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DIAMETER CALCULATION IN INCREMENTAL GRAPHS

ABSTRACT

Incremental graphs are the graphs whose edges can be added or deleted with time.There exists an efficient algorithm called IFUB algorithm for diameter calculation in static graphs whose worst time complexity is O(m) for real-world networks where m is the no.of edges in the network or graph.But when IFUB algorithm is applied to incremental graphs,the algorithm requires a lot of recomputation.So,we are trying to reduce this recomputation by storing the information regarding the nodes in the previous run of the algorithm.

ALGORITHM FOR STATIC GRAPHS

Static graphs are the graphs whose edges and nodes remain constant with time.IFUB(Iterative fringe upper bound) is an efficient algorithm for diameter calculation in static undirected unweighted graphs.

IFUB Algorithm

- A root node is selected using 4-Sweep algorithm.
- BFS is done on the selected root node.
- This algorithm travels upwards from the last level of the nodes in the BFS tree of the root node and does BFS on every visited node and terminates when the program meets a certain condition.
- The worst time complexity is O(m) for real world networks where m is the no.of edges in the graph.

IDEA FOR INCREMENTAL GRAPHS

We will look at two cases:-

Insertion of edges

- While running the IFUB algorithm we will store the BFS tree of the nodes on which BFS is peformed.
- We know that the eccentricity of a node changes when an edge is added between the nodes whose level difference is greater than 1 in the BFS tree of that node.
- So,we need not do BFS on those nodes again where edges are added between the nodes present in the same level or adjacent level.

Deletion of edges

- The eccentricity of a node changes when an edge deleted is a tree edge in the BFS tree of the node.
- So,we need not do BFS on those nodes again where the edges deleted are not tree edges.

WORK IN PROGRESS..

Currently implementing the idea for incremental graphs using OpenMPI C++.

REFERENCES

https://who.rocq.inria.fr/Laurent.Viennot/road/papers/ifub.pdf

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