FAST NUCES – Fall '17 IPT - Assignment 5

Due: Sunday 31st Dec 2017 17:00 hours

How: Please submit on SLATE. Please submit a single .zip/rar file named 'IPTAssignment5 <Reg#>'.zip/rar. Do not share dropbox/google-drive or any other links.

1. Carry out matrix multiplication of large matrices using different approaches and compare the results in the following format:

	100 x 100	500 x 500	1000 x 1000
Single Thread: Integers			
Single Thread: Decimals			
Single Thread: Doubles			
10 threads: Integers			
10 threads: Decimals			
10 threads: Doubles			
TPL Parallel.For: Integers			
TPL Parallel.For: Decimals			
TPL Parallel.For: Doubles			
TPL Asynchronous tasks: Integers			
TPL Asynchronous tasks: Decimals			
TPL Asynchronous tasks: Double			

2. To implement the above, create a form based application that asks for:
    a. Matrix size: 100 x 100 or 500 x 500 or 1000 x 1000
    b. Threading model: Single Thread, 10 threads, by using TPL (Task Parallel Library) Parallel.For OR by using TPL Asynchronous tasks
    c. Storage model: Store matrix cell values as **integers simulating decimals with two decimal places** or Decimal data type or double data type
3. Upon hitting the Execute button, the program should generate matrices of the correct size randomly with cell values ranging from 0.10 to 999.99 with a step size (granularity) of 0.01.
4. The program should display progress of the calculations at the end of each cell calculation of the resultant matrix. The progress could be in the form of simple text messages being shown in the UI via a listbox or any other appropriate UI control.
5. Each execution should do 5 runs of the multiplication (i.e., if user has selected matrix of 100 x 100 with single thread and using doubles, five different multiplications should be done – 10 matices will be generated randomly of size 100 x 100 and each of the 5 pairs of 2 matrices will be multiplied)
6. Once the calculations are done the program should display the time taken to calculate the multiplication process for each of the 5 runs and also the average time. The avg time should be used to fill the above table.
7. The program should LOG its working and all results and all times separate in log file(s).

Notes

1. **Integers simulating decimals with two decimal places** mean store decimal numbers as integers. Since the requirement is two decimal places, we can map/transform a decimal number to an integer by multiplying it with 100, e.g. **37.25** is stored as **3725**.
2. **Granularity** or **step-size** here simply means 2 decimal places. The matrix values should be between 0.10 and 999.99. **0.11** is a valid value and so is **0.12**, BUT **0.125** is not valid (as it is three decimal places)

3. Please provide the program source code, executable(s), sample runs and a word/pdf document with the result table, ALL in a single .zip/.rar file.
4. The date in SLATE is moved to 2nd Jan 2018 5:00 PM.