of labels is equal to \( w \) (step 2). The edges will be labeled so that an edge adjacent to a vertex of high degree is given a small label. If no such assignment is possible, the algorithm backtracks to the previous vertex to try another search path. To further illustrate the algorithm, a trace of the algorithm is given in Figure 6.

![Figure 6 A Trace of the Magiclabel Algorithm](image)

5. Conclusions and Future Work

This paper has presented an algorithm to find a magic label assignment for a given graph. The algorithm utilizes several important properties established in this paper to make the search process more efficient if the graph is magic and to terminate the search process at an early point if the graph is not magic. A depth-first search strategy forms the basis of this algorithm. The properties of magic graph used in the algorithm have been formally presented and proved. The presentation of the algorithm is accompanied by a detailed discussion and an example.

The upper bound for the smallest value of the magic index \( w \) has been conjectured to be \( q \), the number of edges in the graph. However, it is believed that an even smaller upper bound can be found. It is noted that \( p \) is not a candidate for a smaller upper bound. Figure 7 shows an example of a magic graph with \( p = 5 \) and magic index \( w = 6 \). A possible direction for future work is to formally establish the upper bound for the