

S-T connectivity (VST-Conn)

Input: Undirected G , nodes s, t

Output: "Yes" if $s+t$ connected
"No" o.w.

Can solve in poly time, in many ways.

What about small space?

RL = class of problems solvable by randomized log-space
computations

[no change for input space (read only), but can only have
const # ptrs ...]

Thm VST-Conn \in RL

Algorithm:

start at s

take random walk for $\Theta(n^3)$ steps

if ever see t , output "Yes"

o.w. output "No"

Complexity:

Keep track of # steps so far

edges

pick one randomly

at each node & toss coin to

logspace

Behavior:

If s, t not connected, never output "yes"

If s, t connected

$$h_{st} \leq C_s(G_s) \leq n^3$$

↑
connected component of S

$\Pr[\text{output "no"}] = \Pr[\text{start at } s, \text{ walk } \geq c \cdot E[C_s(G_s)] \text{ steps} \\ \text{+ don't see } t]$

$$\leq \frac{1}{c} \quad \text{by Markov's } \neq$$

Comments

• Actually $VST_{CONN} \in L$!!!
...

• Open is $RL = L$?
we know $RL \in L^{3/2}$