CS4390 CS 4390 - Special Topic in Computer Science: Bio-related Data Structures and Algorithms
Fall 2013
Lab 1
Report due in class, September 12

Strings

1) Write a method that receives a string $S$ and a character $c$ and determines the number of times $c$ appears in $S$.

2) Write a method that receives a string $S$ and builds and returns a string that contains the characters in $S$ in reverse.

3) Write a method that receives a string $S$ and a character $c$ and builds and returns a string that contains the characters in $S$ except that all occurrences of $c$ are removed.

4) Write a method that receives two strings $S$ and $T$ builds and returns a string that contains the characters in $S$ followed by the characters in $T$. That is, it returns the concatenation of $S$ and $T$.

5) Write a method that receives an integer $n$ and a character $c$ and builds and returns a string that contains $c$ repeated $n$ times.

6) Write a method that receives a string $S$ and characters $a$ and $b$ and builds and returns a string that is identical to $S$ except that every instance of $a$ in $S$ is replaced by $b$.

7) Write a method that receives a string $S$ and builds and returns an array of characters that contains the same characters in $S$ in the same order (that is, it converts a string into an array of characters).

8) Write a method that receives an array of characters $C$ and builds and returns a string $S$ that contains the same characters in $C$ in the same order (that is, it converts an array of characters into a string).

9) A palindrome is a string that is identical to its reverse. Write a method that receives a string $S$ and determines if it’s a palindrome.

1D Arrays

1) Write a method that receives a 1-D array of integers $A$ and returns the sum of all the elements in $A$.

2) Write a method that receives a 1-D array of integers $A$ and returns the smallest element in $A$.

3) Write a method that receives an integer $n$ and a 1-D array of integers $A$ and determines the number of times $n$ appears in $A$.

4) Write a method that receives a 1-D array of integers $A$ and determines if $A$ is sorted in ascending order (that is, it returns true if $A$ is sorted, false otherwise).

5) Write a method that receives a 1-D array of integers $A$ and builds and returns a copy of $A$.

6) Write a method that receives a 1-D array of integers $A$ and builds and returns an array containing the elements of $A$ in reverse.
7) Write a method that receives integers m and n and builds and returns a 1-D array of integers of length m in which every element has a value of n.

8) Write a method that receives an integer n and builds and returns a 1-D array of integers of length n in which the first element has a value of 0, the second element has a value of 1, and so on.

9) Write a method that receives two 1-D array of integers A and B and computes the dot product of A and B. Recall that the dot product of two vectors u and v is \( d = u_0 \times v_0 + u_1 \times v_1 + u_2 \times v_2 + ... \)

10) Write a method that receives a 1-D array of integers A and rotates A. That is, it moves the first element of A to the last position, and moves every other element one place to the left (thus the original value of A[1] is stored in A[0], the original value of A[2] is stored in A[1] and so on).

**2D Arrays**

1) Write a method that receives a 9-by-9 2-D array of integers A and determines if A encodes a valid solution of the game of Sudoku.

Write a report describing your code, experiments and results, as described in the syllabus. Also, email the source code to your instructor at olacfuentes@gmail.com.