An Overview of Maximum Weight Graph Matching

Erin R. Rhode and Seth Pettie
Department of Computer Science and Engineering, University of Michigan

UNIVERSITY OF MICHIGAN

Maximum Weight Matching

For an undirected weighted graph, $G = (V, E, w)$:

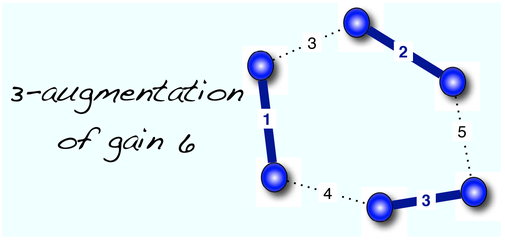
- **Matching :** set of endpoint disjoint edges $M \subseteq E$
- **Weight of a Matching :**

$$w(M) = \sum_{e \in M} w(e)$$

Want to find maximum weight matching, M^*.

Augmentations and Gain

- **Augmentation :** Path or cycle in G with alternating matched and unmatched edges

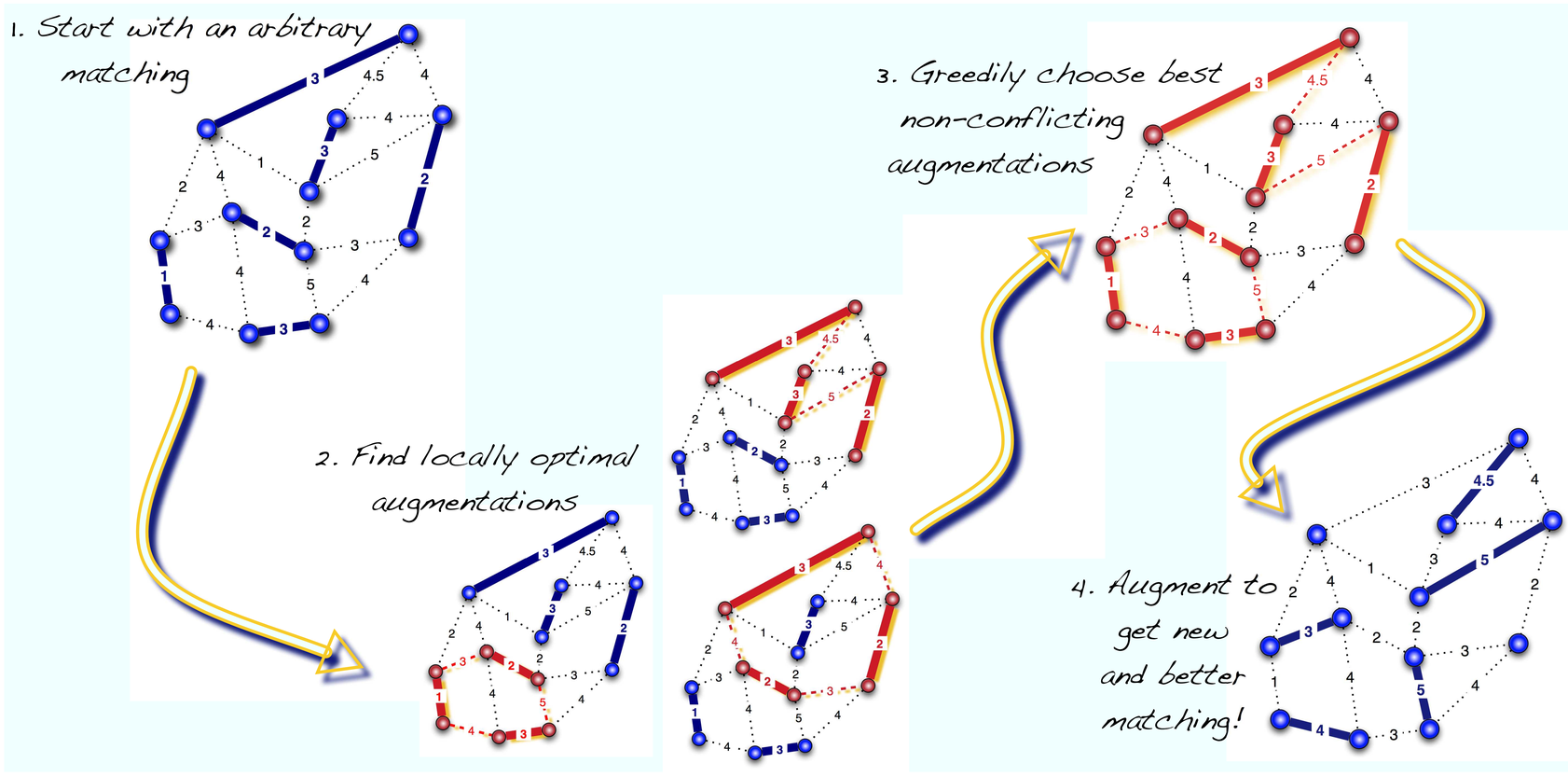


- **Gain of Augmentation :** $g(aug) = w(unmatched) - w(matched)$
- **k-augmentation :** Augmentation containing at most k unmatched edges

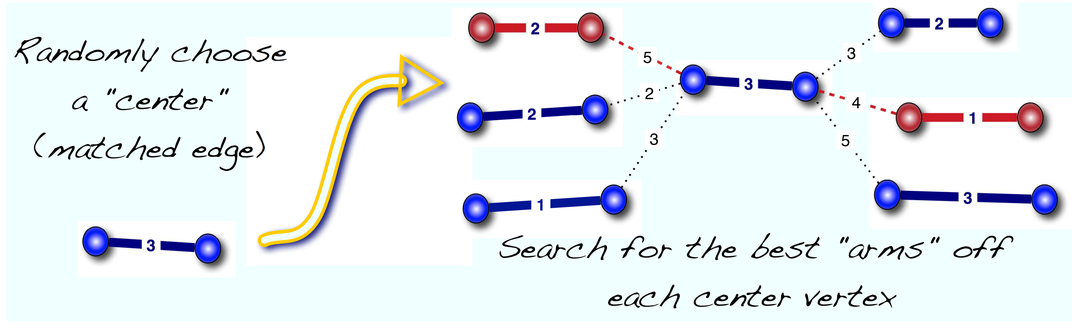
Approximation Theorem

If a matching has no positive gain k-augmentation, it is within $\frac{k}{k+1}$ of optimal.

Overview of Approximation Algorithm



Finding Locally Optimal Augmentations



Issues to Consider

- Sorting and updating lists of long arms
- Avoiding self-conflicting augmentations
- Finding cycles (or finding higher gain paths)

Contact information: Erin R. Rhode, Graduate Student – Seth Pettie, Assistant Professor – Department of EECS, University of Michigan, Ann Arbor, MI 48104 – Email: {*errhode, pettie*}*@eecs.umich.edu*; Web: *http://www.eecs.umich.edu/∼{errhode, pettie}*