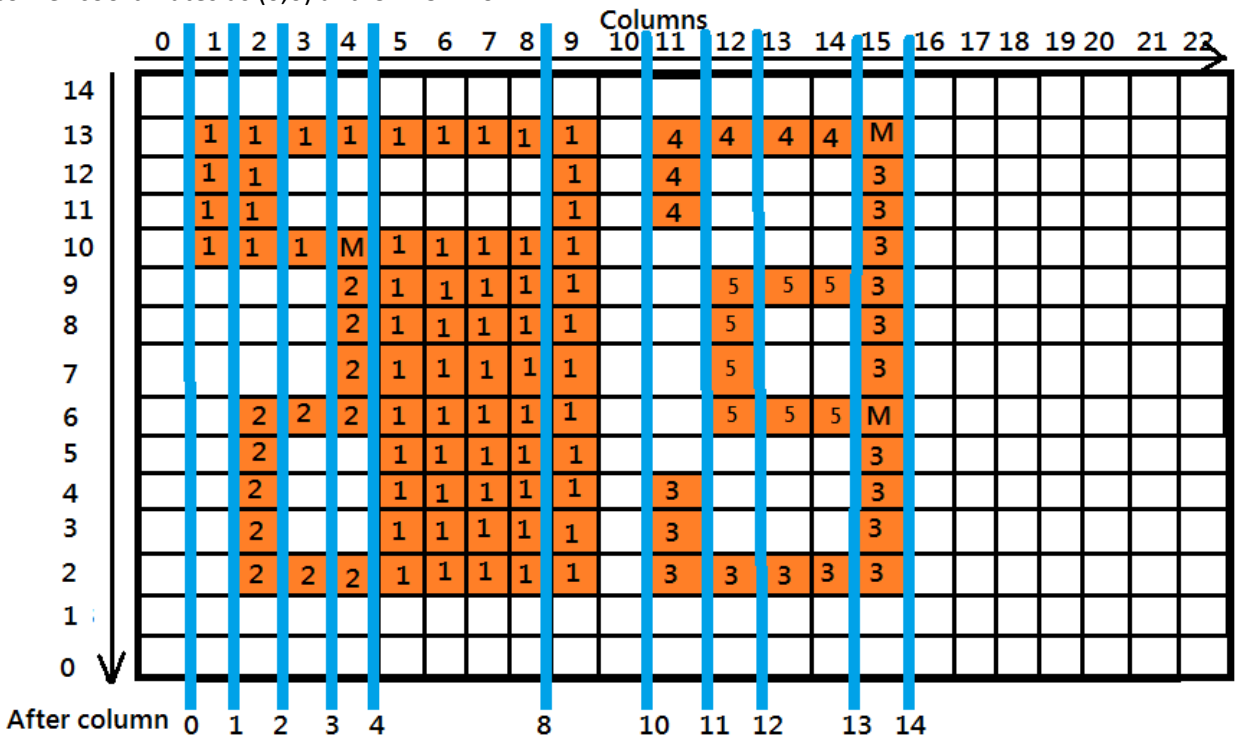
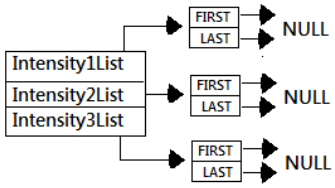
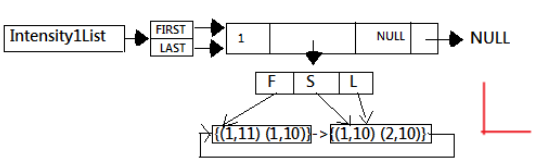
I will explain the strategy with the help of following 2D Grid. Cells are addressed by (i,j) where i is row and j is column. Numbers in the cell represent their assigned polygonID. I will show the list structure before every column up till blue lines. M in a cell represents that merging is required in this cell. Also the advantage this approach only limited search is required only in one node that has same polygonID. The 2D Grid has lower left corner coordinates as (0,0) and CELLSIZE of 1.

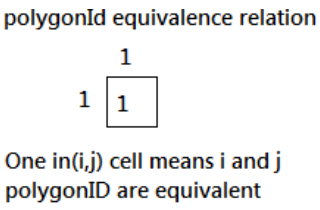


During column 0 :- No cell with any intensity is find therefor list is empty. Here in this 2dGrid I have only one intensity (say Intensity1), so for the next columns I will show only Intensity1List. Intensity2List and Intensity3List will also grow in same manner. And I also maintain a equivalent polygonID information in 2D array which is empty since no poilygonID is initialized.



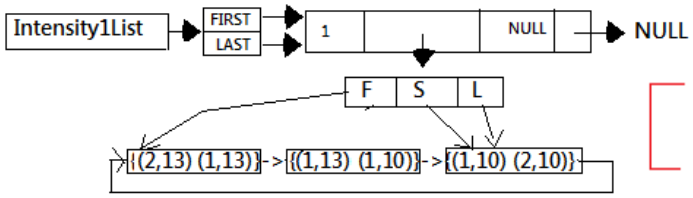
During column 1 :- In this column at(10,1), I find a cell with intensity1. Since cells to its west and south cell has different intensities or no intensity, So I initialize a new ***polygonwithholes*** node (here on PWH) with its lower (starting) segment attached to end and left segments attached to beginning and assign it a polygonID and increment the polygonID by one. I also connect its other two segments if they contribute to boundary After this cell the list will look like :-

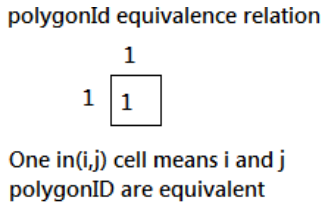




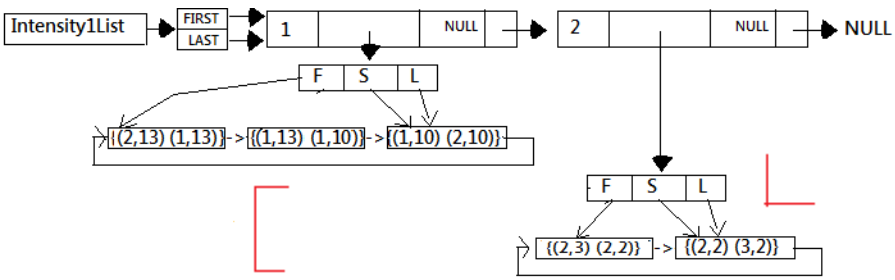
Next, I found (11,1) cell with intensity1. I look to its west and south cell. I found that cell to its west has no intensity 1. Then I search for PWH node in intensity1List that has same polygonId as assigned to this cell and try to connect its all segments which contributes to boundary(maximum 4). In this case only left segment contribute to boundary so I connect it to already searched PWH node.

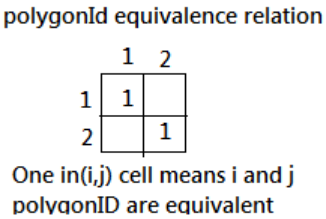
After column 1 list will look like :-





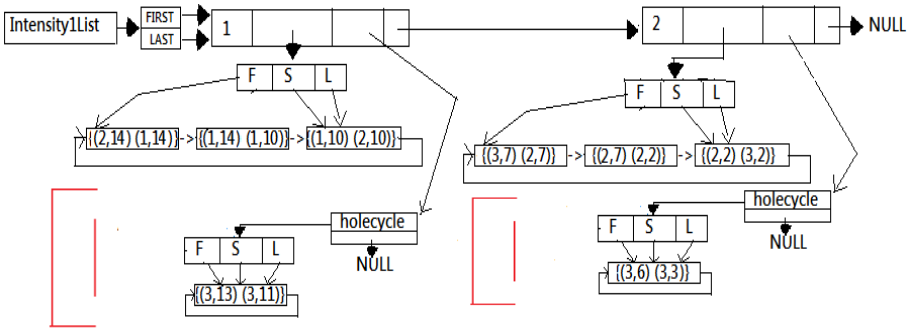
During column 2:- In this column at(2,2), I find a cell with intensity1. Since cells to its west and south cell has different intensities or no intensity, So I initialize a new **pwh** node with its lower (starting) segment attached to end and left segments attached to beginning and assign it a polygonID which is 2 and increment the polygonID by one. I also connect its other two segments if they contribute to boundary After this cell the list will look like :-

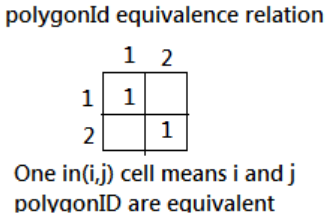




Next in the column at(3,2) I found intensity 1 cell, it is assigned a polygonID 2 since it can be connected to south cell. I try to connect its all segments to PWH node that has polygonID 2 . If I cannot connect it to outer cycle or any of the hole cycles than I will initialize a new holecycle in PWH node with this segment. In this cell I cannot connect its right segments to outer cycle and any of the holes (in this case no holes) ,Si, I start a new hole cycle with this segment as starting segment. Similarly with all the cells.

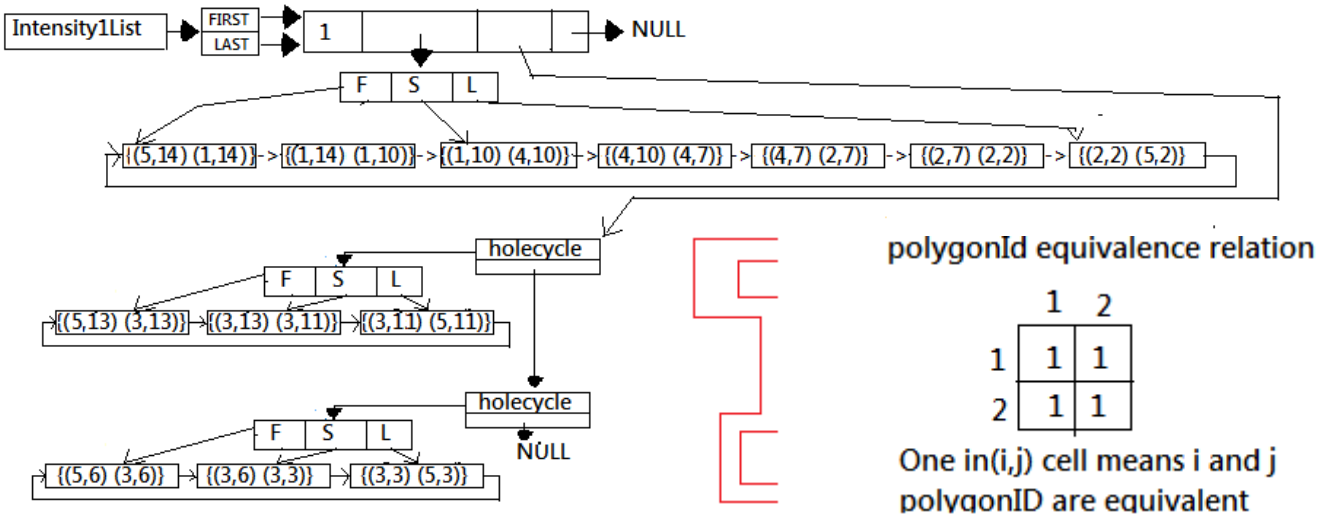
After column 2 the list will look like :-





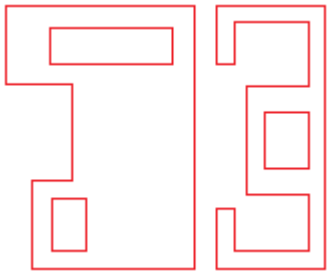
After column 3:- Everything will go normal and at the end the list's PWH nodes will have segments like below: -

After column 4:- This is a important column since merging has to be done at (10,4). This is a cell where we find both the west and south cell have same intensity as cell itself and have different polygonID(1,2). This cell tells us that PWH nodes with polygonID 1 and 2 are equivalent. So, we merge these two PWH nodes and assign a polygonID to resultant node a minimum of two in this case 1. After this column the intensity list will look like :-



After end of whole traversal the list will have two nodes one with two holecycles and polygonID 1 and other with one holecycle and polygonID 3.

The list is as follows and final equivalent relation will be : -



	1	2	3	4	5
1	1	1			
2	1	1			
3			1	1	1
4			1	1	1
5			1	1	1