold.

To run the algorithm the user selects a starting pixel k and gives a sign to the value PR_k to choose a direction (D_k=1,2. . . , 8 for $D_k=\pm PR_k$). The algorithm looks for the next pixel k+1 in the direction $D_k \pm h$ mod 8 (h=0,1,2,3) using the criteria: 1) $PM_{k+1} = PM_k \pm \varepsilon$ (being ε chosen by the user) and 2) Distance (PM_k, PM_{k+1}) be a minimum. Being $PM_k > 0$ and PR_k=n (n=1,2,3, 4) the k+1 pixel could have $PM_{k+1} \geq 0$ and PR_{k+1}=m (m=0,1 . . . . 5) giving rise to three different cases that will be discussed. Range of neighborhood is fixed by the user in a compromise between getting good results in broken lines or a pitfall if the algorithm jumps from one chain to other.

Having the values PM and PR in memory the algorithm lasts 30 to 70 ms/pixel in the final chain (in PL/1 for an IBM 360/65) depending on degree of discontinuity and number of nodes. Results obtained from LANDSAT images to locate the drainage network of the Guadarrama river in Central Spain will be presented.