Subject: Re: Can this be done using array operations instead?
Posted by robintw on Thu, 02 Apr 2009 17:38:46 GMT
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Hi Allan,

Thanks for the very informative reply.

The sort of technique that you suggest at the end looks like the sort of thing I want to do - but I'm not entirely sure how to go about it.

I've looked at my code again and realised that many values in my formula are constant (yes I know some of them can be taken out of the loop in the following code - but once I realised I might be able to do it with array functions I decided not to try and improve that code any more until I'd converted it to use array functions), and in fact only a few things vary. What I need to do is step through each 3x3 square in the array (not sure exactly what to do about the edges) and get the total for each of those squares, as well as the number of values in the square (normally 9 obviously, but if it's at the edge then there might be less). I then need to run a calculation which includes these total and number, as well as some other constant values.

I've posted my code below, but I'd prefer it if you could describe in general how to do these kind of things with some useful examples, rather than just taking my code and writing the new version for me. This code is part of a project I'm doing for university, and, although the code is not the main part of the project (the code is just to help me implement a new technique for image processing) I'd rather write the code mostly myself.

Here is the code:

```
; Creates a Getis image given a FID, the dimensions of the file, a
distance to use for the getis routine
; and a base window to send progress updates to
PRO CREATE_GETIS_IMAGE, file, dims, distance, report_base

  ; Print debugging info
  print, "Distance", distance

  ; TODO: Get this to loop through bands
  ; Get the data for the first band of the file (ignores pos from
earlier)
  WholeBand = ENVI_GET_DATA(fid=file, dims=dims, pos=0)

  ; Calculate the dimensions of WholeBand
  SizeInfo = SIZE(WholeBand, /DIMENSIONS)
```

```
  NumRows = SizeInfo[0]
  NumCols = SizeInfo[1]

  ; Let the progress bar know what the denominator of the fraction is
- the max
  ENVI_REPORT_INC, report_base, NumRows

  ; --- Calculate variable values for the WholeBand

  ; Get the global mean
  GlobMean = MEAN(WholeBand)

  ; Get the global variance
  GlobVariance = VARIANCE(WholeBand)

  ; Get the number of values in the whole image
  GlobNumber = NumRows * NumCols

  ; Create the output array to store the Getis values in - NB: Must be
an array of floats
  OutputArray = FLTARR(NumRows, NumCols)

  ; For each pixel in the image
  FOR Rows = 0, NumRows - 1 DO BEGIN

    ; Send an update to the progress window telling it to let us know
if cancel has been pressed
    ENVI_REPORT_STAT, report_base, Rows, NumRows - 1, cancel=cancelled

    ; If cancel has been pressed then...
    IF cancelled EQ 1 THEN BEGIN
      ; Close the progress window
      ENVI_REPORT_INIT,base=report_base, /FINISH
      ; Exit the function
      RETURN
    ENDIF
    FOR Cols = 0, NumCols - 1 DO BEGIN
      ; Make sure RowBottom doesn't go below 0
      RowBottom = Rows - Distance
      IF RowBottom LT 0 THEN RowBottom = 0

      ; Make sure RowTop doesn't go above NumRows
      RowTop = Rows + Distance
      IF RowTop GE NumRows THEN RowTop = NumRows - 1

      ColBottom = Cols - Distance
      IF ColBottom LT 0 THEN ColBottom = 0
```

```
      ColTop = Cols + Distance
      IF ColTop GE NumCols THEN ColTop = (NumCols - 1)

      ; Get the subset of the image corresponding to the Area of
Interest (AOI)
      AOI = WholeBand[RowBottom:RowTop, ColBottom:ColTop]

      ; Calculate the getis value for this AOI
      getis = CALCULATE_GETIS(GlobMean, GlobVariance, GlobNumber, AOI)

      ; Set the pixel in the output image equal to the getis value
      OutputArray[Rows, Cols] = getis
    ENDFOR
  ENDFOR

  ; Code to scale 0-255 - not used at the moment

  ;MaxOutputArray = MAX(OutputArray)
  ;MinOutputArray = MIN(OutputArray)
  ;RangeOutputArray = MaxOutputArray - MinOutputArray

  ;print, MaxOutputArray
  ;print, MinOutputArray
  ;print, RangeOutputArray

  ;ScaledArray = OutputArray - MinOutputArray
  ;ScaledArray = ScaledArray * (255 / MaxOutputArray - MinOutputArray)

  ; Write the data to an image in ENVI memory
  ENVI_ENTER_DATA, OutputArray

  ; Close the progress window
  ENVI_REPORT_INIT,base=report_base, /FINISH
END

; Calculates the getis value for an AOI given the AOI as an array, and
various
; values of global constants - Mean, Variance and Number of pixels
FUNCTION CALCULATE_GETIS, GlobMean, GlobVariance, GlobNumber, AOI
  ; --- Calculate variable values for the AOI

  ; Get the Sum of the values in the AOI
  AOISum = TOTAL(aoi)

  ; Get number of values in AOI
  SizeInfo = SIZE(aoi, /DIMENSIONS)
  SizeOfSize = SIZE(SizeInfo, /DIMENSIONS)
  IF SizeOfSize EQ 2 THEN AOINumber = SizeInfo[0] * SizeInfo[1]
```

```
  IF SizeOfSize EQ 1 THEN AOINumber = SizeInfo[0]

  ; --- Start Calculating Getis Statistic

  ; Calculate the top of the fraction
  TopFraction = AOISum - (FLOAT(AOINumber) * GlobMean)

  ; Calculate the square root
  SquareRootAnswer = SQRT((FLOAT(AOINumber) * (GlobNumber -
AOINumber))/(GlobNumber - 1))

  ; Calculate bottom of fraction
  BottomFraction = GlobVariance * SquareRootAnswer

  ; Calculate Getis Statistic
  Getis = TopFraction / BottomFraction

  RETURN, Getis
END
```

Thanks,

Robin
