Homework 8

Collaborators: Jay Hou, Thomas Weng, David Marcano

Will Childs-Klein

wdc22

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Problem 1

Algorithm

3CG-Min-Weight-Approx

input: $G = (V, E, w), w : E \to \mathbb{R}^+$
init: $c = \emptyset, n = |v|$
begin
  sort V such that $\sum_{(u,v_1)\in E} w(u, v_1) > ... > \sum_{(u,v_n)\in E} w(u, v_n)$
  for $i = 1...n$:
    let $p_i = \{(u, i) \in E : u \in V\}$
    for $j \in \{1, 2, 3\}$:
      $\text{cost}_i^j = \sum_{q\in p_i : c(p)=j} w(p)$
    end for
  $c(i) = \underset{j\in\{1,2,3\}}{\text{argmin}} (\text{cost}_i^j)$
  end for
  return c
end

Complexity

$$O(n + n \log n)$$

Proof of Complexity

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Correctness

Theorem 8.1

`3CG-Min-Weight-Approx` will alsays find a color assignment c whose total cost is at most

$$\frac{1}{3}\sum_{(u,v)\in E} w(u,v)$$

Proof of Theorem 8.1

Problem 2

Problem 3

Problem 4

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1   input:
2   init:
3   begin
4
5   end
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