MAXIMUM AREA COVERING ALGORITHM – A NEW APPROACH OF VERTEX COVER

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ABSTRACT

One of most frequent operation to be performed to avoid traffic in smart cities is to place a security cameras on the road in less amount i.e. wherever required so that less cameras can covers maximum number of roads to save country money and that saved money can be used in other development of country. An efficient algorithm is required to perform a following task . This paper present a new algorithm named Maximum Area Covering Algorithm(MACA).

Keywords: ***Computer Algorithm, security, smart city, Maximum Area Covering Algorithm, Vertex Cover, Complexity.***

I INTRODUCTION

The process of using a computer to solve a given problem by performing several steps . The set of rules for carrying out calculation or sequence of computational steps used to transform input into output is called computer algorithm[1].

The complexity of algorithm is founded by the analysis of algorithm in the form of Big O(n) notation, where O represent complexity of algorithm and n represent size of the list.

II BACKGROUND AND PREVIOUS WORK

The vertex cover (VC) problem belongs to the class of NPcomplete graph theoretical problems, which plays a central role in theoretical computer science and it has a numerous real life applications [2].

In computer science, the Vertex Cover Problem or Node Cover Problem is one of Karp's 21 NP-complete problems. It is often used in complexity theory to prove NP-hardness of more complicated problems. The classical minimum vertex-cover problem involves graph theory and finite combinatory and is categorized under the class of NP-complete problems in terms of its computational complexity [3].

At present, all known algorithms for NP-complete problems require time that is super polynomial in the input size, and it is unknown whether there are any faster algorithms. [4],[5]. The following techniques can be applied to solve computational problems in general, and they often give rise to substantially faster algorithms: [6].

The vertex cover of an undirected graph G(V,E) is a subset V' is subset of V such that if (u,v)belongs to E then u belong to V' or v belongs to V'(or both). In vertex cover problem we wish to determine whether a graph have vertex cover of given size k.

VERTEX COVER={(G,k): graph G has vertex cover of size k }

III FLOW OF PROPOSED ALGORITHM

- Initialize n,J(n),J'(n)=@,J''(n)=@ // n represent number of node or junction in the list, @ represent empty list.
- Find degree of each nodes and insert in J(n).
- Now rearrange the degree of nodes i.e. in J(n) in non-increasing order.
- Mark the junctions having maximum connectivity and add to list J'(n) and add the connecting node to J''(n).
- Now check the nodes not traversed in J'(n) list

```
If(J'(n) U J"(n)== J(n))
  {
     Print(J'(n))
  }
 Else
{
J'(n)=J'(n) U untraversed element   of J(n)
J"(n)=J"(n)U {connectivity of new node}
}
Move to if statement
end
```

IV EXPERIMENTAL RESULTS

Consider a city having six nodes or junctions such that they connected to each other in a given way

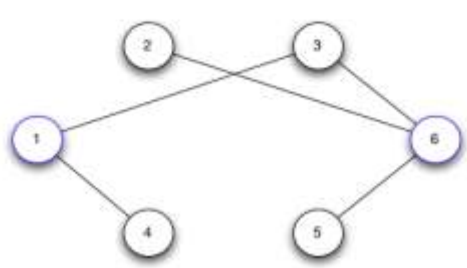

Figure 1: Shows the Six Nodes or Junctions in City

Now according to our proposed algorithm:

- n= 6, J(n),J'(n)=@,J"(n)=@ is initialized .
- Degree of each node is to be calculated:

  J(n)={ node 1= 2, node 2= 1, node 3=2, node 4= 1, node 5=1,node6= 3}
- Now rearranging in non-increasing order.

  J(n)={ node6= 3,node 1= 2, ,node 3=2, node 2= 1,node 4= 1, node 5=1, }
- Since maximum connectivity is with node 6 so place security camera at node 6 due to this node 3 , node 2, node 5 is traversed.

  So, J'(n)={node 6} and,

  J''(n)={node 2, node 3, node 5}
- Now check whether J'(n) U J"(n)== J(n))

  Here not equal so move to else part.

  So, J'(n)=J'(n)U {node 4}

  Now, new J''(n)= { node 2, node 3, node5,node1}

  Now new J'(n)={node 6, node 4}

Now move to **if statement** and now,

J'(n) U J"(n)== J(n)

And J'(n)={node 6, node 4}

So, now we need only 2 security cameras to cover 6 nodes or junctions of a city i.e. at node 6 and node 4 . So, this algorithm act as money saver and full secured system is developed by this algorithm.

V COMPLEXITY COMPARISON OF A MACA ALGORITHM WITH PREVIOUS ALGORITHM

In the previous algorithm or previous technique government use to fix security camera at each and every node i.e. complexity of previous algorithm was **O(n)** but by this algorithm only 2 security cameras covers all the six nodes . So, in this algorithm the complexity is decreased and becomes **< O(n).** So, new Complexity<O(n).

VI CONCLUSION

An efficient algorithm is developed to avoid traffic in smart cities and we placed a security cameras on the road in less amount i.e. wherever required so that less cameras can covers maximum number of roads to save country money and that saved money can be used in other development of country . In this paper we presented a new algorithm named Maximum Area Covering Algorithm(MACA) so that maximum area is covered and less resources are utilized.

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