Subject: Set Operations on A and B
Posted by mxd1007 on Sun, 02 Oct 2005 03:30:22 GMT
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Hello

I'm doing a programming project in computational Graph Theory. I'm trying to implement an algorithm to color the vertices of a graph, a pentagon, and will be using a greedy coloring algorithm as detailed below:

```
 ********************************************************** ******************
GreedyColor( G = (Vertices, Edges))

global color

k = 0
 for i = 0 to n -1
    h = 0
    while h < k and A[i] INTERSECTION ColorClass[h] not eqaul to NULL
do h = h+1

    if h = k then
      k = k+1
      ColorClass[h] = NULL

    ColorClass[h] = ColorClass[h] UNION {i}
    color[i] = h

return(k)
 ********************************************************** ******************
```

Graph coloring is where you color the vertices of a graph with a particular color, using a different color for vertices that ARE connected to each other. So for a regular pentagon, you can apply at least 3 different colors(for set of vertices (0,1,2,3,4), 0 = red, 1 = blue, 2 = red, 3 = blue, 4 = green

the actual k-coloring is stored in the array color

ColorClass is defined as:
ColorClass[h]={i is an element of Vertices : color[i] = h}

UNION and INTERSECTION is of course the typical union and interesection relating to sets

I have no problem implementing the pseudocode as is except for the intersection and union computations. I did find a nice website on this

by Fanning Consulting:

http://www.dfanning.com/tips/set_operations.html

so I used the setuUnion and setIntersection funtions within my program.
when ready to compile, I got this error:

```
IDL> graphcolor
% HISTOGRAM: Expression must be an array in this context: A.
% Execution halted at: SETINTERSECTION    36
/Applications/rsi/graphcolor.pro
%                GRAPHCOLOR       76
/Applications/rsi/graphcolor.pro
%                $MAIN$
```

My question and confusion is about this A array since I'm passing an array(actually a sub array) into the function setIntersection. Or are these set functions useless for my application to graph coloring? any suggestions would be appreciated. I do think these set functions are very useful, just that I don't understand why it can't be applied to my arrays I'm passing in.

~Michael

My code as follows(I indicated with ** where the error happened in SetIntersection function):

```
FUNCTION SetUnion, a,b

   ;A union NULL = a
   IF a[0] LT 0 THEN RETURN, b

   ;B union NULL = b
   IF b[0] LT 0 THEN RETURN, a

   ;Return combined set
   RETURN, Where(Histogram([a,b], OMin = omin)) + omin

END



FUNCTION SetIntersection, a,b

;only need intersection of ranges
```

```
minab = Min(a, Max=maxa) > Min(b, Max=maxb)

maxab=maxa < maxb

;If either set is empty, or their ranges don't intersect:
;result = NULL

IF maxab LT minab OR maxab LT 0 THEN RETURN, -1
** r = WHERE((Histogram(a, Min=minab, Max=maxab) NE 0) AND $
        (Histogram(b, Min=minab, Max=maxab) NE 0), count)

IF count EQ 0 THEN RETURN, -1 ELSE RETURN, r + minab
END



PRO GRAPHCOLOR


;construct an array to hold the set of vertices adjacent
;to any particular vertex. for example for vertex 0,
; vertices 1 and 4 would be a set of vertices adjacent
;to vertex 0, hence a[0] = [1,4]

setA = [[1,4], [0,2], [1,3], [2,4], [0,3]]

;create a color array to hold colors of vertices
;in a undirected regular pentagon graph

color = BYTARR(5,1)
colorClass = BYTARR(5, 1)

k = 0

FOR i = 0, 4 DO BEGIN

   h = 0

   WHILE ( h < k AND setIntersection(setA[i], colorClass[h])$
         NE -1) DO BEGIN


      h = h + 1

      IF ( h EQ k) THEN BEGIN

         k = k+1
```

```
        colorClass[h] = NULL
      ENDIF
      colorClass[h] = setUnion(colorClass[h], i)
      color[i] = h
    ENDWHILE
  ENDFOR
  print, k
  END
```