C++ Homework

MAT5939-04 - Instructor: Pierre Garreau
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Guidelines

To complete this assignment you must hand in a report including:

1. Title
   - The name of the homework assignment. Ex. “Bisection Method”

2. Description of Problem
   - Description of the problem with a discussion of relevant mathematics. Ex. Explain how and why the bisection method works. Be specific and include a few steps worked out by hand with explanations of each step.

3. Description of the Program
   - Description of your program which describes the algorithm you used and details your implementation. Ex. Explain how you implement the bisection method. You may also copy the relevant piece of code to help explain your implementation.

4. Results and Conclusions
   - Discussion of the results including any tables or figures needed. Ex. Tell me all the roots for the two equations with error bounds. You must also explain why you believe the answer is correct. The correct answer alone is not enough, you have to convince me that it is correct to get credit for it.

5. Program Listing
   - Include all your source code, makefiles and instructions on how to execute your code.

You must also email me your source code, makefiles and instructions on how to execute your code.

- Email me at pgarreau@math.fsu.edu
- Include [MAT5939-04] in the subject line of the email.
6 Timer Module

1. Write a program that creates a two dimensional dynamic array.
2. Assign random values to the array in separate function (Note: code to generate random numbers is below).
3. Write a timer class.
   - The type of timer you use is up to you but I suggest you first look at time.h and clock() (Note: you will need to use the internet to look these up).
   - The class must include a struct for the timer to include start and stop times.
   - The class must include functions to start the timer, stop the timer and return the elapsed time.
4. Use this class to time how long it takes to multiply a N by N array against itself 5 times.
5. Make a table and graph showing the computation times for N=100, 200, 300, 400, 500, 600, 700, 800, 900, 1000.

Algorithm 2 Pseudo Code for assignment

1: array ← N by N random values
2: start timer
3: for i = 1, ..., 5 do
4:   array = array * array
5: end for
6: stop timer
7: Output: elapsed time between timer start and stop

Random Numbers

```cpp
#include <iostream>
#include <stdlib.h>
#include <time.h>

using namespace std;

int main()
{
    int randomnumber;
    double lowerbound = 1.0, upperbound = 3.0;

    srand(time(0)); // We seed the random number generator with the current time
    cout << "largest possible random number" << RAND_MAX << endl;

    randomnumber = rand(); // rand() generates integer between 0 and RAND_MAX
    cout << "random integer=" << randomnumber << endl;

    cout << (double)randomnumber / (double)RAND_MAX << endl; // uniform [0, 1]
    cout << lowerbound + (upperbound - lowerbound) * ((double)randomnumber / (double)RAND_MAX) << endl; // uniform [lowerbound, upperbound]

    return 0;
}
```