Sep 26

Explore $(\cancel{s}, G)$

$\boxed{s \equiv S}$

0. $R \leftarrow \{s\}$

1. While $\exists\ (u,w) \in E$ such that $s.t.\ w \notin R, u \in R$

   Add w to R

2. Output $R^* \leftarrow R$

THEOREM: For all $G=(V,E)$, for all $s \in V$, If R^* is the output of Explore$(\cancel{s}, G) = CC(s)$ $\Big\}$ $R^* = CC(s)$

$\Rightarrow$ COROLLARY: BFS is correct

BFS is a special case of Explore

General idea: To show that two sets A & B are $A=B \iff$ (i) $A \subseteq B$ (ii) $B \subseteq A$

Lemma 1: $R^* \subseteq CC(s)$ ← everything that is output by Explore is correct.

Lemma 2: $CC(s) \subseteq R^*$ ← everything the should be output ~~by Explore~~ lie in $CC(s)$) is actually outputed by Exlore

Lemmas 1+2 $\Rightarrow$ THM

Pf of Lemmaa1: Ex (by induction)

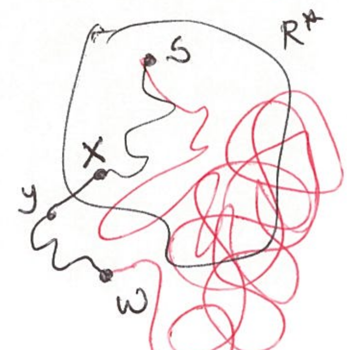
Pf (idea) of Lem 2: Pf by contradiction

Note: Since R^* is output $\Rightarrow$ Explore has terminated (#)

Assume $CC(s) \not\subseteq R^*$

$\Rightarrow \exists\ w \in CC(s)$ s.t $w \notin R^*$

$\iff \exists$ an s-w path P in G but $w \notin R^*$



Since P starts inside of R^* $(s \in R^*)$ but ends up outside of R^* $(w \notin R^*)$

$\Rightarrow P$ has to "cross" R^* at some point

$\Rightarrow \exists\ (x,y) \in E$ s.t. $x \in R^*$ but $y \notin R^*$

$\Longrightarrow$ y should have been added by Exlore to R
by algo defn

$\Rightarrow$ Explore should not have terminated with R^*

$\rightarrow$ contradicts (#)