**Assignment Report**

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| --- | --- | --- | --- | --- |
| **Student** | **Analyze requirement** | **Developer** | **Tester** | **Reporter** |
| Nguyễn Ngọc Nhân | X | X |  |  |
| Lý Bảo Huy | X |  |  | X |
| Mai Phước Thành | X |  | X |  |

**Section 1: Experimental Results**

Fill the following table with appropriate information.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Graph Size** (**NTry = 50,** a number of trials as heuristic value) | | Community: **100**  Member: **50** | Community: **500**  Member: **100** | Community: **3000**  Member: **100** | Community: **500**  Member: **200** |
| **Conventional Method** | Execution Time |  |  |  |  |
| #communities found |  |  |  |  |
| **Heuristic Method** | Execution Time | **6.174** seconds | **31.651** seconds | **340.035** seconds | **41.043** seconds |
| #communities found | **85** communities (50 members) | **463** communities (100 members) | **2724** communities (100 members) | **482** communities (200 members) |

**Section 2: The heuristic approach**

Step 1: Identify the requirement

* A social network is the set of User and Relationship, we can consider it is a Graph
* For each User in the network, we can consider it is a Vertex of the Graph
* For each Relationship between two User, we can consider it is an Edge of the Graph.
* A community is a group in which everyone make friend to each other => It means all Users in the community have relationship with each other (The number of users should be more than 2). Therefore, we can consider a community is a CLIQUE.

Step 2: Build the CLIQUE checking function.

* This function will receive a set of defined Vertices as an Input and return a Boolean value (True if the input is a CLIQUE and False if the input is not a CLIQUE).

Step 3: Build the Heuristic function

* Firstly, the Heuristic function will choose randomly a Vertex in the Graph (called Vertex A)
* Then we will find all of the other Vertices, which have relationship with A. With these Vertices, we will randomly select sets of Vertices (called set SV) which size decrease from the largest to the smallest size. For each size, we will choose NTry - a number of trials as heuristic value (try to select a set of randomly selected vertices), after NTry but couldn't find any clique, we decrease the size by 1. For each SV, we will use the CLIQUE checking function to check if it is a CLIQUE or not.
  + If it is a CLIQUE, we will mark all Vertices in SV as Visited and return the result immediately.
  + If there are no CLIQUE, we will only mark Vertex A as Visited
* After that, we will move to other un-visited Vertex and repeat the process of Heuristic function.