ALTERNATIVE ALGORITHM TO FIND THE CHROMATIC NUMBER

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INTRODUCTION

Graph colouring is one of the most fascinating fields for research (Barenboim and Elkin 2009). This method is used for several types of real world applications such as chemical storage process, time tabling schedule task, map colouring projects etc. Graph colouring algorithm (or vertex colouring algorithm) is used to find the most appropriate arrangement without any clashing in these cases (Omari and Sabri 2006). When the situation is vast and the degrees of vertices are high, application of this method becomes complicated and difficult. Also it takes much more time to solve it. Aim of this study is derive an alternative algorithm to minimize above mentioned problems in complicated situations.

METHODOLOGY

There are many algorithms available for Graph Colouring Method but the efficiency of all these algorithms are not effective in complicated situations (Salari and Eshghi 2008). So the alterative algorithm which is given bellow can be used as an extension of above algorithms in complicated situations.

Step 01: Let's start with n variables and draw the relevant graph G with n vertices

Step 02: Draw the complement graph $\overline{G}$ of graph G

Step 03: Select the available largest degree regular sub graph of $\overline{G}$ For this, first take the (n-1) degree regular graph, if it exists go to step 04. Otherwise find the (n-2) degree regular graph, if it exists go to step 04 Likewise go for this till n=1.

Step 04: Assigned a colour for vertices of the selected regular graph of graph $\overline{G}$ and delete the vertices of selected regular graph. Draw the rest graph again and repeat step 03.

Step 05: Number of colours used to colour regular graphs (or number of regular graphs obtained) is the chromatic number of the graph.

Following flow chart shows the procedure that can be followed for this alternative algorithm and available graph colouring algorithms more efficiently.

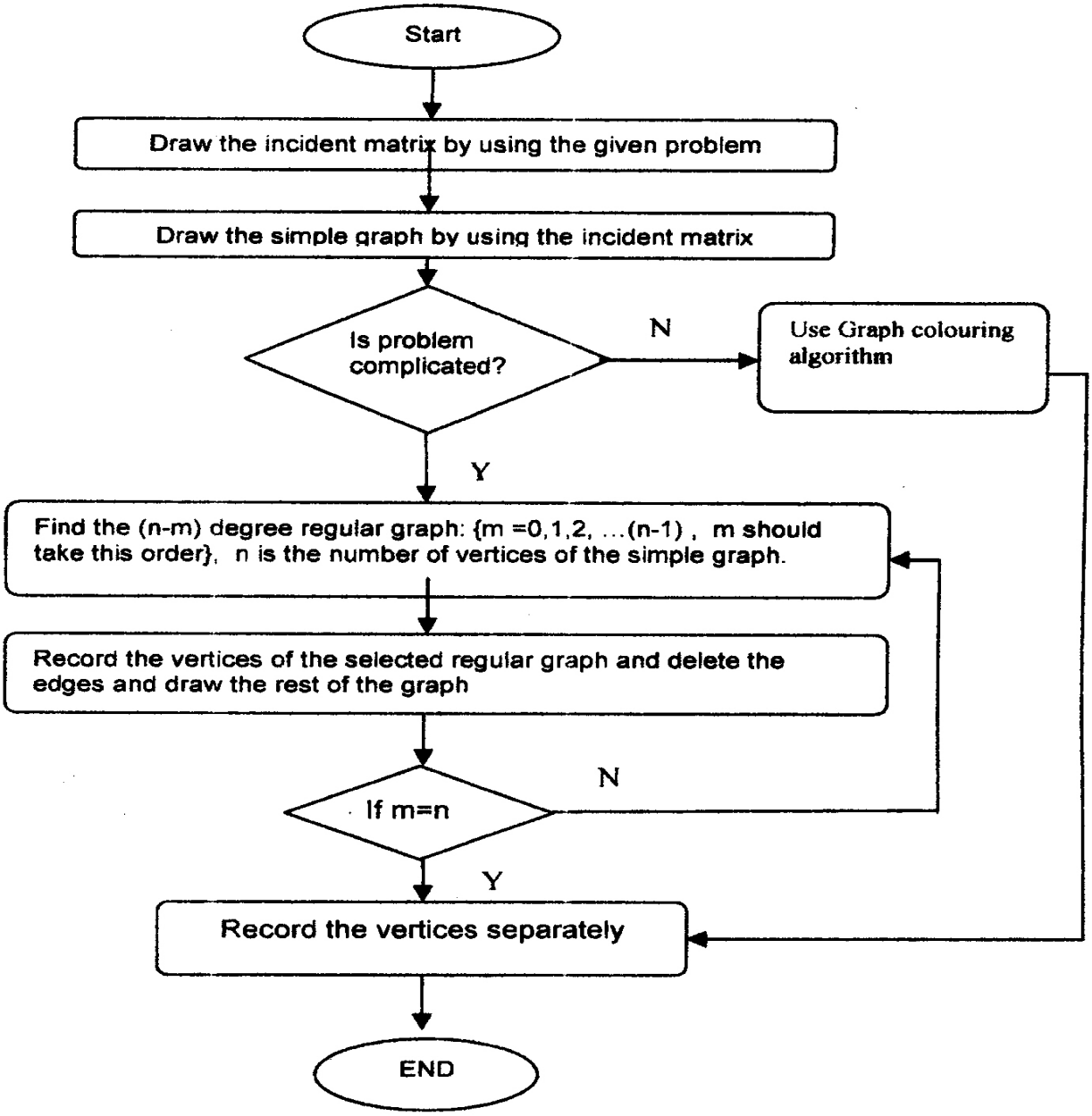
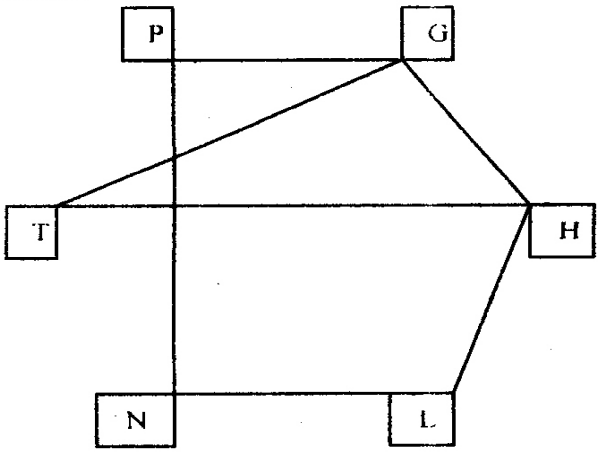
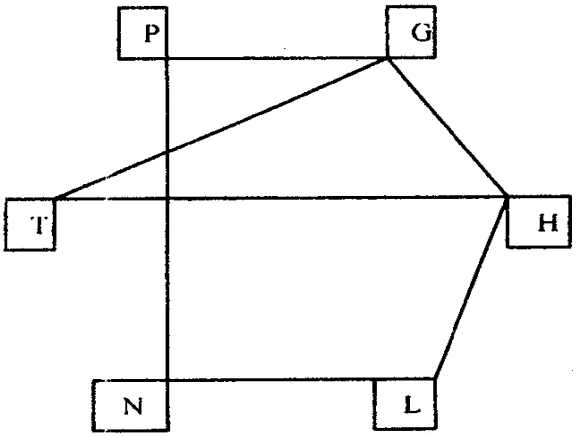
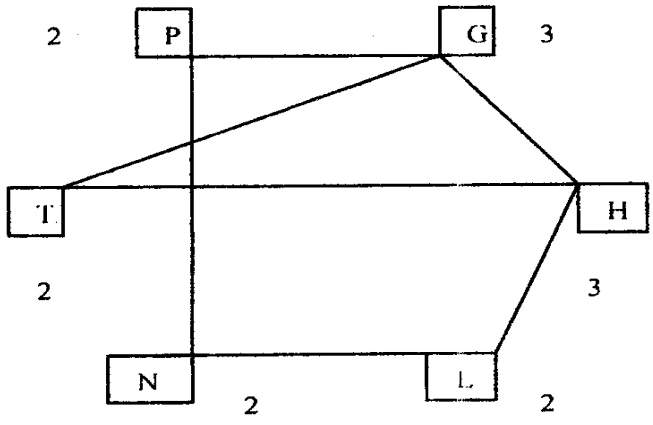
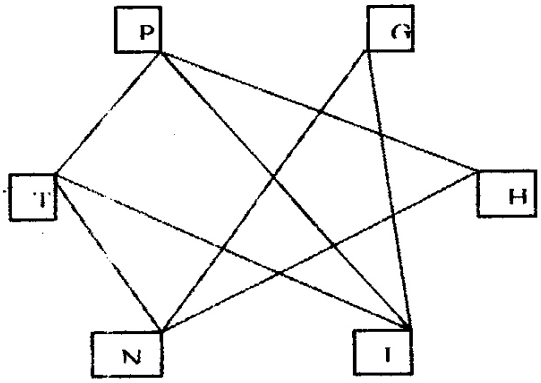


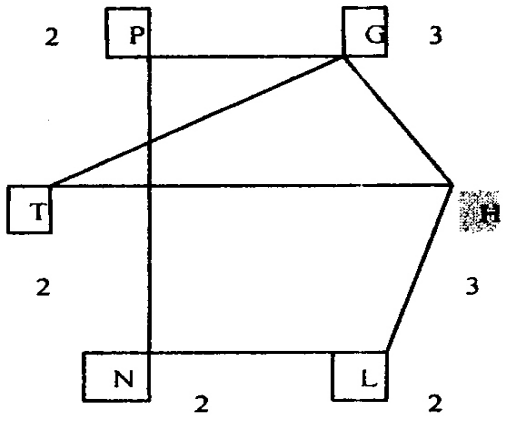
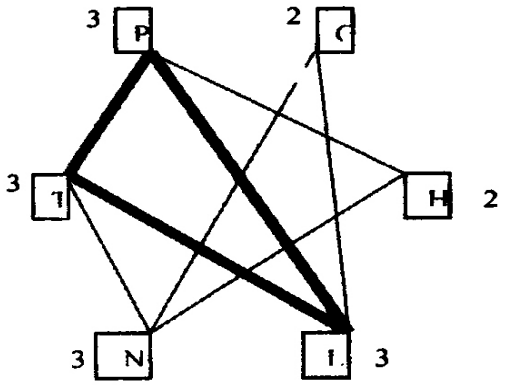
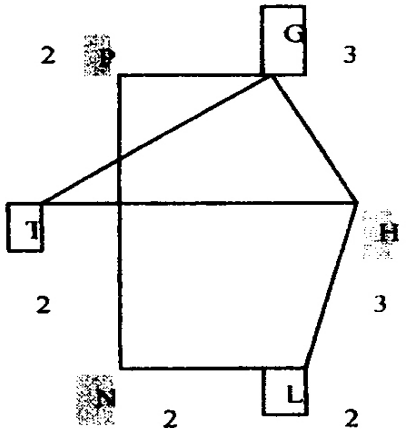
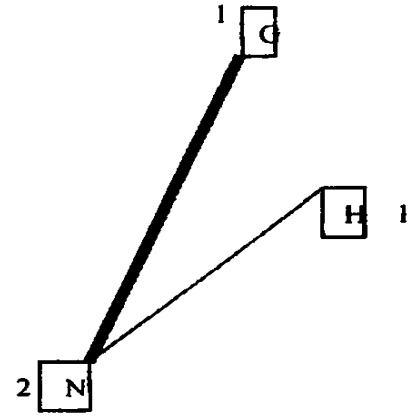
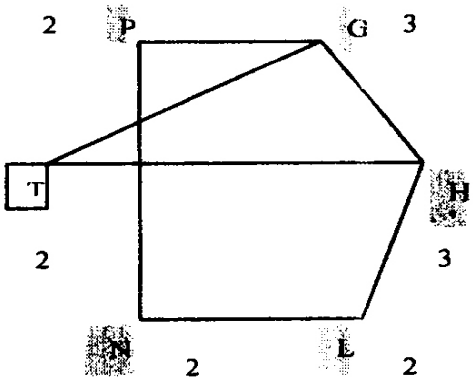
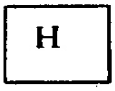
Figure 1

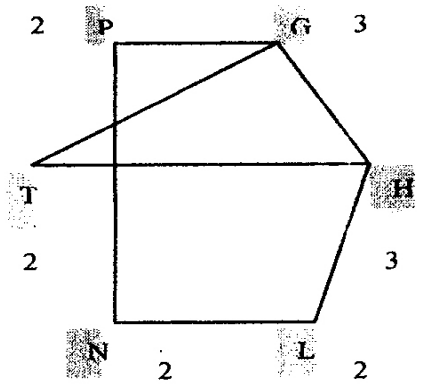
RESULT AND DISCUSSION

Table 1 shows the output of alternative algorithm and former algorithm for same application. Both methods give the same answer but the alternative method has less number of steps. However there are some limitations to solve these problems manually. It is difficult to handle some problems with large number of vertices.

Table 1: Output of former algorithm and alternative algorithm comparison table

Former algorithm	Alternative algorithm
1. Draw the incident matrix	1. Draw the incident matrix
2. Draw the simple graph by using upper or lower triangle of incident matrix. 	2. Draw the simple graph by using upper or lower triangle of incident matrix. 
3. Find the degree of the vertices. 	3. Take the complement of the graph 

4. Assigned a colour for highest degree vertex.  	4. Find the largest degree regular graph and record it.  P,T,L
5. Assigned same colour to non adjacent vertices.  	5. Draw the rest graph and find the largest degree regular graph and record it  G, N
6. Go to the step 4 again.  	6. Draw the rest graph. Degree is zero. Record the vertex and end the process.  H

7. Go to the step 4 again.  	7. Recorded vertices: P,L,T G, N H Chromatic number = 3
8. Number of colours = Chromatic number = 3	

CONCLUSION

- This algorithm can be used successfully as an alternative method for graph colouring.
- This method is more appropriate and efficient for complicated situations.

REFERENCES

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