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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 multispectral 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 5×5 pixels centered at every pixel belonging to an edge and looks for a preferred line in that pixel along 0° , 45° , 90° or 135° ($PR=1,2,3,4,5$. $PR=5$ 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 ($D_k=1,2, \dots, 8$ for $D_k=+PR_k$). The algorithm looks for the next pixel $k+1$ in the direction $D_{k+h} \text{ mod } 8$ ($h=0,1,2,3$) using the criteria:
1) $PM_{k+1} = PM_k \pm \epsilon$ (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 $PR_{k+1} = m$ ($m=0,1, \dots, 5$) 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.