Happy Friends Tutorial

Pre-requisites:

This problem will require concepts of graph theory and graph traversal (dfs, bfs) to solve. Make sure your basics of graph theory are clear before attempting this problem. The following links can help you learn the prerequisites:

- http://www.geeksforgeeks.org/depth-first-traversal-for-a-graph/
- http://www.geeksforgeeks.org/breadth-first-traversal-for-a-graph/
- https://www.topcoder.com/community/data-science/data-science-tutorials/introduction-to-graphs-and-their-data-structures-section-1/
- https://www.topcoder.com/community/data-science/data-science-tutorials/introduction-to-graphs-and-their-data-structures-section-3/
- https://www.topcoder.com/community/data-science/data-science-tutorials/introduction-to-graphs-and-their-data-structures-section-2/

Problem Description:

There are n participants, and the mood of each one of them is given: which can either be happy or sad (0 or 1). Apart from that, there are m room freshener and each room freshener affects the mood of some of them, but it is given that the room of one participant can be affected by exactly two fresheners. Spraying the room fresheners toggles the mood of all participants which are affected by that freshener. We have to find out if there is way to toggle the moods of them in such a way such that all of them become happy.

Difficulty Level:

Medium

Editorial:

Let us begin by understanding how we got the given sample output from the given sample input. In the example, the initial moods of the people are [1, 0, 1] (0 means unhappy, 1 means happy). After spraying freshener 3, we get [0, 0, 0] as the moods

which means that all of them become unhappy. Then, after spraying the freshener 1, we get [1, 1, 1] which means all participants are happy.

Now, model the situation as a graph with moods of the friends as edges and fresheners as nodes. Mark the edges as 1 if the mood of the person is happy else mark the edge as 0. The answer will be "YES" if we can color the graph in such a manner that the edges having value 0 have both nodes under different color (if the person is unhappy then one of the room freshener should be selected) and the edges having 1 have both nodes under same color (if the person is happy, we should either select both room freshener or neither of them). For checking the same, we can start a bfs from freshener 1 and toggle it and proceed, if we are able to color all of the fresheners then the answer is "YES" else it is not possible.

Complexity of solution:

The complexity of this solution is same to the complexity of breadth first search i.e. $O(N + M)$, where *N is the number of people (edges) and M is the number of room fresheners (nodes).*