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HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY

ONE LOVE. ONE FUTURE.



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Applied Algorithm Lab

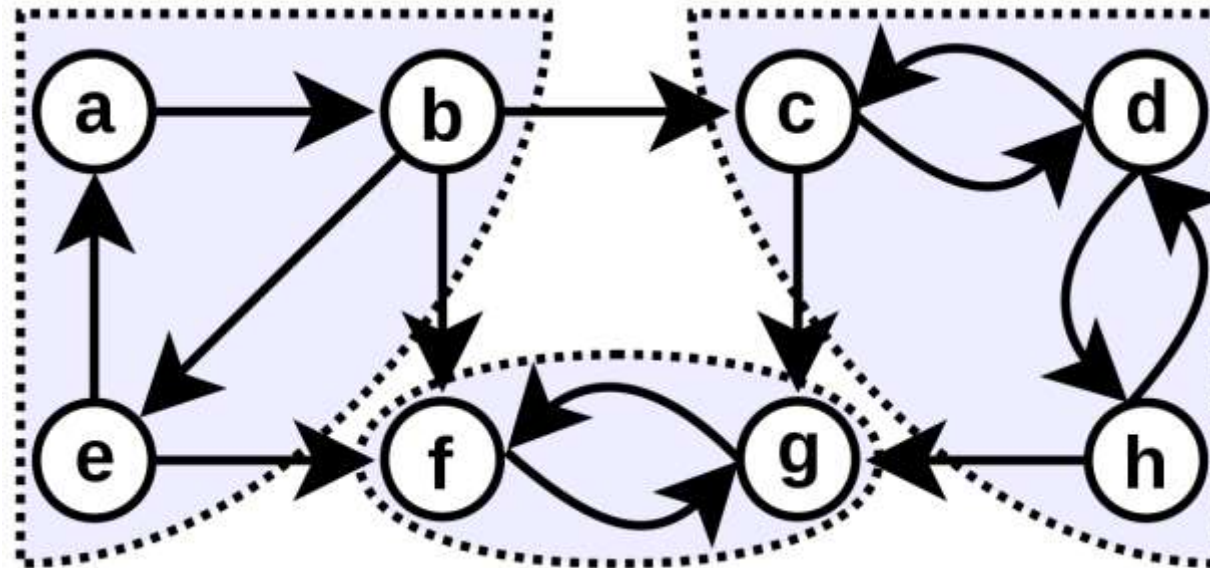
Strongly connected component

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- Count #strongly connected components in a directed graph
 - Definition: A subset with maximal number of vertices that between 2 arbitrary vertices, there exists a path from a vertex to the other and vice versa.
Thành phần liên thông mạnh là một tập con tối đa các đỉnh sao cho giữa 2 đỉnh bất kỳ luôn có đường đi từ đỉnh này đến đỉnh kia và ngược lại.
- **Input:** Edge list
 - Line 1 contains N, M
 - M lines follow, containing a pair of 2 integers a, b which is an undirected edge from a to b.
- **Output:**
 - Number of strongly connected components.

Strongly Connected Components

- BFS and DFS can find all connected component in undirected graph.
- However, in directed graph, finding all strongly connected components is not trivial.
- Can we use DFS tree to find all strongly connected components ?



- Idea to solve: DFS on residual graph. Algorithm:
 - Run DFS on $G \rightarrow$ compute the finishing time $f(v)$ of each node v of G
 - Build residual graph G^T of G : reverse direction of all edges
 - Run DFS on G^T :
 - the nodes are considered in a decreasing order of finishing time f :
 - Each run $\text{DFS}(u)$ will visit all nodes of the strongly connected component containing u
- Number of connected components on G = number of times call DFS on residual graph of G



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THANK YOU !