**2. Algorithm Description**

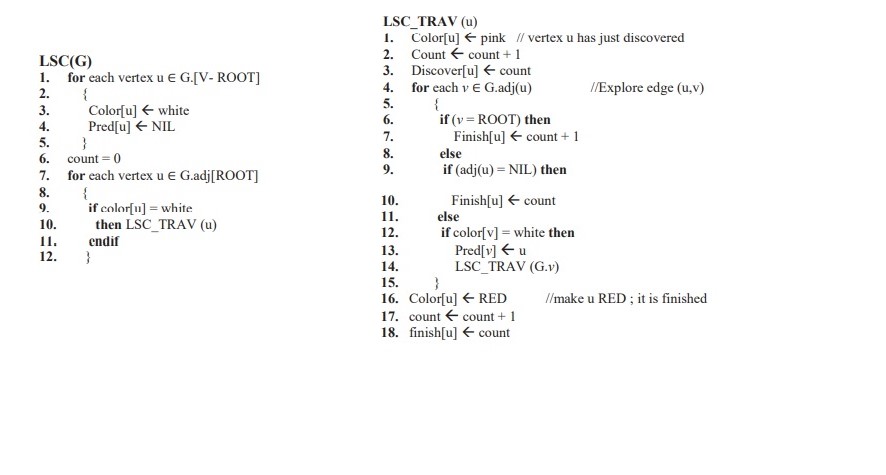
In the previous step, we proved that The Longest Simple Cycle problem (finding the longest path which has the starting and ending vertex as the same vertices and visiting each vertex once except for the starting vertex) is a NP-Complete Hamiltonian path. In our progress report, we proposed an algorithm to solve the Longest Simple Cycle. The previous algorithm solves the problem accurately for all the input because It was a brute force algorithm. We considered each possibility. However, we traded speed for correctness. The complexity of our previous algorithm was O(V!). The running time of our previous algorithm will be significantly large for graphs with large number of vertices. We will now propose a heuristic algorithm which will run faster but it will not guarantee to solve the problem optimally for all the inputs.

**Heuristic Algorithm for Longest Simple Cycle Problem [[1]](#footnote-1)**

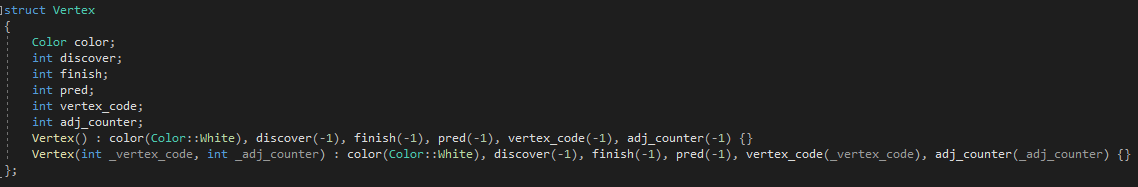
**Algorithm Summary:**

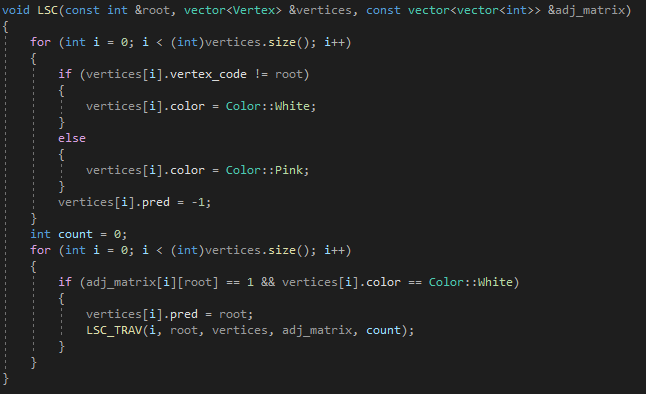
1. Enumerate all the nodes, calculate degree of each node and find the highest degree node.
2. Assign the node with highest degree as the root for tree.
3. Apply the proposed LSC algorithm to find the longest path.
4. Join the leaf node with the root and retrieve the path considering it as the longest cycle in graph.

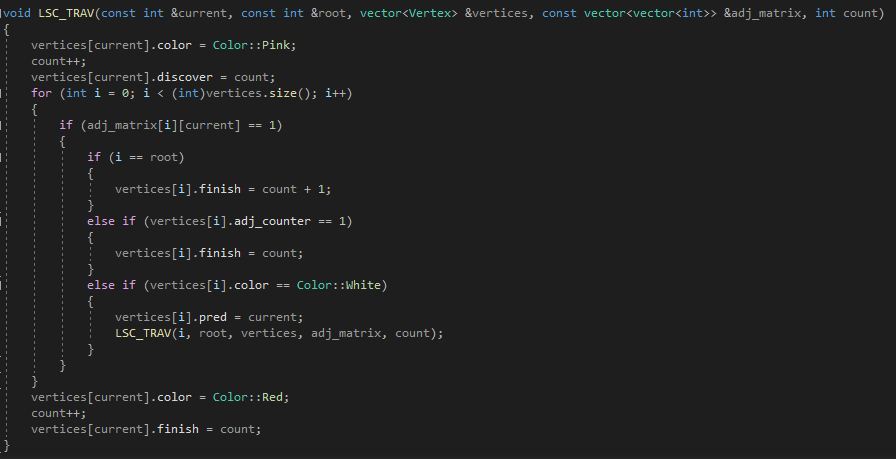
**LSC Algorithm Pseudocode:**



**Implementation of the Algorithm:**







**Explanation of the algorithm:**

We first paint all vertices white except the root and initialize each vertices’ predecessor as -1. Then we reset the global counter to 0. Then, we check each vertex in V and if it is the adjacent of the root and its color is white, we visit it using LSC-TRAV. Before calling LSC\_TRAV on u, we assign its predecessor as root. In each call LSC\_TRAV(u), vertex u is initially white. We then color u to pink and increment the global counter variable and get the discovery for vertex u. We then check for all the vertexes (v) and examine if it is adjacent of u. If v is root, we update the finish of v to global counter+1.

Else if v does not have remaining adjacent, we update the finish of v to global counter. Else if the color v is white, we assign the predecessor of v to u and examine v by calling LSC\_TRAV on vertex v. After we are done with a vertex, we update the color to red and increment the global counter and assign the finish time to global counter.

**3. Algorithm Analysis**

* **Correctness**

Loop Invariant: For the graph (G) where the starting and ending point is the root of the graph, the algorithm will find the longest simple cycle.

Init State: i=0 / before the execution of LSC(G) we need to show that the loop invariant holds. At i=0 the cycle is defined as an empty cycle. For all graphs an empty cycle will be the correct longest simple cycle which could be found. Thus, we can say that the longest simple cycle is found. Which is from 0 to 0.

Maintenance State: i=k where k is [0,n-1] / during the execution of LSC(G) we can see that for each k, the algorithm try’s to add the new founded node into its cycle to find the longest simple cycle. So, if true before an iteration of the loop, it remains true before the  
next iteration.

Termination: After going through all the nodes the program can terminate with the longest simple cycle (which is also the loop invariant).

Hence, the program terminates and finds the correct result.

* **Time Complexity Analysis**

![A picture containing diagram

Description automatically generated](data:image/jpeg;base64,/9j/4AAQSkZJRgABAQEAAAAAAAD/4RCyRXhpZgAATU0AKgAAAAgAAodpAAQAAAABAAAIMuocAAcAAAgMAAAAJgAAAAAc6gAAAAgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAFkAMAAgAAABQAABCAkAQAAgAAABQAABCUkpEAAgAAAAM1NAAAkpIAAgAAAAM1NAAA6hwABwAACAwAAAh0AAAAABzqAAAACAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA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AKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKKKKACiiigAooooAKRqWmt92gDwH4C+PPEHir43fHPStW1Sa907Q9Ws7XTbaQKFtomtyxVQAOrHknJOOte+15tH+z34EgXxqE0u5B8aIY9eZtTunN3lSufmkOw7SRlNvFdv4d0K08L6Fp2j6dG0Wn2FvHa28byNIVjRQqgsxJPAHJJNKPwoHrJtGlXkXxG8aavp/xq+GXhG3u20/RtdTU5b6SMKHuDBApjgDkZTJdnJQhv3fBAzXrzVzvi/wPovjywhtdasftS2863NvIsrwzW8y52yRSxsrxuMkblYHBIzg0uq8g6Ndzm/G3iZPhcNHWCa4vptav7XQ7CzvblpI455HcmZ5G3SEbc5BJzsVRjOa881/4qarrXirw7pcom0bVdG8dxaHqS2FzILe9gewluEOOMqytESjA7WU4J6n1e++FXhnVNDl0q/sp9QtpJIpjLeX9xNcq8bbonW4eQyoUblSrDaSSMZNRTfCHwpMNM3afO76fqX9rwzf2hc+abvYUE0j+ZumbYdv7wsNvHQAU+oHA2f7RF5faf4U1uHRLebQPFdxeWemH7SyzRTQxzSRmb5SNsi2752jMZwPn6jE0Px54n+JmrfCHUdZhj0HSfEkU1+llourXAaWP7CsqrOyrGflkJwoLAjr6V6vYfBvwhpU80tppkluJHuJlhS8nEMEk4ImeGPzNkLMGfLRhT87c/Mc8/ffCWbw/qXw4Hg+2tV0fwkLiBbHUdQn3CCSDykCSMsrNt9G7DGaOwPZ2MrRfjVqmsah4esLmwtBHqninVfDFw0DyIyrapcssyHOQW+z8rnjdweK6D4I3V1NH44s7i+vL2HTvE11Z2rXtzJcPHCscRVN8jMxALN1Pera/BDwfB4gHiC30iUavFqEmsQk6lcrDHeOjI8ixiQohcMwfauGzlgTTvhF4b1Dw/a+JrjUZdPefWNcuNTVNNuWuI4ldY1CFyiEsChz8uOafTzD8j531D4ofFLxR+0R4m8Lal4OmurLRDFd6L4et/EqaSt3CrHF80gXfdKTgGPd5adHRmwa+kvh34m8Y+Imvv+Er8Ex+EBDs+zmPWI7/AO0Z3bvuIuzGF69d3tV3xV8OPD3jTUNEv9Y083F/otz9r0+8hnkgnt5MYO2SNlbaw4ZCSrD7wNdR9KUdIpMb1d0eC6t+0F4m0fV9bnl8K6fJ4a0TxTb+HL2eLUna8Kzi3Ec8cRhCthrlNylhxnBOMmCz+NmvQ6+2k6Z4ds5LvUPGN/oBa/1u4kjjaKyNwsq7o2KqwT/VoAF7A5JrovA/wae38Y+NdZ8SWkVwmo+IU1jTYotRnkiAS3hjjaWD5Y/MVotwOGxlSDlRjoYfgd4Ot9Yj1VNPvFvo9Vm1tZP7Wu8C8liMUku3zdvMZK7cbQOgpLZA7XdjxC4/aHv5PFfw/wBcn3aXNrujapp50truV9N/tGPULa2ikkbhUj3mT94QGw4Xliqn6k0/7V9ihF68Ml3tHmtbqVjLd9oJJx9TXnA/Zr+HbWIspNEuJ7QWd5p4hm1S8kTyLqQSXCYaU/ecBs9QQCpGBj0LRdHttB0u10+08821tGIozdXElxJtHTdJIzOx92JNUtietzL8eanc6b4deOxk8nUr6WOxtJBglJJWC7wD12As+PRDVPwhJcahqGtXYuJnsLWUaZZRySM6kQjEshycsxlLoWPJEQ9a6G80m11C6srmeLfNZSmaBtxARyjIWwDgna7Dn1pNJ0m20Oxjs7OJobeMkqu4scklmJJJJJJJJJySaBnkWl/HTUlh12DV7Ozg1bw3e6gdZtbdXOyxt4RLHPHluTKskBGeB5jDnYc0ta+Onjfw/wCE7nxDdeBbU6ZJHp02n3DavGFmFzcJE0ZCB23IJEYPtCsD/CRg+tp4M0SPXNW1gaZb/wBp6tbx2d9cFcm4hj37EYHggCR/rnBzgY42z/Zv+H2n+HrrQbbRbiLSbiSKQ266reYj8qQSRpEfNzFGrgN5aFUyB8tTqUrbnF3Xxo8ZeDvF3jT/AISqHR20/RNH0y5j03Sy5Bnurm4hT/SJNvBKR7iUAUZ9CTq+LPi5488D+EdX8Qaz4PtbSz0a/g+07bpJZLzT3Kh5oI0kJWWMlh5Tn59vynnFd5rnwi8J+JtS1G+1bSBfzajpy6TeLNPKYrm2Bcqkke/YxUyPhyNw3HBGag8P/Bvwn4WtbC2sLG7WGxuPtMP2jU7q4YybDGN7SSsZAqkhVfKrn5QDVdLErzEXxlqafCO58VsNPn1BdLk1SJbUtJbOojMiKGDfNlcDcDjnIyMZyfAHxWv/ABh4tstKuLK3gt7vwrYeIlkiZiyPOzq0RzwQNuQ3B56cZrp/Cnw50DwP4S/4RjSLJodC2yKLKe5muECvksimV2KpyflBwM8AVR8F/Bjwj8PtSj1DQ9PuLW8jsU01Jp9Rubki1RiyRfvZG+VSTtH8I4GBxS63BbanlE3xR8Q+B/ib49fy11bw9D4l0bTGjur+XzLRbuK3j/cIVZcCSbeRkDGQK3ofj9qx8W3GkJ4di1JpLHWLqyh0+4Z2kksZUjWHzdvlu0okBO05ib5GBNdnqvwR8H63eavc3mn3Us+rX1rqV4y6ndIJLi2KGBwFlAXYY0wq4HyjINUIf2dfANtMZo9HukbbeRoq6reBYluzm5SNfNwiu3zYXADfMMHmhbIbtrYufCT4nQ/EzRtRvoZraR7S6+zPCkUtvPAwjRmjuIJQHhkVmYbTnIAYcNXEeA/jHqeoXnhPTk0yG0TXdS16zl8++nvXt5LOaYBlkkILoxT7nyhRwuAAB6XH4UXwfperzeFdNhu9avCkr/2pqE3+kuqqg8y4YSuMIoA4bGBxyTXK+F/gTpMfhXS7HxDEbzULHVb7V4rixvJ4DBLdTzSOiSRtGzJtmKEH5XA5XtRu3byFscpof7S93fab4GutT0610OPxHa28qXt0JTZSTyTtG9ss4G2KRVUOolx5hcKMEE12XwN8Za94s8C6lrPie6s5p4dW1O2U2duYlSK3u5oQMFmzhYx7+uTzV3TfgP4I0extLG10qdNPtYoYYrFtRunt9kMpmiDRNKUbbIxYbgeuOnFdD4X8E6L4Mh1CLRrR7SG/u5b2eJp5JU82Ry8hVXYhAzMzbUwuWJxyaO4uqueGwfFbxD4w8Y/DfxDZqtv4e17Q9Wv7bTY9QljMypHE0PngLt3YbduUEoWI+bGa0/Dv7QTWeg/DcXWnro1j4i0nTriC+1We4uLeSWdgHtTeMDiZUwymY5mLADnJrt9N/Z78C6PeW9zZaTdWptftItY4dVvFitRcD9+sMYl2RK3dUAGeQAataf8AA3wdpun6dYRaZcmw0+2trOC0l1K6kh8m3kMkCujSlZNjEkFwT0HQAA6aFaXuchqH7QV5p/gm+8ff2Pa3Hgu3XUFZku9t2j20jxplSuD5rRvkD/VjBO7nEnif4weLdDuPFGiw6DYXviTS9Aj8R2SwSyPBeQb3SSHoGWVSnykZD7hwvIHVWnwH8CWepa3eJ4fiY60Jvt1tJPLJayGYETMLdnMSM4JDMqhmyck1teF/h/ong1pG0u2mWSSCO2aa8u5rqXyY87I/MmdmCLuYhQcZYnvR3Ejz6b47XGpXGjr4ctbbW4PEEiQaPMpEYlYWhuZnJaQAqq7VCgg7i4z8hzUj+NXjhfEWm6PfeDNN0W8XRJNb1SO81gytbxxXIimWPyYnV22Eug3DOQG24NdrqvwP8Eax4N07wtPoMceh6fP9qsoLSaW2e1m3M3mRSxsskbZd+VYH5iO9XdJ+FHhjQtcstYsdPmiv7TT20uJ2vbh0+zs+9lZGcq5ZvmLsCxPJJNPox9jzcftCeILDw1F4l1TwasHh7VLSym0e8XUoSJLi6mjiiglCszAfvkcyhcABvlyBu2vhBq2v3XxQ+Klhrd59oWxvbEW0MU8jwRK9ojny1cnZliSVHGa0tN/Z0+Hek6HqujQeHE/sfUlMc1jNdzywxoXD7YFdyLdd4DARbACqkcgY6Lwd8M/D/gS/1O90iC8S81Lyvtlxeajc3kk/lrsQs00jkkKMZ64pLcT2sjrqKKKYBRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUUAFFFFABRRRQAUUUlAEM0iQo8jsERQWZmOAAOSSfSs3R/FmieIJpItK1iw1KSIZkSzuUlKfUKTitOY/u3+lfIP/AAT8VY9R+OxwAP8AhO74enQ0o6yceyuD+Hm87H1VqvinRtDura11HV7Gwurn/UQ3VykTy84+UMQW5IHFTXmuabpmmNqV3f2trpyoHN1PMqRBT0JcnGK+QPjVdfEPwH8SPEvxW8CabpvxU+Hur6ZbWfiPw3K2bi3hji3gw5HKNHNvwA3+sJKHqOZ0Dxpp/wAVP2qfgVpMdvPF8OIPBq6z4f0m+5R7kRyIGdejyRKmB12lMjGaUXzWXUH7qbeyPuLSfEmk68ofS9Us9RQgkNaXCSggEAnKk9Mj8xUtxq1lbWlxeT3lvDaW+7zppJVVItvDbmzgY756V4X+1vqCfCX4T+OfiboEAtPF40hNKXUIVAfZLcRojEgctGXJU9s15L8arWW1+P37M/w3uwy/D9ozdSW7cw315DHmMS54chgjYOcmQk9aFq/nYOl/K59faf438O6xC01h4g0u9iQ/M9vexyKuFLHJDcYUE/QE1vJ83IOQeleL+JPGHw/uv2kPDXhm/wBMuj8RbfT57mwuEtl2NZSKyybpc8plT8p53KMDnnJ/ZK8V3eo2vxH8KXDvNa+EPFt9pGnu5yVswQ8UWf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On LSC(G), loop on lines 1-5 will take O(V). In the worst case, loop on 7-12 will take O(V) time. Therefore, we will call LSC\_TRAV exactly once for each vertex v ∈ V. During an execution of LSC\_TRAV, the loop on line 4-15 will be executed for each adjacent of a v. Since we call LSC\_TRAV exactly once for each vertex v ∈ V:



It will simply be equal to the all the edges. Therefore, the running time of LSC algorithm will be O(V+E).

1. Kumar, Gupta (2014) [↑](#footnote-ref-1)