George Washington University
Department of Computer Science

Csci 6212 - Homework 10

Given: May 2, 2017
No submission

1. We are given an $n \times n$ table of letters. We have redefined "word" to mean an increasing (by ASCII value) chain of characters from length 3 to length n^2. For example, "ABCD" is a legal four-letter word, and "MICROSOFT" is not a legal word because the sequence is not increasing. "BILL" is also illegal, and 'BIL" is however legal. A word may start anywhere in the table and is constructed by forming a chain of adjacent letters, where "adjacent" means diagonal, vertical, or horizontal. A word cannot use any character from the table more than once. Here is an example of a 4×4 table.

B	I	L	E
T	G	L	P
A	E	S	T
H	E	L	E

The following is a partial list of legal words that can be found using the above rules: BILP, AELST, AEGLPT.

(a) Design a backtracking algorithm to find all legal words.

(b) Design a branch-and-bound algorithm to find a longest word.

2. Write a non-recursive algorithm for the preorder traversal of a binary tree T. Your algorithm may use a stack. What is the time complexity of your algorithm?

3. A bipartite graph is a graph whose vertices can be partitioned into two subsets such that there is no edge between any two vertices in the same subset. Describe an algorithms to determine of a given graph is bipartite or not.

4. Let G be a connected graph, and let v be a vertex in G. Let T_D be a depth-first-search tree starting from v. Let T_B be the breadth-first-search tree starting from v. Is it always true that $depthe(T_D) \geq depth(T_B)$? Give a clear argument or a counter example.