HW7 - 7

第二組

2019.4.23

Exercises 22.2-7（塗兩色問題）

There are two types of professional wrestlers (摔角手): babyfaces (good guys) and heels (bad guys). Between any pair of professional wrestlers, there may or may not be a rivalry.
Suppose we have n professional wrestlers and we have a list of r pairs of wrestlers for which there are rivalries. Give an $O(n+r)$ time algorithm that determines whether it is possible to designate some of the wrestlers as babyfaces and the remainder as heels such that each rivalry is between a babyface and a heel. If is it possible to perform such a designation, your algorithm should produce it.

Approach

1. Build a graph whose nodes are wrestlers and edges are rivalries, with adjacency list representation.
2. Find a spanning tree with an arbitrary root via BFS. $\Leftarrow O(n + r)$
3. For nodes of even level in the spanning tree, labeling them as babyfaces.
4. Finally, check if for each edge, its 2 coincident nodes are babyface and heel respectively. $\Leftarrow O(r)$
5. If **#4** is true, the map of node - label is the solution.

Remarks

1. The declaration of data type is important since the computational complexity of BFS depends on it.

   “ adj-matrix $O(n^2)$ v.s. adj-list $O(n+r)$ ”

2. In **#3**, even and odd are changable.

Thank you for your kind attention

Questions & comments are welcome.