Programming Project

Navigation over Terrain

Problem: Navigation over a terrain can be an important concept. Usually you want to avoid high areas (peaks) and low areas (valleys). For this problem, you may assume the terrain that you want to navigate over may be represented as a 2-dimensional grid of cells. You are to determine the number of peaks and valleys in this terrain as well as give the location of these peaks and valley. A peak is defined as a cell for which all eight neighbors are lower than the cell being considered. A valley is defined as a cell for which all eight neighbors are higher than the cell being considered. An example grid is given below with some of the peaks in bold and some of the valleys underlined. Note that no cell on the perimeter may be considered a peak or valley.

The elevation of each cell is given as an integer in the file terrain.dat. The first line gives how many rows and columns are in the array. You may assume the maximum size is 100 by 100. Your program should

♦ Use a function to input the values from the file (remember the first line in the file contains the number of rows and columns respectively).

♦ Use a function to locate peaks and valleys and store the locations (row and column indices) of these peaks and valleys. (Hint: use one array for peaks and one array for valleys).

♦ Use a function to calculate the average elevation over the entire array and return this overall average to main.

♦ Use a function to output the number of peaks or valleys and elevations associated with the peak or valley and the locations of these peaks or valleys

Your main function should

- Declare the 2-Dimensional array (no input file will contain more than 100 rows and 100 columns).
- Call the function to import the data into the array (remember the first line of file contains the number of rows and number to be used.
- Call the function to locate the peaks, valleys, and store locations of the peaks and valleys.
- Call the function to calculate the average

- Call the function to output peaks or valleys and locations with peak and valley information.
- Output the overall average of heights.