MEDGAR EVERS COLLEGE
The City University of New York

Project B: Applications

Directions:

To develop applications, you will usually have to implement a data structure. For your project, you will be developing an application that will use data structures that were discussed in class. Regardless of which application you are assigned, your project must

- □ Define your own data structure class that is specific for your assigned application. Your data structure class must define the special member functions and a string constant `ToString()` method.
- □ Define your own application class that has at least one field which is an object of your data structure.
- □ Each of the classes must be written in their own header file.
- □ A main cpp file must written to run the application.
- □ The files can only include the libraries *iostream*, *string*, *sstream*, *fstream*, *cstdlib*, *ctime*, *cctype*, *Array.h* and *Node*.
- □ If your application requires using a linked list you must use the **Node** objects from the **Node** header file.

The applications are

- □ DNA Motif Analyzer A DNA motif is a nucleic acid (Adenine (A), Thymine (T), Cytosine (C) and Guanine (G)) sequence pattern that has some biological significance. Your application will read files that represents DNA sequences and analyze motifs of size 4. The application will keep track of the frequencies of the motifs in the sequence. Likewise, it will be able to provide statistics on the DNA sequence, which are the most frequent motifs, least frequent motifs, missing motifs from the sequence and average frequency. However, since DNA is a double helix with base pairs (Adenine always with Thymine and Cytosine always with Guanine), whenever the count of a motif is incremented, the count of its complement is incremented as well. For instance, if your program reads the sequence `ATAGC`, the motifs `ATAG`, `TATC`, `TAGC`, and `ATCG` will have a count of 1.
- □ Ball Sorting Game The ball sorting game uses 6 tubes and 4 balls of each color red, green, blue and yellow. The game starts by randomly placing the 16 balls in 4 of the tubes. Afterwards, you are required to sort the balls so that 4 tubes will only contain a balls of the same color. However, only a single ball can be moved at a time, which must be the top ball of the tube. Likewise, the ball being moved can only be moved to a tube whose top ball is the same color as the ball being moved and the tube will not exceed capacity, or to an empty tube. The maximum capacity of the tubes is 4 balls. Your application must display all the tubes and their content with a label for each tube (either a number or alphabet). It will use the labels to determine the source and destination tubes of the ball being moved.
- □ Month Scheduler A month scheduler application allows the user to add, view and remove notifications for the current calendar month. Each day can store up to 5 notifications. Notifications can be added in any order, that is, notifications can be added for any day in the month; however, for only the current day to the last day of the month. Likwise, the application must store the notifications for future uses of the application. When the application starts, the old notifications [notifications stores for days earlier than the current date] will be displayed, and then, removed from the scheduler. The application must allow the user to view the notifications of a day at a time or the notifications for the entire month. Each notification view must contain a label, a creation timestamp (month, day and time only) and its message; and they must be displayed in ascending order based on the timestamp. Last, the application can remove a specific notification using the day and its label or it can remove the notifications for an entire day.