CSE 101 – Nov 25, 2019 (Week 9)

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PA4

- Due Friday ("Black Friday")

Definition

Let G be a digraph. The **component graph (or condensation graph)** of G is the digraph G^{SCC} with

$V(G^{SCC}) = \{$ S.C.Cs of $G\}$

$E(G^{SCC}) = \{(c_i, c_j) \mid \exists x \in C_i, \exists y \in C_j \text{ s.t. } (x, y) \in E(G)\}$

Note: G^{SCC} is necessarily acyclic

Example: Last example (previous notes), topological sort

(1 5 2) $\rightarrow$ (3 4) $\rightarrow$ (7 6) $\rightarrow$ (8)

Chapter 24

SSS in weighted graphs

Definition

A **weighted graph** (or digraph) is a graph $G = (V, E)$ with a function $w : E \rightarrow \mathbb{R}$

The weight of a path

$P : x = v_0, v_1, v_2, ..., v_k = y$

is

$w(p) = \sum_{i=1}^{k} w(v_{i-1}, v_i)$

Shortest path weight

$$\delta(x, y) = \begin{cases} \min\{w(p) \mid p \text{ is an } x \check{} y \text{ path in } G\} \\ \infty \text{ if no such path exists} \end{cases}$$

Shortest $x\breve{}y$ path

An $x\breve{}y$ path P with

$$w(p) = \delta(x, y)$$

SSSP in a weighted graph

Given a weighted graph and a source vertex $s \in V(G)$, find

- $\delta(s, x)$ for all $x \in V(G)$

and

- for each x with $\delta(s, x) < \infty$ determine a shortest $s\breve{}x$ path