Problem E. Simple Tree Counting

https://www.hackerrank.com/contests/university-codesprint-3/challenges/simple-tree-counting/problem

Problem G. Tourists

http://codeforces.com/contest/487/problem/E

Problem H. Interesting excursion

First, let's restate the problem in terms of graphs. We are given a directed graph, which edges are colored in m different colors. We are required to find an edge-simple cycle where all adjacent edges have different colors.

Let's describe the $O(m^2)$ solution first. Build a new graph, where the vertices represent the edges of initial graph. You can go from one edge to another if the end of the first edge is the same as the beginning of the second edge, and their colors differ. Any cycle in this graph corresponds to a desired cycle in the initial graph. Still, the number of transitions can be up to m^2. To get a linear solution you should build transitions more efficiently.

Consider building all transitions between incoming and outgoing edges of vertex v. Sort all outgoing from v edges by color. Let's call the number of such edges as d_v. Now all edges having the same color c form the contiguous segment in this sorted array, and all other edges are located in the union of some prefix and some suffix of this array.

For each vertex v create $2d_v$ vertices $\texttt{prefix}_i$ and $\texttt{suffix}_i$. Add edges from $\texttt{prefix}_i$ to $\texttt{prefix}_{i-1}$ and to i-th edge in the sorted array. Similarly, add edges from $\texttt{suffix}_i$ to $\texttt{suffix}_{i+1}$ and to i-th edge. Using this construction, starting from vertex $\texttt{prefix}_i$ you can reach all edges with index less than or equal to i, and starting from vertex $\texttt{suffix}_i$ — all edges with index greater than or equal to i.

Let's look at the edges $u \to v$ having color c. Suppose that all outgoing from v edges, which have color c are located on segment $[l, r]$. Add transition from this edge to $\texttt{prefix}_{l-1}$ and $\texttt{suffix}_{r+1}$. This way, from this edge you can reach all edges, which color is either less than c or greater than c. In this new graph, find any cycle. Numbers of vertices which correspond to edges of the initial graph will yield the desired answer for the problem. Auxiliary vertices $\texttt{prefix}_i$ and $\texttt{suffix}_i$ should be removed.

Let's estimate the number of vertices and edges of the new graph. For each vertex v we added $2d_v$ new vertices, each one has at most two outgoing edges. Sum of all d_v is equal to number of edges m. Thus, new graph contains $3m$ vertices and at most $6m$ vertices. You can find cycle using depth first search, which takes $O(m)$ time.

Problem I. Sushi

https://www.hackerrank.com/contests/w33/challenges/bonnie-and-clyde/problem

Problem J. Tree-Tac-Toe

https://codeforces.com/blog/entry/65079

Problem K. Elephants

https://codeforces.com/blog/entry/56486?#comment-401833