University of Houston

Programming Assignment 2

COSC 6326
Distributed Algorithms

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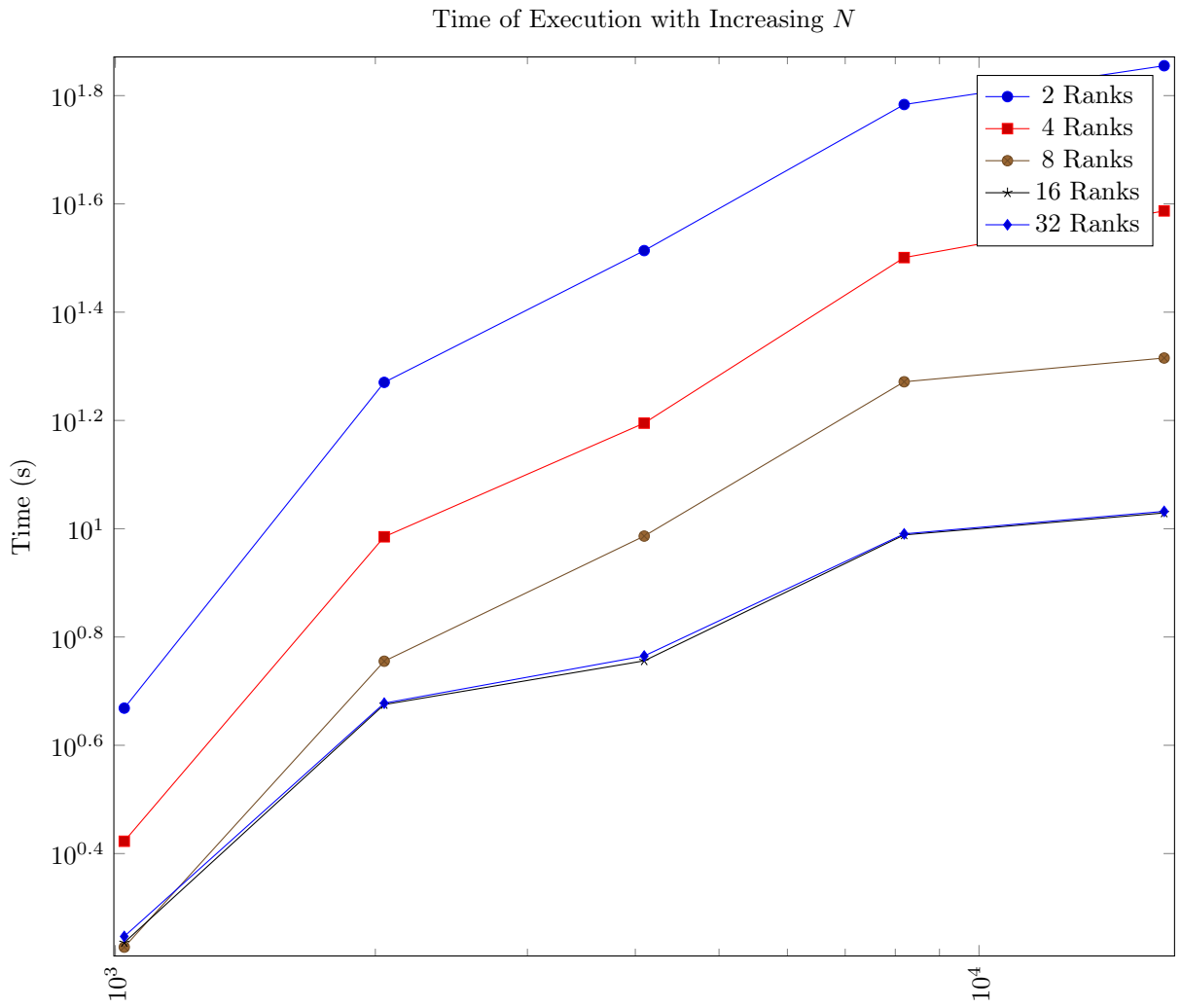

Figure 1: Runtime of the algorithm based on number of ranks and each real-world graph.

1 Algorithm

The pseudocode of the algorithm is described in Algorithm 1.

2 Analysis

All edges are traversed at most two times. So the message complexity is $O(|E|)$. Nomination phase takes $O(|C|)$ where $|C|$ is the number of components of the graph.

3 Evaluation

Runtime of the graph is described in Figures 1 and 2.

4 Acknowledgement

The code was executed by **UH's Sabine cluster**. I should thank ***CACDS/IT*** for their support, provision, and maintenance of *Sabine* cluster.

References

Algorithm 1 Distributed BFS By Flooding

```
1: Coordinator (Machine with rank 0) begins Nominating phase by sending nominate message.
2: while Not Ended do
3:     Receive message m with type t and sending node v, sanding machine k, target node u.
4:     if t == nominate then
5:         Select a node w which is not visited
6:         If no w found, w = Null
7:         Send w to coordinator.
8:     end if
9:     if t == nominate and rank == coordinator then
10:        Collect all nominations and select a nominee w at random.
11:        Send a bfs message to M(w) with parent p = coordinator.
12:    end if
13:    if t == broadcast then
14:        if parent[u] == Null then
15:            return accepted to M(v).
16:            broadcast bfs message to all the edges of u.
17:            add all of children to q[u].
18:        else
19:            return rejected to M(v).
20:        end if
21:    end if
22:    if t == accepted then
23:        do nothing.
24:    end if
25:    if t == rejected then
26:        remove v from q[u].
27:        if |q[u]| == 0 then
28:            send done to M(p[u])
29:        end if
30:    end if
31:    if t == done then
32:        if rank == coordinator then
33:            begin nomination.
34:            increase component count.
35:            if if all nodes return Null then
36:                output component count
37:                broadcast finish
38:            end if
39:        else
40:            remove v from q[u].
41:            if |q[u]| == 0 then
42:                send done to M(p[u])
43:            end if
44:        end if
45:    end if
46: end while
```

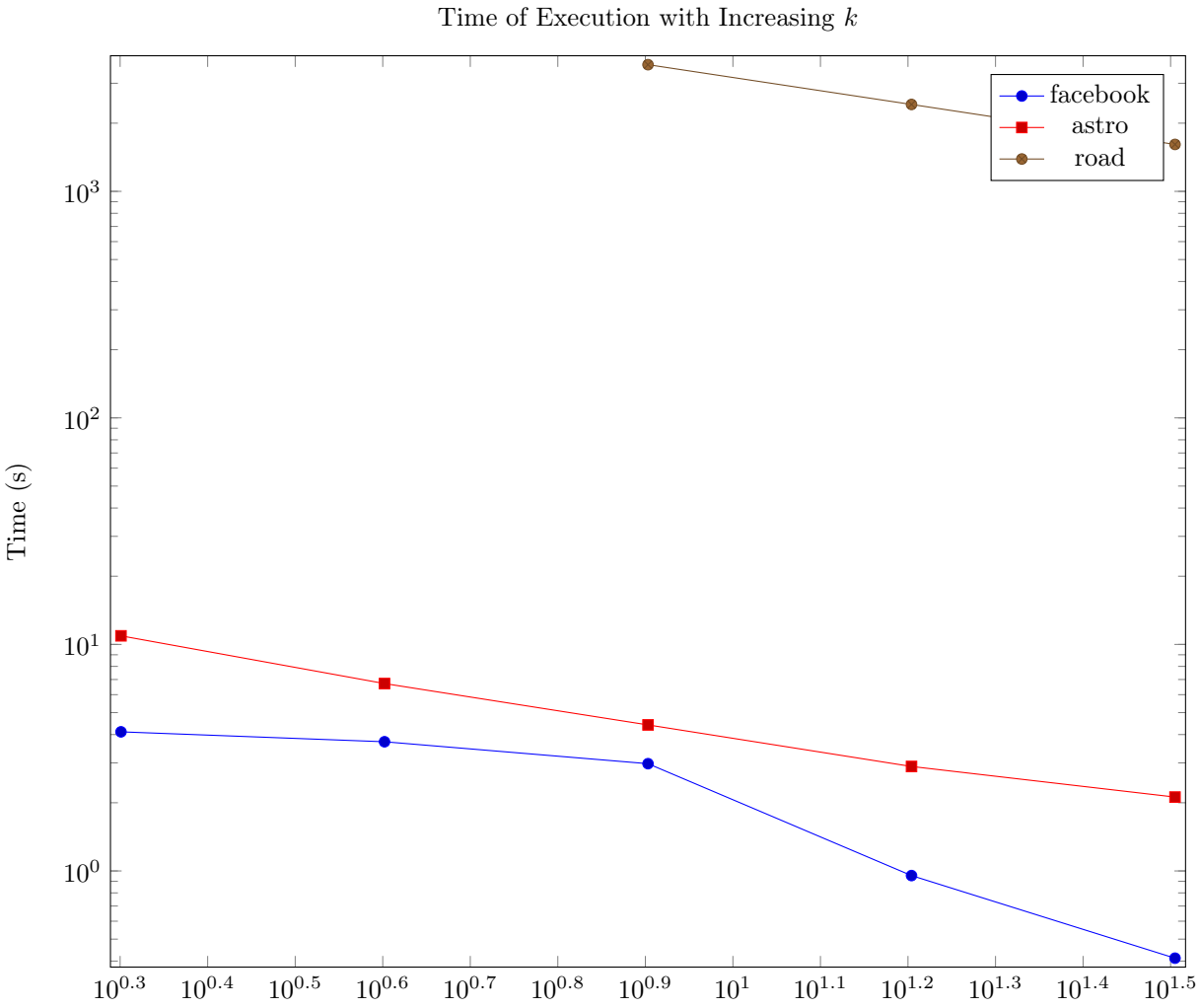

Figure 2: Runtime of the algorithm based on number of nodes and size of ranks.