Programming Assignment 5 Report

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Program description and purpose of assignment

The purpose of the assignment is to learn about and understand how a disjoint set structure works. The disjoint set was implemented using linked lists and nodes.

Data structure description of the Class DisjointSet

The DisjointSet class is made up of 6 functions. The constructor, destructor, getNodeLocator(), MakeSet(), Union(), and FindSet(). MakeSet() creates a new node for every new set and points next and previous both to NULL. It sets the trailer and representative to itself and inserts the node at the correct key in the vector. Union() checks for the larger set and adds the second sets first element to the larger sets last element. The elements in the smaller set have their representatives set to the representive of the elements in the larger set. The list size is the sum of the two lists and the larger sets trailer is set to the smaller sets trailer. It then returns the representative. FindSet() has 2 implementations. The first takes in a node and the representative is then returned and the second takes in a key and searches for the representative and then returns it once it is found.

Runtime analysis

MakeSet() has O(n) runtime. Union() has O(logn) runtime. Both FindSet() implementations have O(1) or constant runtime.

Instructions to Compile

The program can only run through the build.tamu.edu server. Segmentation faults occur if run on a different server. The files are disjointset.h, disjointset.cpp, main.cpp, and TemplateDoublyLinkedList.h.

Object oriented programming features

Classes are used in this. The DisjointSet class and DListNode class are used.