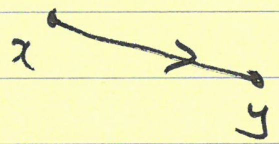
10-10-19

① A. Asynch BFS.

messages: $O(n\,|E|)$; time?

diam is known to all ?

if # hops (to root) through the sender of an "explore" message results in me having # of hops to the root > diam {
reject the message
}



no more than diam-1 on each link.
in the worst case. for an arbitrary link.

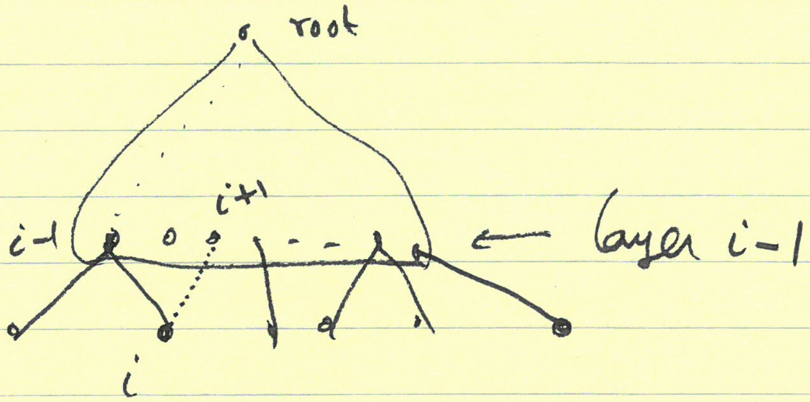
$O(\text{diam}\,|E|)$.
time?

B Layered BFS

Build the BFS tree, one layer at a time

(Start layer i only after all processes of layer $i-1$ have joined the tree)

2



$i = 1, 2, \ldots, diam$ — All processes in layer $i-1$ get a "start" message from the root on the partial BFS tree.

Each process in the "frontier" ~~will~~ sends an explore message to all neighbors & "acquire" as many children as possible &
// an ack or a NAck is sent
// as a reply

Using convergecast to the root find when all layer i processes have been identified

How many layers? diam

messages: $O(|E| + diam \cdot n)$

③ <u>c. Hybrid BFS</u>

choose a parameter m

one phase { pretend that diameter is m and run asynch BFS algorithm

At end of 1 Phase, 1st phase, all processes in the BFS tree of depth m rooted at the root are identified correctly & join the BFS (partial) at the correct position.

At end of phase i (i = 1, ...) all processes that are i × m hops or Les on the BFS tree have been identified

Phase i+1:? Frontier processes of Phase i (who are exactly i ∗ m hops from root on the BFS tree) start. identify all those who are m h or Less from th

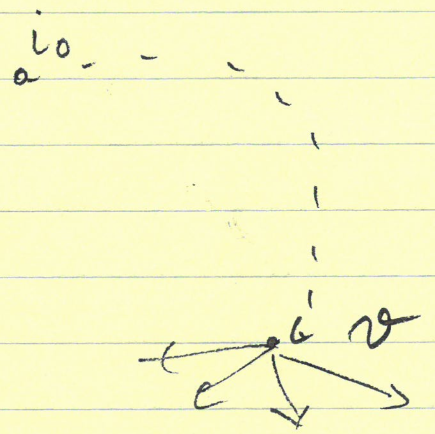
Use Convergecast messages to the root to find when phase i+1 has been completed.

Termination: Find the total # processes added to the BFS tree that are exactly (i+1) ∗ m hops from root on the BFS tree (using the same Convergecast).

(4) When this # is 0, terminate
else go to next phase.

# of messages: $O\left(\underbrace{m \cdot |E|}_{\text{explore/ ack/NACK}} + \frac{\text{diam}}{m} \cdot n\right)$

Asynch - Bellman Ford - Shortest paths.



Each distinct path from i_0 to v can have a distinct path length.

# of distinct paths between i_0 and v = $O(2^n)$
$[= (n-2)!]$

Very expensive in messages in the worst case.