SCC (Strongly Connected Components)

What it is:

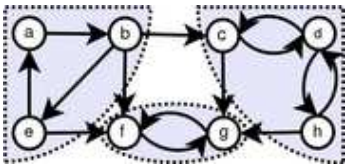

Figure 1: Graph with strongly connected components marked.

A directed graph is called strongly connected if there is a path from *each* vertex in the graph to *every* other vertex.

The strongly connected components (SCC) of a directed graph are its maximal strongly connected subgraphs.

পাশের গ্রাফে a, b আর e নোডগুলা নিয়ে একটা SCC; কারণ a থেকে কোন না কোনভাবে b, e দুটোতেই যাওয়া যায়, b থেকে e, a দুটোতেই যাওয়া যায়, আর e থেকে a, b দুটোতেই যাওয়া যায়। একইভাবে, (f, g) আর (c, d, h) –ও দুটো SCC।

How to program:

1. Run DFS from any node (for example ***a***).
2. While running DFS, find the topological sort along with it.
3. Reverse the direction of the edges.
4. Now run DFS again from the node **whose finishing time is the *lengthiest***. (You can find it from the topologically sorted array).
5. While running the DFS, output the nodes in the DFS tree. These nodes comprise an SCC.
6. If there are still unvisited (i.e., white colored) nodes, then repeat steps 4 and 5.

Note that a node itself is a strongly connected component if nowhere cannot be gone from that node. For example, in *Figure 2*, nodes 1, 2 and 4 comprise an SCC. Again, only node 3 is also an SCC.

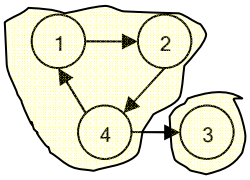

Figure 2