Stony Brook University
ESE 224: Computer Techniques for Electronic Design II
Spring 2017

Assignment 2
Classes, Reference Variables and the String Class

Total Score: 12 points

1 Assignment

1. Given a two-dimensional input integer array of size M x N, write a program such that if an element in the array is 0, the entire row and column is set to 0. You can initialize the array as follows:

   ```
   int arrN[4][3] = {{5, 1, 0}, {3, 2, 4}, {39, 20, 0}, {11, 2, 49}};
   ```

   Generate the appropriate test cases, and test the program with array sizes 20 x 30. **(2 points)**

2. Write a function that adds two numbers. You cannot use + or any other arithmetic operator. You will be utilizing the bit manipulation and bitwise operators in C++. **(2 points)**

3. Given an arbitrary ransom note, consisting of $15 - 20$ words and several magazines, write a function that will return a true, if the ransom note can be constructed from the words in the magazines, otherwise it will return a false. Each word in the magazines can only be used once in your ransom note. The algorithm should work efficiently, such as, utilizing hash tables for storing and looking up strings. An example hash function maybe the sum of the ascii values of all the characters in the string, modulus an appropriate positive integer. Utilize the built in `string` class, and some of its methods. For testing the code, utilize the ransom note and the magazines provided on the Blackboard in files `RansomNote.dat`, `Magazine1.dat`, `Magazine2.dat`, `Magazine3.dat`, `Magazine4.dat`, `Magazine5.dat`and `Magazine6.dat`. **(4 points)**

4. Define, implement and test a `Complex` class, which has:

   (a) At least two constructors.

   (b) A destructor.

   (c) Several Methods with functionality as described below:

   - Returns real part.
   - Returns imaginary part.
   - Displays the number.
   - Computes magnitude.
   - Computes polar co-ordinates.
   - Overloads operators +, -. * and /, with the corresponding operations.
   - Overloads the operator $\sim$ for complex conjugate.
   - Overloads the operators == and != for comparison.

   The methods *must* make appropriate use of the reference variables, for arguments and return types, as described in Stephen Prata, Chapter 10. For more details on operator overloading, refer to Prata, Chapter 11. **(4 points)**

2 Grading

In addition to code functionality, there will be points for optimized algorithm, coding style and comments. A few useful comments would be sufficient.

3 Assignment Submission

The Assignments **must** be submitted on the Blackboard, and should include the following:

1. The C++ source code, with **one file per problem**.
2. Screen shots which show each program executing. All the screen shots maybe in a single .pdf or .jpg file.