UNIVERSITY OF MINNESOTA
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

5511 ARTIFICIAL INTELLIGENCE I FALL 2018

PROGRAMMING ASSIGNMENT (100 points)
Assigned: 11/5/18 Due: 12/04/18

The programming assignment consists of the following problems:

- (50 points) Write some Lisp code (*functionatom*) that has as an argument a list of arbitrary structure and returns a list that consists of the same atoms in the same order but with all the atoms at the same level. For example, this function should operate like this:

  > (*functionatom* '(*a* (*b c*) (((*d*) *e f*))))

  (*a b c d e f*)

  Write some Lisp code (*replaceword*), which has as input a symbol and a list. It replaces in the list all the instances of the symbol with YYYY. The function must be written recursively and cannnot make use of any of Lisp's higher-order functions such as mapcar or substitute. For example, this function should operate like this:

  > (*replaceword* 'NIKOS '(*I AM NIKOS*))

  (*I AM YYYY*)

- (50 points) Implement the A* search for searching trees (in Lisp). Do not use Russell's code or other code from the web. Implement a counter that counts the number of nodes expanded and prints this number at the end of the search. Use your code to solve the 8-puzzle problem with the heuristic being the sum of distances of the tiles from their goal positions and start state $((E,1,3),(4,2,5),(7,8,6))$. The goal state is: $((1,2,3),(4,5,6),(7,8,E))$. Print the number of nodes expanded. You only need to show the states generated during the search process. Your code should detect **infeasible puzzles**. For an infeasible puzzle run your code and submit the results as well.

Sample Lisp code for the problems can be found at the web resources (ref [2]) listed in the syllabus.

All the programs must be written in Lisp (follow the instructions discussed in class and at the site of the class). You need to submit: **a) a hardcopy (code, script, report) and b) an electronic copy through the class site (code, script)**. You must also satisfy the following guidelines: Please hand in a report that contains a Title Page (including your name, login, ID number, class number and/or name, the professor's name, the assignment number and/or name, location and name of the files (source, executable, data, make, etc.), and the date due), a Program Implementation Description, Known Bugs and Deficiencies, Style Guidelines, Terminal Session Script and Source Code. At the class site, you will find instructions on how to submit your programs. The rough weight distribution for the assignment is: Correctness-60%, Report-20%, Style-10%, and Innovations-10%. You should work on this assignment individually and not in groups.

Finally, I suggest that you begin the assignment as early as possible.