Assignment 3

Design & Analysis of Algorithms Lab

January 18, 2022

1. Given N scientists, where some of them belong to same research communities, and some are not, your task is to find out the number of research communities. Given a N X N matrix M representing the direct collaboration between scientists in the world. If M[i][j] = 1, then the ith and jth scientists are direct collaborators, otherwise they are not. The community is transitive. For example, if A is directly collaborating with B, and B is directly collaborating with C, then A is an indirect collaborator of C. We define a community as a group of scientists who are direct or indirect collaborators. Write a program to output the total number of research communities in the world.

```
Input:
6
1  1  0  0  0  0
1  1  0  1  0  0
0  0  1  0  0  1
0  1  0  1  0  0
0  0  0  0  1  0
0  0  1  0  0  1
Output: 3
Explanation: \{0, 1, 3\} \{4\} \{2, 5\} are research communities.
```

2. Given a two-dimensional seating arrangement of students, write a program to find the number of groups. If student A is sitting to the east/west/north/south of student B, then A can group with B. Their connection in the group is transitive. For example, if A can group with B, and B can group with C, then A and C are in the same group. The number 1 indicates a student sitting in a chair, where 0 indicates an empty chair.

```
Input:
Rows = 4 Columns = 4  4  3  5
1  1  1  1
1  1  0  1
1  1  0
0  0  0  0  1
Output: 2
```

Hint: Use Union-Find data structure with parent[] and groupsize[] array
Submission Instruction:

File Name: A3_RollNo.c/cpp
Email to: *pds2016autumn@gmail.com* with **subject line**: A3_RollNo