EECS 560 Lab 09: Disjoint Sets and Random Maze Generation

Objective

- Get familiar with basic disjoint set implementation using C++.
- Have fun with generating a random maze using the disjoint set data structure.

Specification of the ADT

1. Implement the disjoint set data structure as `MyDisjointSets`. You need to implement path compression and union-by-size union. `MyDisjointSets` should use `MyVector` to hold the disjoint set information.
2. Implement a class `MyMaze` that allows the generation and printing of random mazes. Build the random mazes using the `MyDisjointSets` data structure.

Additional Specifications

1. Use your program to generate a 20 (rows) by 40 (columns) maze.
2. Format your maze (for MS Word, please do 1: set the font to Courier New; 2: set the font size to 8; and 3: bold all symbols). An example of a formatted maze is attached at the end of this document.
3. Print out the formatted maze, solve the maze manually by drawing a valid path that goes from the entrance to the exit.
4. Scan the solved maze and include it in your submission.

Testing and Grading

We will test your implementation using the tester main function posted online. Your code will be compiled under Ubuntu 20.04 LTS using g++ version 9.3.0 (default) with C++11 standard.

Your final score will be the determined by your manually solved maze (20%) and the number of valid random mazes your program can generate. We will test maze sizes of 5*5, 5*10, 10*10, 10*15, 15*15, 20*20, 30*30, and 30*50 (10% each). Note that if your code does not compile (together with our tester main function), you will receive 0. Therefore, it is very important that you ensure your implementation can be successfully compiled before submission.

Submission and Deadline

Please submit your implementation as three .h files and one .pdf file, with names "MyVector_[YourKUID].h" (the same as your Lab 01 submission), "MyDisjointSets_[YourKUID].h, "MyMaze_[YourKUID].h", and "SolvedMaze_[YourKUID].pdf". For example, if my KU ID is c123z456, my submission will be three files named "MyVector_c124z456.h", "MyDisjointSets_c124z456.h", and "MyMaze_c124z456.h". Please also submit your manually solved maze in the PDF format as "SolvedMaze_c124z456.pdf". Submissions that do not comply with the naming specification will not be graded. All submission will go through Blackboard. The deadline is November 18th, 2022 11:59PM.

Example of a formatted maze: