

CS F364 – Design and Analysis of Algorithm
BITS Pilani, Hyderabad Campus
Assignment -1

Due Date : 24th February 2020 (by Midnight)
Total Marks: 30 (weightage : 10%)

The objective of this assignment is to read a research paper based on Divide-and-Conquer to identify the Strongly Connected Components in a Directed Graph and implement it. Also compare it with more traditional algorithm. Experiment with many different data sets and compare results.

Exercise 1: Implement the classical algorithm to find the Strongly Connected Components in a directed graph using Depth First Search. This algorithm is given in “Introduction to Algorithms” by Cormen et. al. [6]

Exercise 2: Read the research paper “A Divide-and-Conquer Algorithm for Identifying Strongly Connected Components” by Don Coppersmith, Lisa Fleischer, Bruce Hendrickson, and Ali Pinar. Implement the first algorithm DCSC (Divide-and-Conquer Strong Components) given in the paper. [12]

Exercise 3: Run your algorithm on different kinds of directed graph. Smaller graphs to test your code and larger graphs to verify the robustness of both implementations (one using DFS and DCSC) and compare them. Use <https://snap.stanford.edu/data/> to download some of the social network graphs. Expecting output on minimum three large graphs. [6]

Exercise 4: Record your experimental results along with the documentation of algorithm. Develop HTML pages to document the results produced by your code, issues in coding, general discussion on the algorithm, timing analysis, references, and any other remarks. [4]

Exercise 5: Use software Doxygen to produce the code documentation. [2]

Bonus Points: Show the visualization of graphs and its strongly connected components using any visualization tool/library. You can use any language for this exercise. [4]

General Instructions:

1. This assignment can be done in groups of no more than four students.
2. Design the classes and headers properly. The code should be well indented, well commented and easily readable. Points will be deducted for an unorganized and uncommented code.
3. The assignment has to be coded completely in C/C++.
4. The code should be developed in CSIS labs (Systems Lab/ Data Science Lab) in your respective logins. Submission instructions will be given later.
5. The name of the file should be id1_DAA_A1.zip, where id1 refers to the ID of only one member of the group.
6. There should be only one submission from a group.

7. You can discuss with your friends but refrain from copying the code and submitting. Copied codes will receive no credits for the entire assignment.
8. You have to demo the code to the instructor/TA on a scheduled date and timing after submission.
- 9. During Demo all members must be present. Anybody not present will be awarded zero credit.**