

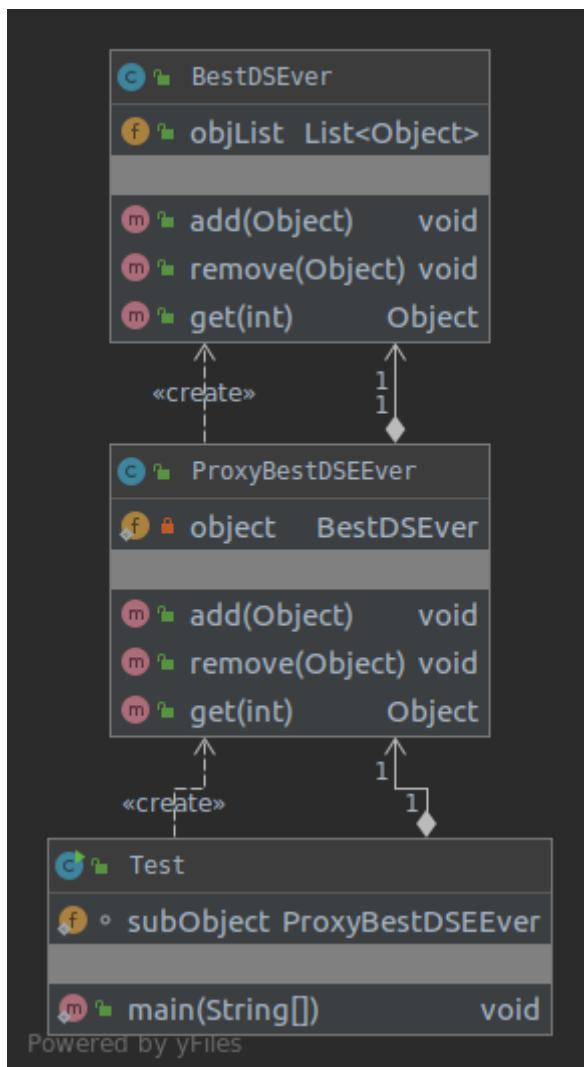
Homework - 3 CSE443
Object Oriented Analysis And Design
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Question 1 :

In the design I have created, we can control the responsibility and functional status of some classes, objects or processes on another object and put the responsibility on this object. More precisely, we can transfer the proxy of objects in the process to another class. So, I used **Proxy Design Pattern** in this project.

As you can see, I write the insert, remove and get ProxyBestDSEEver class as thread safe. When these methods are triggered, the object will be linked to the reference and will trigger unsafe methods over the reference and the actual untread methods will be called.

Class Diagram :



Test and Result :

I wrote a demo that is inserting 10 elements. And 1 removed element and 1 got element.

```
Inserted -> 0
Inserted -> 1
Inserted -> 2
Removed -> 2
Got -> 0
Inserted -> 3
Inserted -> 4
Inserted -> 5
Inserted -> 6
Inserted -> 7
Inserted -> 8
Inserted -> 9
```

Question 2 :

The Model View Controller (MVC) design pattern specifies that an application consist of a data model, presentation information, and control information. The pattern requires that each of these be separated into different objects. Our models MonitorLock and SynchronizedWaitNotify Classes.

→ The View presents the model's data to the user. The view knows how to access the model's data, but it does not know what this data means or what the user can do to manipulate it. Our Project has Controller View class user can add component to project. If Our component is called in ControllerView constructor. We can easily add component to gui.

•→ The Controller exists between the view and the model. It listens to events triggered by the view (or another external source) and executes the appropriate reaction to these events. In most cases, the reaction is to call a method on the model. Since the view and the model are connected through a notification mechanism, the result of this action is then automatically reflected in the view. All triggered buttons are in ControllerView class.

Discrete Fourier Transform :

I calculated fourier transform of A and B 2d matrix. According to following link :

https://en.wikipedia.org/wiki/Discrete_Fourier_transform

Implementation 1 with wait, synchronized, notifyAll (SynchronizedWaitNotify Class):

I implemented with synchronization tools that work according to if all thread are finishing to A and B matrix summation. Finished thread is waiting other threads. Then last finished thread is notify all other waiting threads.

Then all thread are traverse to DFT process.

Implementation 2 with lock and monitor:

I provided synchronization with lock mechanism. Our sumResult array is lock to thread to wait. Then last finished thread is notifyAll waiting thread.

```
threadNumber++;
synchronized (result) {
    if (threadNumber != ControllerView.threadNumber) {
        try {
            result.wait();
        } catch (InterruptedException e) {
            e.printStackTrace();
        }
    } else {
        result.notifyAll();
    }
}
```

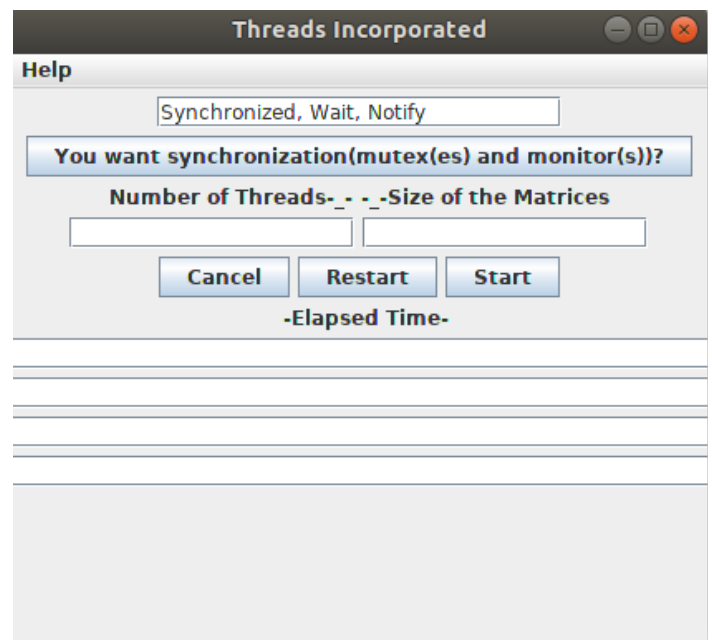
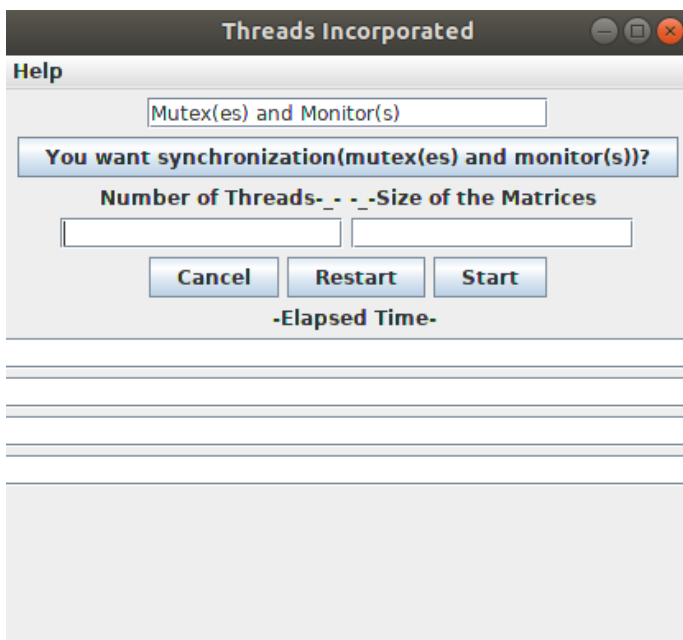
Then all woke up threads are processing to DFT.

TEST PROGRAM :

Step 1 : You can select implementation with **You want synchronization...** button. Just click button and change which implementation you want.

Mutex(es) and Monitor(s)

Synchronized, Wait, Notify



STEP 2: You can enter 2,4 and 8 number for thread options. For matrix size you can enter coefficient of 32.

Threads Incorporated

Help

Synchronized, Wait, Notify

You want synchronization(mutex(es) and monitor(s))?

Number of Threads-_-Size of the Matrices

2 64

Cancel Restart Start

-Elapsed Time-

Threads Incorporated

Help

Mutex(es) and Monitor(s)

You want synchronization(mutex(es) and monitor(s))?

Number of Threads-_-Size of the Matrices

8 128

Cancel Restart Start

-Elapsed Time-

(Start)STEP 3: if you press start button. Then the operation is starting.

Threads Incorporated

Help

Mutex(es) and Monitor(s)

You want synchronization(mutex(es) and monitor(s))?

Number of Threads-_-Size of the Matrices

2 128

Cancel Restart Start

-Elapsed Time-

A and B both of size 128x128 filled with complex numbers.

2 threads work ... You will see finish time.

2 threads finished -> 29.806007687s

1 thread would finish -> 38.7478099931s

(Cancel)Step 4: When operation is continuing. If you press cancel button. All threads are canceled.

Note : Elapsed Time can be different according to computer.

(DFT Result) Step 5 :

```
(31744.0, 31744.0), (63084.0, 63421.0), (94419.0, 95098.0), (125690.0, 126751.0), (156998.0, 158427.0), (188295.0, 190103.0), (219566.0, 221756.0), (250819.0, 253392.0), (280979.0, 31503.0), (62030.0, 63061.0), (281910.0, 284970.0), (313250.0, 316393.0), (344786.0, 347597.0), (375724.0, 379316.0), (406853.0, 410905.0), (438167.0, 442319.0), (469006.0, 474063.0), (499946.0, 505777.0), (279711.0, 284022.0), (310508.0, 315026.0), (347344.0, 351891.0), (379929.0, 385085.0), (412239.0, 418058.0), (444786.0, 451268.0), (477513.0, 484372.0), (510551.0, 518234.0), (543689.0, 552029.0), (577027.0, 585985.0), (610575.0, 620116.0), (643724.0, 654363.0), (677133.0, 688883.0), (710792.0, 723653.0), (744561.0, 758561.0), (778561.0, 793611.0), (812792.0, 828961.0), (847292.0, 863811.0), (882092.0, 898461.0), (917092.0, 932961.0), (952092.0, 967511.0), (987292.0, 1002061.0), (1022592.0, 1037611.0), (1057892.0, 1073261.0), (1093292.0, 1109011.0), (1128792.0, 1144861.0), (1164392.0, 1180711.0), 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